



DULUTH INTERNATIONAL AIRPORT

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**DULUTH INTERNATIONAL AIRPORT
NEW PASSENGER TERMINAL
BID PACKAGE 2C- SITEWORK, APRON, CONCESSIONS & FURNISHINGS
CONTRACT DOCUMENTS
ISSUE FOR BID**

FAA AIP No. - 3-27-0024-54-12
RS&H PROJ. No. – 214.1882.091
CITY OF DULUTH BID No. 12-4401

**PROJECT MANUAL
VOLUME 2 OF 4**

Date: FEBRUARY 10, 2012



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**NEW PASSENGER TERMINAL
DULUTH INTERNATIONAL AIRPORT
DULUTH, MINNESOTA**

SECTION 01010 - SUMMARY OF WORK

1. GENERAL

- A. All work furnished under this Project Manual shall be installed at the following location in accordance with the Contract Documents:
 - 1. At: Duluth International Airport
New Passenger Terminal
Bid Package 2C
Duluth, Minnesota
 - 2. For: Duluth Airport Authority
4701 Grinden Drive
Duluth, MN 55811
- B. The provisions of Part 2 through 6, Part 9 and 10 of the specifications, and Division 1, General Requirements, shall apply to all work of the Contract.
- C. The Scope of Work for the Duluth International Airport, New Passenger Terminal, Bid Package 2C includes all work required for complete construction in accordance with the Contract Documents.
- D. Construction Contract: Construction will be accomplished under Multiple Prime Contracts as described in Section 01014 – Work Scope Descriptions.
- E. Coordination: Project will require close cooperation and coordination with Owner, Owner's Construction Manager (CM) and Contractor and Subcontractors. Contractor shall: consider such coordination in his work; schedule the Work with subcontractors and the Owner and Construction Manager, particularly near the end of the Project, keep the Owner and Construction Manager advised of his schedule to complete the Work.
- F. Examination of Site and Documents: In submitting a bid and in accepting a Contract award, the Contractor represents he has examined the site, existing conditions as well as the entire set of documents, in accordance with the General Conditions and agrees to be bound by all conditions of the site, existing conditions and all documents, without additional cost.
 - 1. Contractor's questions regarding this project must be directed to the Architect of record submitted through the Construction Manager. The Owner's employees are not authorized to make decisions or give direction regarding any aspect of this project.
- G. Construction Limits: Except as specifically indicated or as may be necessary to complete the work under the contract, activities of the contract shall be limited to within the limits designated on the drawings.

2. USE OF BUILDING BY OWNER

- A. Owner reserves the right to let other contracts in connection with this Project or in connection with existing buildings. Contractor shall afford other contractors reasonable opportunity for the introduction and storage of their materials and execution of their work, and shall properly connect and coordinate his work with theirs.
- B. Owner reserves the right to jointly occupy the premises with the Contractor in the performance of his duties and functions. The Owner also reserves the right to: enter into the Project and premises at all times; make installations of materials and equipment at appropriate times as the Work progresses; install equipment, furniture and furnishings when spaces are at appropriate stages of completion. Contractor shall coordinate work with the Owner and cooperate with the Owner to minimize undue interferences. Any activities required by the Contractor that may interfere with the Owner's occupation of the premises or Project during the work must be coordinated with the Owner and Construction Manager and may be required to be completed during alternate time periods.
- C. If any part, unit, phase, or the entire Project is substantially complete or ready for occupancy, the Owner may, upon notice to the Contractor, enter into and make use of the Work that is substantially complete.

3. CONTRACTOR'S USE OF PREMISES

- A. General: During the construction period the Contractor shall have full use of the premises for construction operations, including use of the site. The Contractor's use of the premises is limited only by the Owner's right to perform construction operations with its own forces or to employ separate contractors on portions of the project.
 - 1. Confine operations to areas within Contract limits indicated. Portions of the site beyond areas in which construction operations are indicated are not to be disturbed.
 - 2. Keep driveways and entrances serving the premises clear and available to the Owner at all times. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on site.
- B. Site Storage Areas: As determined by Construction Manager. The Construction Manager shall establish and govern the use of available space.
- C. Site Protection: Protect existing trees and other plantings which are not to be removed and all features of adjacent buildings, paved surfaces which are to remain and are susceptible to damage from ordinary operations of the Contractor, trucking or other activity.
- D. Restoration: All improvements on or about the site and adjacent property which are not shown to be altered, removed or otherwise changed, and which have been damaged or disturbed by any work or operations under this contract, shall be restored to the conditions which existed previous to starting work. All existing buildings, structures, or other features shall be protected from damage by any operation in connection with the Project. The Contractor shall replace or repair, at

his own expense (and to the satisfaction of the Owner), all damage to existing buildings, sidewalks, curbs, drives, fencing, lawns, plants, trees, shrubbery and other property resulting from work of this Contract, from whatever cause.

4. CONSTRUCTION SCHEDULE

A. Refer to Section 01041 – Schedules.

END OF SECTION 01010

**NEW PASSENGER TERMINAL
DULUTH INTERNATIONAL AIRPORT
DULUTH, MINNESOTA**

**SECTION 01027 - APPLICATIONS
FOR PAYMENT**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements governing the Contractor's Applications for Payment.
 - 1. Coordinate the Schedule of Values and Applications for Payment with the Contractor's Construction Schedule, Submittal Schedule, and List of Subcontracts.
- B. Related Sections: The following Sections contain requirements that relate to this Section.
 - 1. Schedules: The Contractor's Construction Schedule and Submittal Schedule are specified in Division 1 Section 01300 - SUBMITTALS.

1.3 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the Schedule of Values with preparation of the Contractor's Construction Schedule.
 - 1. Correlate line items in the Schedule of Values with other required administrative schedules and forms, including:
 - a. Contractor's Construction Schedule.
 - b. Application for Payment forms, including Continuation Sheets.
 - c. List of subcontractors.
 - d. Schedule of allowances.
 - e. Schedule of alternates.
 - f. Schedule of submittals.
 - 2. Submit 3 copies of the Schedule of Values to the Construction Manager for approval at the earliest possible date but no later than 21 days before the date scheduled for submittal of the initial Applications for Payment.
 - 3. Subschedules: Where Work is separated into phases requiring separately phased payments, provide subschedules showing values correlated with each phase of payment.
- B. Format and Content: Use the Project Manual Table of Contents as a guide to establish the format for the Schedule of Values.
 - 1. Identification: Include the following Project identification on the Schedule of Values:
 - a. Project name and location.
 - b. Name of the Architect.
 - c. Project number.
 - d. Contractor's name and address.
 - e. Date of submittal.

2. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:
 - a. Related Specification Section or Division.
 - b. Description of Work / generic name of the item.
 - c. Name of subcontractor.
 - d. Name of manufacturer or fabricator.
 - e. Name of supplier.
 - f. Change Orders (numbers) that affect value.
 - g. Dollar value.
 - h. Percentage of Contract Sum to nearest one hundredth percent, adjusted to total 100 percent.
3. Provide a breakdown of the Contract Sum in sufficient detail, acceptable to the Architect, to facilitate continued evaluation of Applications for Payment and progress reports. Break principal subcontract amounts down into several line items.
4. Round amounts to nearest whole dollar; the total shall equal the Contract Sum.
5. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment, purchased or fabricated and stored, but not yet installed.
 - a. Differentiate between items stored on-site and items stored off-site. Include requirements for insurance and bonded warehousing, if required.
6. Provide separate line items on the Schedule of Values for initial cost of the materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
7. Margins of Cost: Show line items for indirect costs and margins on actual costs only when such items are listed individually in Applications for Payment. Each item in the Schedule of Values and Applications for Payment shall be complete. Include the total cost and proportionate share of general overhead and profit margin for each item.
 - a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at the Contractor's option.
8. Schedule Updating: Update and resubmit the Schedule of Values prior to the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.4 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as certified by the Construction Manager and paid for by the Owner.
 1. The initial Application for Payment, the Application for Payment at time of Substantial Completion, and the final Application for Payment involve additional requirements.
- B. Payment Application Times: Payment applications are due to the Construction Manager on the 1st day of each month. The period of construction work covered by each payment request is the period indicated in the Owner-Contractor agreement or, if none is indicated therein, starting the day following the end of the preceding period. Pay application meetings, which all Prime Contractors are required to attend, occur on the 3rd Thursday of each month. Refer to General Conditions and other Contract Documents for other dates related to payment application times.

- C. Payment Application Forms: Use AIA Document G702 and Continuation Sheets G703 as the form for Applications for Payment.
- D. Application Preparation: Complete every entry on the form. Include notarization and execution by a person authorized to sign legal documents on behalf of the Contractor. The Architect will return incomplete applications without action.
 - 1. Entries shall match data on the Schedule of Values and the Contractor's Construction Schedule. Use updated schedules if revisions were made.
 - 2. Include amounts of Change Orders and Construction Change Directives issued prior to the last day of the construction period covered by the application.
- E. Report of DBE Activity: With each Application for Payment, submit a Report of DBE Activity for the construction period covered by the application for payment.
- F. Transmittal: Submit five (5) signed and notarized original copies of each Application for Payment to the Construction Manager by a method ensuring receipt within 24 hours. One copy shall be complete, including waivers of lien and similar attachments, when required.
 - 1. Transmit each copy with a transmittal form listing attachments and recording appropriate information related to the application, in a manner acceptable to the Construction Manager.
 - 2. Each Application for Payment must be submitted directly to the Construction Manager's office at 8625 Rendova Street N.E., P.O. Box 158, Circle Pines, MN 55014 for processing. Do not submit to jobsites or branch offices.
- G. Waivers of Mechanics Lien: With each Application for Payment, submit waivers of mechanics liens from every entity who may lawfully be entitled to file a mechanics lien arising out of the Contract, including but not limited to subcontractors, and suppliers, for the construction period covered by the previous application.
 - 1. Submit partial waivers on each item for the amount requested, prior to deduction for retainage, on each item.
 - 2. When an application shows completion of an item, submit final or full waivers.
 - 3. The Owner reserves the right to designate which entities involved in the Work must submit waivers.
 - 4. Waiver Delays: Submit each Application for Payment with the Contractor's waiver of mechanics lien for the period of construction covered by the application.
 - a. Submit final Applications for Payment with or preceded by final waivers from every entity involved with performance of the Work covered by the application that is lawfully entitled to a lien.
 - 5. Waiver Forms: Submit waivers of lien on forms and executed in a manner acceptable to Owner.
- H. Initial Application for Payment: Administrative actions and submittals, that must precede or coincide with submittal of the first Application for Payment, include the following:
 - 1. List of subcontractors.
 - 2. List of principal suppliers and fabricators.
 - 3. Schedule of Values.
 - 4. Contractor's Construction Schedule (preliminary if not final).
 - 5. Schedule of principal products.

6. Schedule of unit prices.
 7. Submittal Schedule (preliminary if not final).
 8. List of Contractor's staff assignments.
 9. List of Contractor's principal consultants.
 10. Copies of building permits.
 11. Copies of authorizations and licenses from governing authorities for performance of the Work.
 12. Certificates of insurance and insurance policies.
 13. Performance and payment bonds.
 14. Data needed to acquire the Owner's insurance.
 15. Initial settlement survey and damage report, if required.
- I. Application for Payment at Substantial Completion: Following issuance of the Certificate of Substantial Completion, submit an Application for Payment.
1. This application shall reflect any Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
 2. Administrative actions and submittals that shall precede or coincide with this application include:
 - a. Occupancy permits and similar approvals or certifications by governing authorities, assuring Owners full access and use of the completed work.
 - b. Warranties (guarantees) and maintenance agreements.
 - c. Test / adjust / balance records.
 - d. Maintenance instructions.
 - e. Meter readings.
 - f. Start-up performance reports.
 - g. Change-over information related to Owner's occupancy, use, operation, and maintenance.
 - h. Final cleaning.
 - i. Application for reduction of retainage and consent of surety.
 - j. Advice on shifting insurance coverages, including proof of extended coverages as required.
 - k. Final progress photographs.
 - l. List of incomplete Work recognized to be completed by the Contractor, as exceptions to Architect's Certificate of Substantial Completion.
- J. Final Payment Application: Administrative actions and submittals that must precede or coincide with submittal of the final Application for Payment include the following:
1. Completion of Project closeout requirements.
 2. Completion of items specified for payment application at time of Substantial Completion (regardless of whether such application was made).
 3. Assurance, satisfactory to Owner, that unsettled claims will be settled and that work not actually completed or accepted will be completed without undue delay.
 4. Transmittal of required Project construction records to the Owner.
 5. Certified property survey.
 6. Proof, satisfactory to Owner, that taxes, fees, and similar obligations of the Contractor have been paid.
 7. Removal of temporary facilities and services.
 8. Removal of surplus materials, rubbish, and similar elements.
 9. Change of door locks and other Contractor access to Owner's property.
 10. Consent of Surety for Final Payment.

1.5 RETAINAGE

A. The amount that will be retained will be as follows:

1. Refer to GP 90-06 Partial Payments specifications.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01027

**NEW PASSENGER TERMINAL
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**SECTION 01035 - MODIFICATION
PROCEDURES**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements for handling and processing contract supplements and modifications.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 1, Section 01027 "Applications For Payment" for administrative procedures governing Applications for Payment.
 - 2. Division 1, Section 01300 "Submittals" for requirements for the Contractor's Construction Schedule.
 - 3. Division 1, Section 01631 "Products and Substitutions" for administrative procedures for handling requests for substitutions made after award of the Contract.

1.3 CONTRACT DOCUMENT SUPPLEMENTS

- A. Clarification / Supplemental Instructions (C-): Shall provide further detail to requirements inferred in the Contract Documents or authorize minor changes in the work, not involving an adjustment to the Contract Sum or Contract Time, and will be issued by the Architect with supplemental or revised drawings and specifications, if necessary. Clarifications / Supplemental Instructions issued by the Architect-Engineer shall become binding and a part of the Contract as minor changes in the work unless the Contractor notifies the Architect-Engineer within 21 days that the instructions result in changes that affect the Contract Cost or Contract Time.
- B. Request for Information / Supplemental Instructions (RFI-): Shall be initiated by the Contractor when necessary for performance of the work. The Architect's reply will constitute further detail to requirements if inferred in the Contract Documents or interpretations of the requirements. Requests for information must describe all document references that pertain to the issue and any conflicts and must include the contractor's interpretation or proposed action that would be made if there was not a process to obtain the information from the Architect. Requests for information that do not include this, or that request information already included in the contract documents without conflict, will be returned without action (RWA). The Architect will record the time expended to process such requests and notify the Contractor of the charges. The owner shall deduct any such compensation due the Architect from the Contractor's monthly periodic pay requests in accordance with the compensation terms for cost, overhead and profit in the Owner / Architect agreement. Use forms provided by the Architect. The Contractor shall maintain a sequentially numbered log of all such requests.

- C. Contractor Corrective Action Proposals (CCA-): Shall be initiated by the Contractor when deviation from the contract requirements has been constructed. The Contractor shall provide a fully detailed proposal for his corrective or remedial work. The Architect's reply will indicate approval of the proposed action as detailed, approval with certain modifications, or rejection of the proposal. Use forms provided by the Architect. The Contractor shall maintain a sequentially numbered log of all such proposals. Upon notification of a deviation and request for a CCA the Contractor shall submit one promptly. Should this not occur in a timely fashion which, in the judgment of the Architect, will allow time for processing and correction ahead of other advancing elements of work, the Architect will initiate a CCA giving direction for correction. If the Architect initiates the CCA or must provide significant direction to a Contractor initiated CCA, due to a lack of a fully detailed proposal, the Architect will record the time expended and notify the Contractor of the charges. The owner shall deduct any such compensation due the Architect from the Contractor's monthly periodic pay requests in accordance with the compensation terms for cost, overhead and profit in the Owner / Architect agreement.

1.4 PROPOSAL / CHANGE ORDER REQUESTS

- A. Request for Proposal (RFP-): The Architect will issue a detailed description of proposed changes in the Work that will require adjustment to the Contract Sum or Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
1. Proposal requests issued by the Architect are for information only. Do not consider them as an instruction either to stop work in progress or to execute the proposed change.
 2. Unless otherwise indicated in the proposal request, within 20 days of receipt of a proposal request, submit an estimate of cost necessary to execute the change to the Architect for the Owner's review.
 - a. Include a list of quantities of products to be purchased and unit costs, along with the total amount of purchases to be made. Where requested, furnish survey data to substantiate quantities.
 - b. Itemize labor charges by time and category.
 - c. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - d. Indicate overhead and profit charges.
 - e. Include a statement indicating the effect the proposed change in the work will have on the Contract Time.
- B. Contractor-Initiated Change Order Requests (RCO-): When latent or unforeseen conditions require modifications to the Contract, the Contractor may propose changes by submitting a request for a change to the Architect.
1. Include a statement outlining the reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and Contract Time.
 2. Include a list of quantities of products to be purchased and unit costs along with the total amount of purchases to be made. Where requested, furnish survey data to substantiate quantities.
 3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.

4. Comply with requirements in Section 01631 - PRODUCTS AND SUBSTITUTIONS if the proposed change requires substitution of one product or system for a product or system specified.
5. Change Order Request Form: Use forms provided by the Architect. The Contractor shall maintain a sequential log of all Requests for Change Orders.

1.5 ALLOWANCES

- A. Allowance Adjustment: For allowance-cost adjustment, base each Change Order Proposal on the difference between the actual purchase amount and the allowance, multiplied by the final measurement of work-in-place. Where applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.
 1. Include installation costs in the purchase amount only where indicated as part of the allowance.
 2. When requested, prepare explanations and documentation to substantiate the margins claimed.
 3. The Owner reserves the right to establish the actual quantity of work-in-place by independent quantity survey, measure, or count.
- B. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the purchase order amount or the Contractor's handling, labor, installation, overhead, and profit. Submit claims within 20 days of receipt of the Change Order or Construction Change Directive authorizing work to proceed. The Owner will reject claims submitted later than 20 days.
 1. Do not include the Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of work has changed from what could have been foreseen from information in Contract Documents.
 2. No change to the Contractor's indirect expense is permitted for selection of higher or lower-priced materials or systems of the same scope and nature as originally indicated.

1.6 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive: When the Owner and the Contractor are not in total agreement on the terms of a Change Order Proposal Request, the Architect may issue a Construction Change Directive on AIA Form G714. The Construction Change Directive instructs the Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
 1. The Construction Change Directive will contain a complete description of the change in the work and designate the method to be followed to determine change in the Contract Sum or Contract Time.
- B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
 1. After completion of the change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

1.7 CHANGE ORDER PROCEDURES

- A. Upon the Owner's approval of a Change Order Proposal Request, the Architect will issue a Change Order for signatures of the Owner and the Contractor on AIA Form G701, as provided in the Conditions of the Contract.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01035

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SECTION 01040 – COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this section.

1.2 SUMMARY

- A. This section includes administrative and supervisory requirements necessary for coordinating construction operations including, but not necessarily limited to, the following:
 - 1. General project coordination procedures.
 - 2. Coordination Drawings.
 - 3. Administrative and supervisory personnel.
 - 4. Cleaning and protection.
- B. Related Sections: Refer to other Division 1 sections for coordination requirements regarding field engineering services, project meetings, Contractor's construction schedule, general installation and contract closeout.

1.3 COORDINATION

- A. Coordinate construction operations included in various sections of these Specifications to assure efficient and orderly installation of each part of the work. Coordinate construction operations included under different sections that are dependent upon each other for proper installation, connection, and operation.
 - 1. Schedule construction operations in the sequence required to obtain the best results where installation of one part of the work depends on installation of other components, before or after its own installation.
 - 2. Coordinate installation of different components to assure maximum accessibility for required maintenance, service, and repair.
 - 3. Make provisions to accommodate items scheduled for later installation.
- B. Where necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and attendance at meetings.
 - 1. Prepare similar memoranda for the Owner and separate contractors where coordination of their work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and assure orderly progress of the work. Such administrative activities include, but are not limited to, the following:
 - 1. Preparation of schedules.
 - 2. Installation and removal of temporary facilities.
 - 3. Delivery and processing of submittals.
 - 4. Progress meetings.

5. Project closeout activities.

1.4 SUBMITTALS

- A. Coordination Drawings: Prepare coordination drawings as careful coordination is needed for installation of products and materials fabricated by separate entities. Prepare coordination drawings where limited space availability necessitates maximum utilization of space for efficient installation of different components.
 - 1. Show the relationship of components shown on separate Shop Drawings.
 - 2. Indicate required installation sequences.
 - 3. Comply with requirements contained in Section 01300 - SUBMITTALS.
 - 4. Refer to Divisions 15 and 16 for additional requirements.
- B. Staff Names: Within fifteen (15) days of commencement of construction operations, submit a list of the Contractor's principal staff assignments, including the superintendent and other personnel in attendance at the Project Site. Identify individuals and their duties and responsibilities. List their addresses and telephone numbers.
 - 1. Post copies of the list in the Project meeting room, the temporary field office, and each temporary telephone.
- C. Subcontractor / Supplier Names: Within fifteen (15) days of commencement of construction operations, submit a listing of Contractor's principal subcontractors and suppliers, naming persons and listing their addresses and phone numbers.

1.5 SITE USE PLAN

- A. Within ten (10) working days of Contract award, the Contractor shall develop and submit for Owner's approval a site use plan. This plan shall clearly describe the proposed temporary facilities, staging areas, ramps and major traffic ways, hazardous material storage, provisions for site services, safety and security. Changes to the site plan shall be submitted for review and approval five (5) working days prior to effecting the changes.

1.6 TRADESPERSONS AND WORKMANSHIP STANDARDS

- A. General: Instigate and maintain procedures to ensure that persons performing work at site are skilled and knowledgeable in methods and craftsmanship needed to produce required quality levels for workmanship in completed work. Remove and replace work which does not comply with workmanship standards as specified and as recognized in the construction industry for applications indicated. Remove and replace other work damaged or deteriorated by faulty workmanship or its replacement.
- B. Availability of Tradespersons: At each progress or coordination meeting, review availability of tradespersons and projected needs to accomplish work as scheduled. Require each entity employing personnel to report on events which might affect progress of work. Where possible, consider alternatives and take actions to avoid disputes and delays.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 GENERAL COORDINATION PROVISIONS

- A. Inspection of Conditions: Require the Installer of each major component to inspect both the substrate and conditions under which work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.
- B. Coordinate temporary enclosures with required inspections and tests to minimize the necessity of uncovering completed construction for that purpose.
- C. Manufacturer's Instructions: Comply with manufacturer's installation instructions and recommendations, to the extent that those instructions and recommendations are more explicit or stringent than requirements contained in Contract Documents.
- D. Inspect materials or equipment immediately upon delivery and again prior to installation. Reject damaged and defective items.
- E. Provide attachment and connection devices and methods necessary for securing work. Secure work true to line and level. Allow for expansion and building movement.
- F. Visual Effects: Provide uniform joint widths in exposed work. Arrange joints in exposed work to obtain the best visual effect. Refer questionable choices to the Architect for final decision.
- G. Recheck measurements and dimensions, before starting each installation.
- H. Install each component during conditions of temperature, humidity, exposure, forecasted weather and status of project completion that will ensure the best possible results, in coordination with entire work. Isolate each part of the completed construction from incompatible material as necessary to prevent deterioration.
- I. Mounting Heights: Where mounting heights are not indicated, install individual components at standard mounting heights recognized within the industry for the particular application indicated. Refer questionable mounting height decisions to the Architect for final decision.

3.2 CLEANING AND PROTECTION

- A. Clean and protect construction in progress and adjoining materials in place, during handling and installation. Apply protective covering where required to assure protection from damage or deterioration at Substantial Completion.
- B. Clean and maintain completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to assure operability without damaging effects.
- C. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period. Where applicable, such exposures include, but are not limited to, the following:
 - 1. Excessive static or dynamic loading.
 - 2. Excessive internal or external pressures.
 - 3. Excessively high or low temperatures.

4. Thermal shock.
5. Excessively high or low humidity.
6. Air contamination or pollution.
7. Water or ice.
8. Solvents.
9. Chemicals.
10. Light.
11. Radiation.
12. Puncture.
13. Abrasion.
14. Heavy traffic.
15. Soiling, staining, and corrosion.
16. Bacteria.
17. Rodent and insect infestation.
18. Combustion.
19. Electrical current.
20. High-speed operation.
21. Improper lubrication.
22. Unusual wear or other misuse.
23. Contact between incompatible materials.
24. Destructive testing.
25. Misalignment.
26. Excessive weathering.
27. Unprotected storage.
28. Improper shipping or handling.
29. Theft.
30. Vandalism.

3.3 ENVIRONMENTAL PROTECTION

- A. Soil Disposal and / or Borrow: Conduct all soil disposal and / or borrow work in accordance with requirements of local regulatory authorities. Dispose of all excess soil in a legal manner off site.
- B. Solid, Liquid and Gaseous Contaminants: Contractor shall be responsible for the proper disposal of all solid, liquid and gaseous contaminants in accordance with all local codes and regulations, together with the following requirements.
 1. Discharge gaseous contaminants so that they will be sufficiently diluted with fresh air to reduce the toxicity to an acceptable level.
 2. Liquid contaminants may, subject to local utility standards, be diluted with water to a level of quality acceptable in the local sewer system or shall be contained in approved vessels for disposal at approved sites.
- C. Disposal of Refuse: Remove refuse resulting from construction operations from the site. Burning on the site is not permissible.
- D. Hazardous Waste: All hazardous waste generated by the Contractor and the Contractor's subcontractors during the course of construction shall be stored, transported and disposed of in accordance with 40 CFR 260. The Contractor and his subcontractors shall be responsible for all documentation related to hazardous waste generated as a result of this Contract and that documentation shall be in accordance with 40 CFR 260.
- E. Construction Site Maintenance:

1. Store all supplies and equipment on project site so as to preclude mechanical and climatic damage. Maintain site in a neat and orderly manner.
 2. Contractor shall be responsible for maintaining the temporary structures and construction enclosure (fence) in good repair and visually pleasant. Contractor shall further provide adequate security, supplementing the existing fencing as necessary, to prevent the presence of unauthorized persons on the site and to keep gates secured when not in actual use to ensure the integrity of the barrier as well as for property security.
- F. Noise Control: Comply with all applicable state and local laws, ordinances and regulations relative to noise control.

END OF SECTION 01040

**NEW PASSENGER TERMINAL
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SECTION 01041 - SCHEDULES

GENERAL

1. RELATED DOCUMENTS

Drawings and general provisions of Contract, including General Conditions and Division 1 Specifications, apply to work of this Section.

2. COORDINATION

- A. The Contractor shall coordinate scheduling with the Construction Manager. In particular, the Contractor shall provide close coordination of progress schedule, schedule of values, listing of subcontractors, schedule of submittals, progress reports and payment requests.
- B. Close coordination will be required between all construction trades in order that individual areas of construction can be completed by their scheduled time. Consult the proposed construction sequence schedule for start and completion dates of individual work areas.

3. PRELIMINARY SCHEDULE

- A. The Construction Manager has developed a Preliminary Schedule included at the end of this section, showing work areas of the project which directly impact the orderly use of the facility during construction. The timing of these activities has been approved by the Owner.
- B. The Preliminary Schedule may not list the work completely and may vary from the drawings and specifications.

4. CONSTRUCTION SCHEDULE

- A. The Construction Manager shall computerize a Precedence Diagram Method (PDM) Network using data supplied by the Contractor and all subcontractor(s). The Contractor will be responsible for his own methods and procedures and the performance of the work consistent with good practice.
- B. Neither the Construction Manager nor the Owner warrants the information supplied by the Contractors is accurate or correct or that the project can be performed as scheduled based upon data supplied by the Contractors.
- C. The Contractor shall be responsible for providing all data to develop and update the schedule. The Contractor shall supervise all work activities to maintain progress in accordance with the schedule.
- D. The Contractor and Subcontractor shall provide their own data to the Construction Manager reflecting the actual plan of operation for the Project. Schedule input data shall include a comprehensive list of all activities of the construction phase of the project, including submittals (shop drawings,

SCHEDULES

samples, product data), procurement of material, and on-site activity (erection, installation, construction). Activities for procurement of materials shall be included to delineate between material purchasing and fabrication/delivery.

- E. The Contractor shall assign durations and sequencing to each activity. Submittal activities shall be listed with the anticipated date of submittal. Procurement activities shall be listed with the duration required for fabrication and delivery from date of purchase. The Construction Manager shall computerize a PDM network using input data supplied by the Contractor. The Construction Manager will meet with the Contractor to revise and expand the Schedule and resolve conflicts. The revised schedule shall conform to the specific plan of operation envisioned by the Contractor.

The Construction Manager will guide the Contractor in determining the level of detail to be included in the PDM Networks. The schedule shall be adequate enough to evaluate progress, cost of work in place and serve as a control technique for the Contractor's Field Superintendent.

- F. The Contractor and all subcontractors shall be obligated to perform in accordance with the Construction Schedule and to participate in updating the schedule. The Contractor shall include provisions in all subcontracts binding Subcontractors to participate in revisions of the schedule as are necessary, and to supply data throughout the project.
- G. Upon request, the Contractor shall submit to the Construction Manager purchase orders and subcontracts. Such information shall be submitted as soon as available so the Construction Manager will be aware of the progress being made by the Contractor in the placing of orders and the status of material. The Contractor shall be solely responsible for expediting the delivery of all material furnished by him and coordinating his subcontractors so construction progress shall be maintained according to Contract Schedule.

5. COMPLIANCE WITH THE CONSTRUCTION SCHEDULE

- A. If the Contractor shall fail to adhere to the Construction Schedule or to the said schedule as revised, he must promptly adopt such other or additional means and methods of construction as will make up for the time lost and will assure completion of the work in accordance with said Construction Schedule at no additional cost to the Owner, except in accordance with the provision of the contract governing such costs. If the Owner or the Construction Manager notifies the Contractor of any change in the contract or any extra work performed, or if any other conditions arise which are likely to cause delays, the Contractor shall notify the Construction Manager in writing within five (5) days of the receipt of such notice or occurrence of such condition. This notice shall document the effect, if any, of such change, or extra work, of suspension or other condition upon the Construction Schedule. No time extensions will be granted due to a delay in any activity unless the Owner deems the length of the delay exceeds the float time associated with the activity at the time the delay occurs.

6. FLOAT TIME

- A. The Contractor, in directing the compliance with Construction Schedule shall cooperate with the Owner and the Construction Manager in utilizing float time. Full control over use of total float time in the Schedule rests with the Owner and will be utilized by him in any necessary rescheduling of the Construction Schedule occasioned by design changes, field conditions, strikes, Acts of God, or unavoidable equipment and material delays. If rescheduling of any activity adversely affects the Contractor's operation, he shall advise the Construction Manager in writing no later than five (5) days after the receipt of the revised schedule or Notice of Intent to revise the schedule.

7. PRELIMINARY SCHEDULE DATES

- A. All work shall be completed as follows:
1. Will be issued by Addendum.

END OF SECTION 01041

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SECTION 01045 - CUTTING AND PATCHING

1. WORK INCLUDED

- A. Refer to Section 01010 and 01500 for special requirements, protection, constraints, timing of work, scheduling of work, enclosures and similar requirements relating to this Section.
- B. This Section covers cutting, demolition, removal work, patching and restoration of work as necessary to accomplish and complete all work under the Contract, including any relocation or reuse of existing materials, equipment, systems, or other work, as well as the disposition of salvaged materials or debris. This Section applies to all work under the Contract, including general construction, mechanical and electrical work.
- C. Drawings generally indicate the extent of demolition, removals, relocations and cutting. The drawings shall not be construed as indicating all required work, nor indicating all conditions or details which might be encountered to accomplish the work of this Contract. The Contractor and his subcontractors shall examine the spaces themselves to determine the actual conditions and requirements. All removals, demolition, cutting, restoration, new installations and other work shall be accomplished to transform the existing spaces and conditions to the new conditions required under the Contract, as well as to accomplish all tie-in work of new to existing.
- D. It is the intent that unless specially shown on the general construction type drawings (i.e., architectural and structural) and schedules, or is inherent in the work to be accomplished under the general construction work of the area, that the mechanical and electrical Contractors shall perform the demolition, cutting, removals, relocations, patching and restoration as will be required to accomplish the work under their contracts. All work shown or indicated on the general construction drawings and schedules shall be accomplished by the associated Contractor.
- E. Except for general demolition of entire areas, it is the intent that at each area, or space, the Contractor and each subcontractor shall make the removals, perform cutting or demolition and accomplish relocations of work normal to his trades (i.e., Mechanical Contractor removes or relocates piping, ductwork and similar; Electrical Contractor removes or relocates panelboards, conduit lighting and similar). At areas of general demolition of the entire spaces, the Mechanical and Electrical shall make removals of work normal to their trades or as may be called for, for reuse or relocation, make any relocations and cut-off, terminate, cap or otherwise discontinue services that will be abandoned or removed in the space.

2. GENERAL REQUIREMENTS

- A. Accomplish all work of cutting, removal, demolition, relocation, patching and other restoration by using only mechanics skilled in the trade. If necessary, sublet the work to skilled contractors or subcontractors.
- B. The Contractor shall coordinate all work of this Section with all subcontractors so the work will progress without interruption and minimum delays. The Contractor shall also coordinate and schedule the work with the Owner and Construction Manager where possible disturbance may occur and where relocations or other potential disruptions of the Owner's functions and services may occur. All work affecting the Owner's functions and services shall be performed at times acceptable to the Owner.

END OF SECTION 01045

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SECTION 01200 - PROJECT MEETINGS

1. GENERAL

- A. This Section specifies administrative and procedural requirements for project meetings including but not limited to:
1. Pre-Construction Conference.
 2. Pre-Installation Conference.
 3. Progress Meetings.

2. PRE-CONSTRUCTION CONFERENCE

- A. Pre-Construction Conference shall be scheduled as directed by Construction Manager. Conduct the meeting to review responsibilities and personnel assignments.
- B. Attendees: Construction Manager, the Owner, Architect and their consultants, the Contractor and its superintendent, major subcontractors, manufacturers, suppliers and other concerned parties shall each be represented at the conference by persons familiar with and authorized to conclude matters relating to the Work.
- C. Agenda: Discuss items of significance that could affect progress including such topics as:
1. Construction schedule.
 2. Critical work sequencing.
 3. Designation of responsible personnel.
 4. Procedures for processing field decisions and change orders.
 5. Procedures for processing Applications for Payment.
 6. Distribution of contract documents.
 7. Submittal of shop drawings, product data and samples.
 8. Preparation of record documents.
 9. Use of the premises.
 10. Office, work and storage areas.
 11. Equipment deliveries and priorities.
 12. Safety procedures.
 13. First aid.
 14. Security.
 15. Housekeeping.
 16. Working hours.

3. PRE-INSTALLATION CONFERENCES

- A. The Contractor shall conduct a pre-installation conference at the Project Site before each construction activity that requires coordination with other construction.
- B. Attendees: The Installer and representatives of manufacturers and fabricators involved in or affected by the installation, and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the

meeting. Advise the Architect at least ten (10) working days in advance of scheduled meeting dates.

- C. Do not schedule conferences until the submittals required by the Contract Documents for work associated with the construction activity requiring the conference have been approved and returned to the Contractor.
- D. Review the progress of other construction activities and preparations for the particular activity under consideration at each pre-installation conference, including requirements for the following:
 - 1. Contract Documents.
 - 2. Options.
 - 3. Related Change Orders.
 - 4. Purchases.
 - 5. Deliveries.
 - 6. Shop Drawings, Product Data, and quality-control samples.
 - 7. Review of mockups.
 - 8. Possible conflicts.
 - 9. Compatibility problems.
 - 10. Time schedules.
 - 11. Weather limitations.
 - 12. Manufacturer's recommendations.
 - 13. Warranty requirements.
 - 14. Compatibility of materials.
 - 15. Acceptability of substrates.
 - 16. Temporary facilities.
 - 17. Space and access limitations.
 - 18. Governing regulations.
 - 19. Safety.
 - 20. Inspecting and testing requirements.
 - 21. Required performance results.
 - 22. Recording requirements.
 - 23. Protection.
- E. The Contractor shall record the results of the meeting and distribute copies to attendees and other interested parties.
- F. Do not proceed with the installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of work and reconvene the conference at the earliest feasible date.

4. PROGRESS MEETINGS

- A. Construction Manager shall conduct regular progress meetings at the Project site. Time of meeting to be scheduled by Construction Manager.
- B. Attendees: In addition to representatives of the Owner, Construction Manager and Architect, each prime contractor, subcontractor, supplier or other entity concerned with current progress or involved in planning, coordination or performance of future activities shall be represented at these meetings by persons familiar with the Project and authorized to conclude matters relating to progress.

- C. Agenda: Review and correct or approve minutes of the previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to the current status of the Project.
1. Contractor's Construction Schedule: Review progress since the last meeting. Determine where each activity is in relation to the Contractor's Construction Schedule, whether on time or ahead or behind schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 2. Review the present and future needs of each entity present, including such items as:
 - a. Interface requirements.
 - b. Time.
 - c. Sequences.
 - d. Deliveries.
 - e. Off-site fabrication problems.
 - f. Access.
 - g. Site utilization.
 - h. Temporary facilities and services.
 - i. Hours of work.
 - j. Hazards and risks.
 - k. Housekeeping.
 - l. Quality and work standards.
 - m. Change orders.
 - n. Documentation of information for payment requests.
- D. Reporting: No later than three (3) days after each progress meeting date, the Construction Manager shall distribute copies of minutes of the meeting to each party present and to other parties as applicable.
1. Schedule Updating: The construction schedule shall be revised after each progress meeting where revisions to the schedule have been made or recognized. The revised schedule shall be issued to all applicable parties.

END OF SECTION 01200

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SECTION 01210 - ALLOWANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements governing allowances.
 - 1. Certain items are specified in the Contract Documents by allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when additional information is available for evaluation. If necessary, additional requirements will be issued by Change Order.
- B. Types of allowances include the following:
 - 1. Lump-sum allowances.
 - 2. Unit-cost allowances.
 - 3. Quantity allowances.
 - 4. Contingency allowances.
 - 5. Testing and inspecting allowances.
- C. Related Sections include the following:
 - 1. Division 1 Section 01035 "Modification Procedures" for procedures for submitting and handling Change Orders for allowances.
 - 2. Divisions 2 through 16 Sections for items of Work covered by allowances.

1.3 SELECTION AND PURCHASE

- A. At the earliest practical date after award of the Contract, advise Architect of the date when final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work.
- B. At Architect's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.
- C. Purchase products and systems selected by Architect from the designated supplier.

1.4 SUBMITTALS

- A. Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders.
- B. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.

- C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.5 COORDINATION

- A. Coordinate allowance items with other portions of the Work. Furnish templates as required to coordinate installation.

1.6 LUMP-SUM / UNIT-COST AND QUANTITY ALLOWANCES

- A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner under allowance and shall include taxes, freight, and delivery to Project site.
- B. Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials ordered by Owner under allowance shall be included as part of the Contract Sum and not part of the allowance.

1.7 TESTING AND INSPECTING ALLOWANCES

- A. Testing and inspecting allowances include the cost of engaging testing agencies, actual tests and inspections, and reporting results.
- B. The allowance does not include incidental labor required to assist the testing agency or costs for retesting if previous tests and inspections result in failure. The cost for incidental labor to assist the testing agency shall be included in the Contract Sum.
- C. Costs of services not required by the Contract Documents are not included in the allowance.
- D. At Project closeout, credit unused amounts remaining in the testing and inspecting allowance to Owner by Change Order.

1.8 UNUSED MATERIALS

- A. Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.
 - 1. If requested by Architect, prepare unused material for storage by Owner when it is not economically practical to return the material for credit. If directed by Architect, deliver unused material to Owner's storage space. Otherwise, disposal of unused material is Contractor's responsibility.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

- A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

- A. **Allowance No. 1:** Include allowance in Work Scope 2.21C for unforeseen conditions in the amount of \$40,000.
- B. **Allowance No. 2:** Include allowance in Work Scope 2.22C for additional plantings in the amount of \$12,000.
- C. **Allowance No. 3:** Include allowance in Work Scope 3.21C for unforeseen conditions in the amount of \$25,000.
- D. **Allowance No. 4:** Include allowance in Work Scope 5.21C for additional openings in the amount of \$10,000.
- E. **Allowance No. 5:** Include allowance in Work Scope 6.22C for substitution of alternate finish materials in the amount of \$20,000.
- F. **Allowance No. 6:** Include allowance in Work Scope 7.22C for substitution of alternate metal siding and roofing materials in the amount of \$8,000.
- G. **Allowance No. 7:** Include allowance in Work Scope 9.25C for substitution of alternate paint coatings in the amount of \$5,000.
- H. **Allowance No. 8:** Include allowance in Work Scope 10.22C for additional regulatory signage in the amount of \$12,000.
- I. **Allowance No. 9:** Include allowance in Work Scope 11.20C for substitution of alternate food service equipment in the amount of \$8,000.00
- J. **Allowance No. 10:** Include allowance in Work Scope 12.21C for substitution of alternate shade materials in the amount of \$8,000.00.
- K. **Allowance No. 11:** Include allowance in Work Scope 12.22C for substitution of alternate furnishings in the amount of \$15,000.00.
- L. **Allowance No. 12:** Include allowance in Work Scope 13.23C for alternate lane control equipment in the amount of \$5,000.00
- M. **Allowance No. 13:** Include allowance in Work Scope 14.21C for unforeseen existing bridge conditions in the amount of \$10,000.00.

- N. **Allowance No. 14:** Include allowance in Work Scope 16.22C for additional access control and Flight Information Displays materials in the amount of \$35,000.

END OF SECTION 01210

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SECTION 01230 - ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for alternates.

1.3 DEFINITIONS

- A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the Bidding Requirements that may be added to or deducted from the Base Bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
 - 1. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

- A. Coordination: Modify or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
 - 1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.
- B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated modifications to alternates.
- C. Execute accepted alternates under the same conditions as other work of the Contract.
- D. Schedule: A Schedule of Alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

- A. **Alternate No. 1:** Replace metal walkway covers as shown on A537 with fabric walkway covers as specified in Section 10530 as part of Work Scope 7.22C.

Add (deduct) the sum of: _____Dollars (\$_____).

- B. **Alternate No. 2:** Delete Motorized Roller Shades as specified in Section 12494 as part of Work Scope 12.21C.

Add (deduct) the sum of: _____Dollars (\$_____).

- C. **Alternate No. 3:** Delete Tug Tunnel Ramp Snowmelt System as shown on Sheet M303 as part of Work Scope 15.21C.

Add (deduct) the sum of: _____Dollars (\$_____).

END OF SECTION 01230

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**SECTION 01270 – UNIT
PRICES**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for unit prices.
- B. Related Sections include the following:
 - 1. Division 1 Section 01035 "Modification Procedures" for procedures for submitting and handling Change Orders.
 - 2. See Civil Drawing Sheet C001 for a Summary of Estimated Quantities for Civil Work.

1.3 DEFINITIONS

- A. Unit price is an amount proposed by bidders, stated on the Bid Form, as a price per unit of measurement for materials or services added to or deducted from the Contract Sum by appropriate modification, if estimated quantities of Work required by the Contract Documents are increased or decreased.

1.4 PROCEDURES

- A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.
- B. Measurement and Payment: Refer to individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.
- C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.
- D. List of Unit Prices: Refer to Section 01014 "Work Scope Descriptions" and the Bid Form Package in Volume 1 of the Project Manual.

PART 2 - PRODUCTS (Not Used)

EXECUTION (Not Used)

END OF SECTION 01270

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SECTION 01300 - SUBMITTALS

1. GENERAL

- A. This Section defines procedures for the following submittals required by the Contract Documents.

2. SCHEDULE OF SUBMITTALS - REQUIRED

- A. The following documents are required to be submitted to the Construction Manager for review at the times indicated.

1. Prior to Bidding (ten days prior to bid opening):
Request for approval of substitute material and equipment.
2. Within 10 days of Letter of Contract Award:
Performance and Payment Bonds
Insurance Certificate
Schedule of Values (based on specification sections – no Pay Application will be processed without approval of Schedule of Values)
List of materials and equipment
List of subcontractors
3. During Progress of Project as specified:
Samples
Test results
Application for Payment (see Specifications Section 01027)
4. Upon receipt of Substantial Completion Certificate, submit the following documents within 30 days:
Shop drawings and required submittals
Equipment and material guarantees
Operations manuals
As-built drawing notes
Completed punch lists
Final payment request accompanied by:

Affidavit of Payment of Claims	Affidavit of Release of Liens
Withholding Tax Affidavit	Consent of Surety to Final Payment

Note: No final retainage payment will be released without the receipt and approval of the above referenced documents.

3. SHOP DRAWINGS

- A. Three hard copies of drawings larger than 11" x 17" in size and electronic copy of drawings 11" x 17" or smaller in size of shop drawings prepared specifically for this work shall be submitted to the Construction Manager for submittal to the Architect. Contractors are to review and stamp shop drawings or they will be returned. At least 40 square inches of space in the lower right hand corner of each sheet shall be left blank for approval stamps and notes. After the Architect has checked and approved

each drawing, he will so stamp it, make such copies as he requires and return it through the Construction Manager to the Contractor who shall make and distribute such copies as he requires. In instances where minor corrections are required, they will be so noted on the drawing and it will be stamped "Make Corrections Noted" and returned to the Contractor as above. Where major corrections are required, the shop drawings will be returned to the Contractor who shall make a new drawing incorporating the required corrections and resubmit the revised drawings for approval (three hard copies of drawings larger than 11" x 17" in size and electronic copy of drawings 11" x 17" or smaller in size of shop drawings).

- B. Shop drawings in the form of printed descriptive information shall be bound together with a title and index sheet listing each sheet in the binding. The title and index sheet shall have a blank rectangular space of at least 4" x 8" for notes and approval stamps. Three hard copies of drawings larger than 11" x 17" in size and electronic copy of drawings 11" x 17" or smaller in size of shop drawings are to be submitted to the Construction Manager.
- C. Shop drawings and samples shall be dated and contain: Names of project, description or names of equipment, materials and items; and complete identification of locations at which materials or equipment are to be installed.
- D. Submission of shop drawings shall be accompanied by transmittal letter, containing project name, Contractor's name, number of drawings, titles and other pertinent data such as section and article numbers.

4. SAMPLES

- A. Deliver samples of materials, equipment, assemblies and components as required by specifications to Construction Manager for submittal to the Architect (or other designated location) with delivery costs prepaid. At Construction Manager's direction, remove samples after approval. Samples shall be of like kind to the products to be provided for building and shall have finish and other characteristics required by work. Samples shall indicate type of construction and quality proposed for installation in the project.
- B. Where the Contractor requires approved samples to be returned, submit the number of samples required by the Contractor plus three (3) which shall be retained by the Architect and Construction Manager.

5. LIST OF MATERIALS

- A. Within ten (10) days after the award of the contract (notice to proceed or letter of intent), the Contractor shall submit three (3) copies of a complete list of all materials, products, and equipment proposed to be used in construction to the Construction Manager for acceptance. Materials shall not be ordered until the proposed listed materials, products and equipment proposed to be used in construction are reviewed by the Architect for acceptance and the listed materials are accepted.
- B. Where two or more makes or kinds of items are named in the specifications (or additional names are called for in addendum), the Contractor shall state which particular make or kind of each item he proposes to provide. If the Contractor fails to state a preference, the Owner shall have the right to select any of the makes of kinds named without change in price.

- C. This list shall be arranged in order of specification sections. The items listed shall fully conform to project requirements and specifications. All materials are subject to the Architect's acceptance. After acceptance, there shall be no changes or substitutions.
- D. The list shall clearly identify the material, product or equipment by manufacturer and brand by listing the names, for all items, including those where only one material or product is specified. Each and all material, products and equipment shall be specifically named, not listed "as specified".

6. LIST OF SUBCONTRACTORS

- A. Within ten (10) days after the award of the contract (notice to proceed) and prior to the execution of the Contract, the Contractor shall submit three (3) copies of a complete list of all work he proposes to subcontract and the subcontractors (and major material suppliers) he proposes to use in performance of the Contract to the Construction Manager for review by the Architect, Construction Manager and Owner. The list shall include Sub-subcontractors. No subcontracts shall be executed until the proposed list of subcontractors is accepted.
- B. Reasonable objection shall be deemed to have been exercised when, in the opinion of the Architect or Owner, objections have been made based on their reasonable belief that the proposed Subcontractor, Sub-subcontractor or material supplier: (1) cannot provide materials, equipment, facilities or other products as specified or required by the Contract Documents; (2) cannot provide labor and skill necessary to accomplish the part of Work for which he is proposed, including but not limited to quality of workmanship; (3) lacks adequate and appropriate experience for the part of the Work for which he is proposed, including materials or methods required; (4) has previously failed to perform timely or satisfactorily, including in cooperation and in necessary services after project completion; (5) proposed deviations in material or methods that are unacceptable to the Architect or Owner, such as proposing materials or methods that were not specified or not listed in addenda; (6) there is reasonable doubt he can satisfactorily perform the part of the Work for which he is proposed, within the time schedule, due to size of organization or existing work load; (7) cannot demonstrate his ability through quality or representative work to perform the part of the Work for which he is being considered; (8) of questionable integrity; (9) or other similar considerations bearing on the possibility of unsatisfactory performance. If the Owner, Construction Manager or the Architect has a reasonable objection to any person or entity proposed by a substitute to whom neither the Owner, Construction Manager, nor the Architect has any reasonable objection and no increase in the Contract Sum shall be allowed as a result of any such substitution.
- C. After review of the proposed list, no change of any Subcontractor, Sub-subcontractor or supplier not objected to by the Architect, Construction Manager or Owner, shall be made, except for cause acceptable to all parties. In the event of a proposed change, the Contractor shall submit the reasons for the change, in writing, along with the alternate proposed Subcontractor, Sub-subcontractor or material supplier. The proposed change is subject to the conditions of this Article and the requirements of the General Conditions.

7. GUARANTEES AND WARRANTIES

- A. Refer to Section 01740 - Warranties.
- B. Special Warranties: Contractor shall complete all manufacturer's warranty registrations and shall submit same to Construction Manager for transmittal to Owner.

8. INSTRUCTION MANUALS

- A. For all items of mechanical equipment and electrical apparatus, the Contractor shall obtain from the manufacturer and furnish to the Construction Manager three (3) copies of the following:
 - 1. Operating instructions.
 - 2. Parts lists (including name and address of nearest vendor or service agent).
 - 3. Maintenance instructions.
 - 4. Shop Drawings.
- B. These items are separate from and in addition to the operating placards required to be attached to or posted near the equipment.
- C. Contractor shall provide field instruction to Owner's personnel as required to fully instruct them in correct operating and maintenance procedure, for all equipment installed under this contract.
- D. Manual shall be submitted in 8-1/2" x 11" form in adequately sized three (3) ring loose leaf binders with entire contents indexed and thumb-tabbed.

9. RECORD SET OF DRAWINGS

- A. Contractor shall provide the record set of drawings to the Construction Manager at the completion of Contract.
- B. During construction, Contractor shall maintain a clean set of drawings for the sole purpose of recording changes and actual "as installed" information.
- C. As a general guide, the type of information to be recorded on the record set includes: (1) changes, deviations or revisions made, except minor or noncritical dimensions, including those made by Change Order or Supplementary Instructions; (2) omissions, including work omitted by accepted alternates; (3) dimensioned locations of major or main utility lines, such as main conduit runs, piping mains and similar work; (4) locations of control valves; (5) additions to the work; (6) changes in significant details; (7) changed footing or other elevations; (8) changes in locations of panelboards, outlets, drains, piping, opening, dampers and similar features; (9) other similar data. Refer to Section 01720 – Project Record Documents.

END OF SECTION 01300

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**SECTION 01361 - SUSTAINABLE DESIGN
REQUIREMENTS**

DULUTH, MINNESOTA

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 RELATED SECTIONS

- A. Construction Waste Management - Section 01524
- B. Construction IAQ Management - Section 01525
- C. Soil Erosion and Sedimentation Control Plan - Section 02125

1.3 SUMMARY

- A. The Owner requires the Contractor to implement practices and procedures to meet the Project's environmental performance goals, which include obtaining a LEED Silver certification based on LEED-NC, Version 2.2. Specific project features include (but are not limited to): materials and equipment that reduce the facility's energy and water consumption; recycled-content materials, locally-manufactured materials, low-emitting materials, construction waste recycling, and the implementation of a construction indoor air quality management plan. The Contractor shall ensure that the requirements related to these goals, as defined in this section and throughout the contract documents, are implemented to the fullest extent. Substitutions or other changes to the work proposed by the Contractor or their subcontractors shall not be allowed if such changes compromise the stated LEED Requirements.

1.4 DEFINITIONS

- A. Certificates of Chain-of-Custody: Certificates signed by manufacturers verifying that the wood used to make products was obtained from forests certified by a Forest Stewardship Council (FSC) accredited certification body to comply with FSC "Principles and Criteria." Certificates shall include evidence that the mill is certified for chain-of-custody by an FSC-accredited certification body.
- B. LEED: The Leadership in Energy & Environmental Design rating system developed by the United States Green Building Council (USGBC). LEED-NC, New Construction, Version 2.2, is the rating system used for this project.
- C. Green Label Plus: The Carpet & Rug Institute's testing/certification program for carpet VOC emissions. Certification numbers guarantee product is within allowable VOC emission rates. Approved products are listed under the manufacturer's name at www.carpet-rug.com/.

1.5 LEED OVERVIEW AND GENERAL REQUIREMENTS

A. OVERVIEW:

1. LEED certification is determined by a system of assigned points (credits) based on sustainable building goals being met by a project.
2. There are some prerequisites for a project to qualify for LEED certification.
3. Some prerequisites and credits depend on material selections and may not be specifically identified as LEED requirements in this document. Refer to Item 1.7, LEED Prerequisites.
4. Some prerequisites and credits depend on the Architect's design and other aspects of the project that are not part of the work of the contractor.
5. LEED New Construction (NC) v. 2.2 Reference Guide is available at www.usgbc.org/.

B. GENERAL REQUIREMENTS:

For specific contractor requirements refer to Item 1.7, LEED Prerequisites and LEED ACTION PLANS under Item 1.9, LEED SUBMITTALS.

1. Erosion and Sedimentation Control (ESC)
 - a. Refer to Items 1.7 LEED Prerequisites and 1.9 LEED Submittals (Action Plans)
 - b. Typical precautions are:
 - 1) Silt fences, hay bales, and water retention areas to prevent sediment runoff
 - 2) Graveled truck wash-off areas
 - 3) Construction fencing to prevent dust from escaping the site
 - 4) Installation and maintenance of sump pumps
 - 5) Use of mulching and seeding, sometimes on a temporary basis
 - c. Refer to Civil Engineer's documents for project specific information
 - d. The Contractor shall in part:
 - 1) Develop an Erosion and Sedimentation Control (ESC) Plan in accordance with Section 02125
 - 2) Maintain ESC measures throughout the project
 - 3) Take dated photographs of the ESC measures in place
 - 4) Log maintenance activities, inspections and repairs after major rain falls.
2. Construction Waste Management (CWM)
 - a. Refer to Item 1.9 LEED Submittals (Action Plans).
 - b. CWM is the reuse of materials that otherwise would have been sent to a landfill.
 - c. The project requires that at least 50% of the construction waste be recycled.
 - d. Reused site materials such as stone, excavated soil and land-clearing debris cannot count towards the recycled percent.

- e. The contractor shall in part:
 - 1) A Construction Waste Management Plan shall be developed in accordance with Section 01524, Construction Waste Management outlining methods, goals and strategies.
 - 2) Maintain a spreadsheet with weight, category (e.g. concrete, metal, wood, paper), percent (%) diverted from landfill, method of diversion (i.e. recycled, reused, sold), dated, name of the hauler, and site of disposal.
 - 3) Keep back-up documentation (e.g. hauler's tickets, receipts from recycling centers, sales receipts).
- 3. Materials with Recycled Content
 - a. LEED Recycled Content is the percent of a product that comes from recycled material. The percentage by weight of constituents that have been recovered or otherwise diverted from the solid waste stream, either during the manufacturing process (pre-consumer), or after consumer use (post-consumer)
 - 1) Spills and scraps from the original manufacturing process that are combined with other constituents after a minimal amount of reprocessing for use in further production of the same product are not recycled materials.
 - 2) Discarded materials from one manufacturing process that are used as constituents in another manufacturing process are pre-consumer recycled materials.
 - b. The project requirement is that at least 10% of the value of the project materials (without labor and equipment) be from recycled materials.
 - c. The manufacturer must provide the recycled content of the product.
 - d. To determine Recycled Content:
 - 1) The recycled content is determined by weight. 100% of post-consumer recycled content contributes, and 50% of pre-consumer (also called post-industrial) content contributes.
 - a) "Post-consumer" material is defined as waste material generated by households or by commercial, industrial, and institutional facilities in their role as end users of the product, which can no longer be used for its intended purpose.
 - b) "Pre-consumer" material is defined as material diverted from the waste stream during the manufacturing process. Excluded is reutilization of materials such as rework, regrind, or scrap generated in a process and capable of being reclaimed within the same process that generated it.
 - 2) Determine the percentage of recycled content by weight:
 - a) Determine the total weight of the material or product.
 - b) Determine the weight of the recycled content contained in the product (100% post-consumer + 50% pre-consumer).
 - c) Divide the recycled content weight by the total weight to get a percentage (%) of recycled content by weight.

- 3) Determine the value of recycled content:
 - a) Determine the total value of the product (without labor and equipment)
 - b) Multiply the total value of the product by the percentage of recycled content to get the value of the recycled content.
- e. The contractor shall in part:
 - 1) Maintain a spreadsheet showing the recycled materials purchased, including the material name, supplier, percentage of pre-consumer and percentage of post consumer recycled material, the weight of the material, the value of the material (without labor and equipment), and the source of the recycled content information.
 - 2) Maintain records of recycled materials, including cut sheets, published product information and cost back up.
 - 3) Submit a completed "Green Building Materials Reporting Form" (GBMRF) in accordance with Item 1.9, LEED Submittals for each product, along with back up. A blank copy of the GBMRF is included at the end of this document.
4. Regional Materials
 - a. To qualify as LEED Regional Content a material must:
 - 1) Be manufactured within a 500 mile radius, AND
 - 2) Be extracted or harvested within a 500 mile radius.
 - b. The project goal is that at least 10% of the value of the project materials (without labor and equipment) be from regional materials.
 - c. The manufacturer must provide the location of manufacture and the location of extraction/harvest.
 - d. To determine Regional Content for LEED:
 - 1) Determine that the product is manufactured regionally
 - 2) Determine the percentage (%) of regional material weight:
 - a) Determine the total weight of the material or product
 - b) Determine the weight of the regional harvested/extracted component
 - 3) Divide the regionally harvested weight by the total weight to get a percentage (%) of regionally manufactured and harvested material.
 - e. Determine the value of the regional content:
 - 1) Determine the total cost of the product (without labor and equipment).
 - 2) Multiply the total value of the product by the percentage (%) of regionally manufactured and harvested material content to get the value of the Regional Content.
 - f. The contractor shall in part:
 - 1) Maintain a spreadsheet showing the Regional Materials purchased, including the material name, supplier, percentage (%) of locally extracted/harvested materials (by weight), the total weight of the material, the cost of the material (without

- labor and equipment), and the source of the regional content information.
- 2) Maintain records of Regional Materials, including cut sheets, published product information and cost back up.
 - 3) Submit a completed "Green Building Materials Reporting Form" (GBMRF) in accordance with Item 1.9, LEED Submittals for each product, along with back up. A blank copy of the GBMRF is included at the end of this document.
5. Low-Emitting Materials
- a. Refer to Items 1.9 LEED Submittals (Action Plans) and 1.11, Products, Sub-Item D., "VOC Limits for Low-Emitting Materials".
 - b. Carpet Systems
 - 1) Use carpets and carpet backing that meet the requirements for the Carpet and Rug Institute's Green Label Plus Program.
 - 2) Use carpet adhesives that do not have Volatile Organic Compound (VOC) contents in excess of 50 grams/liter
 - c. Adhesives, Sealants, Paints and Coatings
 - 1) Use adhesives, sealants paints and coating that have a Volatile Organic Compound (VOC) limit below certain thresholds.
 - 2) Chemical component limitations are also defined for some categories of paint and primer.
 - 3) Maintain records of adhesives, sealants, paints and coatings including the manufacturer, product name and VOC content in grams per liter or pound per gallon.
 - d. Non-Urea-formaldehyde Resins (Engineered Wood Products and Laminate Adhesives)
 - 1) Do not use engineered wood, composite wood or agrifiber board that contains urea-formaldehyde glue for any permanently installed materials or assemblies.
 - 2) Do not use adhesives containing urea-formaldehyde resins for bonding veneers and other laminates to substrates, both on-site and for shop work.
 - 3) Examples of materials included in this restriction are plywood, medium density fiberboard, door cores, wheat-board, strawboard, and panel substrates.
 - 4) Maintain records of engineered wood products with manufacturer, product name and manufacturer's written statement that product does not contain urea-formaldehyde resin.
 - e. Forest Stewardship Council (FSC) Certified Materials
 - 1) To qualify as FSC wood material must:
 - a) Have its own FSC label and Chain of Custody (COC) Certificate (Certificates signed by manufacturers certifying that wood used to make products was obtained from forests certified by an FSC-accredited certification body to comply with FSC STD 01-001, "FSC Principles and Criteria for Forest Stewardship."

- Certificates shall include evidence that manufacturer is certified for Chain of Custody by an FSC-accredited certification body), OR
- b) Be manufactured in a shop that has its own FSC Certificate out of at least 70% FSC Certified wood.
- 2) The FSC wood content of the project can be determined by material costs (without labor and equipment), weight, or volume, but the same criteria must be applied consistently.
 - 3) The Contractor shall in part:
 - a) Maintain a spreadsheet showing the new wood materials purchased, including the material name, supplier, percentage (%) FSC Certified content, the total cost/weight/volume of the material, the cost of the material (without labor and equipment), the supplier and the COC Certificate number.
 - b) Maintain records of FSC wood, including COC Certificates, cut sheets, published product information and cost back up.
 - c) Submit a completed "Green Building Materials Reporting Form" (GBMRF) in accordance with Item 1.9, LEED Submittals for each product, along with back up. A blank copy of the GBMRF is included at the end of this document.
6. Indoor Air Quality (IAQ) During Construction
- a. IAQ during construction addresses the reduction of pollutants in the project
 - b. Comply with Sheet Metal and Air Conditioning National Contractors' Association (SMACNA) Guidelines, as stated in Chapter 3 of the referenced "IAQ Guidelines for Occupied Buildings Under Construction". The Construction IAQ Management Plan shall be organized in accordance with the SMACNA format, and shall address measures to be implemented by the Contractor and/or Subcontractors in each of the five categories (including subsections).
 - c. The Contractor Shall in part:
 - 1) Develop an IAQ Management Plan in accordance with Section 01525, Construction IAQ Management to be implemented by the Construction Manager, and by their subcontractors throughout the duration of the project construction, under the direction of the Construction Manager, and shall be documented per the Submittal Requirements of Item 1.9, LEED Submittals.
 - 2) Take Photographs (18 Total) that document the implementation of the Construction IAQ Management Plan throughout the course of the project construction. Examples include photographs of ductwork sealing and protection, temporary ventilation measures, and conditions of on-site materials storage (to prevent moisture damage). Photographs shall include integral date stamping, and shall be submitted

with brief descriptions, or a reference to project meeting minutes or similar project documents.

7. Commissioning of Building Systems
 - a. The project is required to meet the LEED requirements for Enhanced Commissioning
 - b. Coordinate and support the efforts of the Commissioning Agent.

1.6 REFERENCES, STANDARDS, AND REGULATORY REQUIREMENTS

- A. General: Comply with the applicable provisions of the referenced standards except as modified by governing codes and the Contract Documents. Where a recommendation or suggestion occurs in the referenced standards, such recommendation or suggestion shall be considered mandatory. In the event of conflict between referenced standards, this specification or within themselves, the more stringent standard or requirement shall govern.
 1. American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE)
 2. Carpet and Rug Institute (CRI)
 3. Environmental Protection Agency (EPA)
 4. Forest Stewardship Council (FSC)
 5. Green Seal (GS)
 6. Illuminating Engineering Society of North America (IESNA)
 7. Sheet Metal and Air-Conditioning National Contractor Association (SMACNA)
 8. South Coast Air Quality Management District (SQAMD)
 9. United States Green Building Council (USGBC): Leadership in Energy and Environmental Design (LEED) Green Building Rating System, Version CS-2.0.
- B. Rule 1168 – “Adhesive and Sealant Applications”, effective dated of July 1, 2005 and Rule Amendment date of January 7, 2005: South Coast Air Quality Management District (SCAQMD), State of California, www.aqmd.gov.
- C. “Green Seal Standard for Commercial Adhesives”, GS-36, requirements in effect October 19, 2000, www.greenseal.org/.
- D. “Green Seal Standard for Architectural Coating”, GS-11, plus “Green Seal Standard for Anti-Corrosive Paints”, GS-03, www.greenseal.org/.
- E. Rule 1113 “Architectural Coatings”, amended 7/9/04: South Coast Air Quality Management District (SQAMD), State of California, www.aqmd.gov.
- F. SMACNA IAQ “Guidelines for Occupied Buildings Under Construction”: Sheet Metal and Air-Conditioning National Contractor Association (SMACNA) November 1995, www.smacna.org.
- G. ANSI/ASHRAE 52.2, “Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size”. www.ashrae.org.

1.7 LEED PREREQUISITES

- A. The following LEED Prerequisites are required in order to achieve the project's targeted LEED rating. Compliance with all applicable prerequisite criteria, as defined in this specification and the contract drawings, is mandatory.
1. Prerequisite SS 1, Construction Activity Pollution Prevention
 2. The contractor and their subcontractors shall develop and implement a site Erosion and Sediment Control Plan which complies with all applicable regulatory requirements and the applicable control measures established in Chapter 3, "Sediment and Erosion Control" of the U.S. Environmental Protection Agency (EPA) document No. 832R92005, Storm Water Management for Construction Activities, September 1992.
 3. Prerequisite EA 1, Fundamental Commissioning of the Building Energy Systems
 4. Building systems including HVAC, lighting, electrical, domestic hot water and renewable energy systems (if applicable) shall be commissioned, with oversight provided by a third-party Commissioning Authority contracted directly to the Owner. Commissioning requirements shall be defined under Divisions 1, 15, 16 and 17.
 5. Prerequisite EA 2, Minimum Energy Performance
 6. The project is designed to meet or exceed the energy conservation requirements of the standard ASHRAE/IESNA 90.1-2004, "Energy Standard for Buildings except Low-Rise Residential Buildings".
 7. Prerequisite EA 3, CFC Fundamental Refrigerant Management
 8. Chlorofluorocarbon (CFC) refrigerants are prohibited from all HVAC&R systems installed as part of the project.
 9. Prerequisite MR 1, Storage & Collection of Recyclables
 10. The project includes dedicated storage/collection facilities for recyclable materials, including paper, corrugated cardboard, glass, plastics and metals.
 11. The project is designed to meet or exceed the ventilation performance requirements of standard ASHRAE 62.1-2004, "Ventilation for Acceptable Indoor Air Quality", including approved Addenda.
 12. Prerequisite EQ 1, Minimum IAQ Performance

13. Prerequisite EQ 2, Environmental Tobacco Smoke (ETS) Control
14. Smoking shall be prohibited in the public areas of the building and exterior designated smoking areas shall be 25 feet from entries, air intakes and operable windows. No applicable contractor/subcontractor requirements.

1.8 LEED PERFORMANCE CRITERIA FOR MATERIALS

- A. The following sub-sections, organized by CSI Division, list the required LEED performance criteria for materials used in this project. Product substitutions, if proposed by the Contractor or their subcontractors, shall not be allowed if such changes compromise the stated LEED requirements. The percentages should be adjusted to reflect availability of products with the greatest amount of recycled content within the S. Korean market.

1. It is the responsibility of the contractors to bring to the attention of the Architect any conflicts between the LEED Performance criteria listed in this section and any additional performance criteria or "acceptable products" listed in other sections of the contract documents (specifications or drawings). These conflicts shall be brought to the Architect's attention for resolution prior to the purchase or installation of the materials in question. LEED criteria will not be waived unless specifically approved, in writing, by the Architect.

B. DIVISION 2 – SITE CONSTRUCTION

1. Recycled Content Materials:
 - a. While there is no minimum requirement for the use of flyash, ground granulated blast furnace (GGBF) slag, or other recycled materials within the concrete mix designs, the use of such products is encouraged where: 1) it is readily available; 2) it does not negatively impact the performance characteristics of the concrete; and 3) it does not add to the product cost. Any use of flyash, GGBF slag, or other recycled materials within the concrete mix designs shall be reported and documented in accordance with Item 1.9, LEED Submittals below. All design mixes are subject to review and approval by the project's Structural Engineer.
 - b. Recycled materials within the concrete mix designs shall be reported and documented in accordance with Item 1.9, LEED Submittals below. All design mixes are subject to review and approval by the project's Structural Engineer.
 - c. Steel reinforcing bar, rods, wire, and welded wire fabric shall contain a minimum of 25% combined post-industrial/post-consumer recycled content (the percentage of recycled content is based on the weight of the component materials). Certification of recycled content shall be in accordance with Item 1.9, LEED Submittals below.
2. Regionally-manufactured/Harvested Materials
 - a. The manufacturing locations for concrete and bituminous pavement materials shall be within 500 miles (by air) of the project site, and

shall be documented in accordance with Item 1.9, LEED Submittals below.

- b. The location of the nursery or other source for all landscape plantings shall be documented in accordance with Item 1.9, LEED Submittals below.

C. DIVISION 3 - CONCRETE

1. Recycled Content Materials:

- a. While there is no minimum requirement for the use of flyash, ground granulated blast furnace (GGBF) slag, or other recycled materials within the concrete mix designs, the use of such products is encouraged where: 1) it is readily available; 2) it does not negatively impact the performance characteristics of the concrete; and 3) it does not add to the product cost. Any use of flyash, GGBF slag, or other recycled materials within the concrete mix designs shall be reported and documented in accordance with Item 1.9, LEED Submittals below. All design mixes are subject to review and approval by the project's Structural Engineer.
- b. Steel reinforcing bar, rods, wire, welded wire fabric, anchors, and ties shall contain a minimum of 25% combined post-industrial/post-consumer recycled content (the percentage of recycled content is based on the weight of the component materials). Certification of recycled content shall be in accordance with Item 1.9, LEED Submittals below.

2. Regionally-manufactured/Harvested Materials

- a. The manufacturing location(s) for cast-in-place concrete shall be within 500 miles (by air) of the project site, and shall be documented in accordance with Item 1.9, LEED Submittals below.
- b. The manufacturing location(s) for steel reinforcing products shall be documented in accordance with Item 1.9, LEED Submittals below.
- c. The origin of the raw materials from which the concrete and steel reinforcing products were manufactured shall be documented in accordance with Item 1.9, LEED Submittals below.

3. Low-emission Products:

- a. Field-applied adhesives, sealants, and paints shall meet the requirements of Item 1.11, Products, Sub-Item D., "VOC Limits for Low-Emitting Materials". Only those products used on the interior of the building (inside of the weatherproofing system) are required to comply with these requirements. VOC content shall be documented in accordance with Item 1.9, LEED Submittals below.

D. DIVISION 4 – MASONRY

1. Recycled Content Materials:

- a. Steel reinforcing bar, rods, wire, anchors, and ties shall contain a minimum of 25% combined post-industrial/post-consumer recycled content (the percentage of recycled content is based on the weight of the component materials). Certification of recycled content shall be in accordance with Item 1.9, LEED Submittals below.

2. Regionally-manufactured/Harvested Materials

- a. The manufacturing location(s) for all concrete masonry units shall be within 500 miles (by air) of the project site, and shall be documented in accordance with Item 1.9, LEED Submittals below.
- b. The manufacturing location(s) for dimensional stone and for steel reinforcing products shall be documented in accordance with Item 1.9, LEED Submittals below.
- c. The origin of the raw materials from which the concrete masonry units and dimensional stone products were manufactured shall be documented in accordance with Item 1.9, LEED Submittals below.

3. Low-emission Products:

- a. Field-applied adhesives, sealants, and paints shall meet the requirements of Item 1.11, Products, Sub-Item D., "VOC Limits for Low-Emitting Materials". Only those products used on the interior of the building (inside of the weatherproofing system) are required to comply with these requirements. VOC content shall be documented in accordance with Item 1.9, LEED Submittals below.

E. DIVISION 5 – METALS

1. Recycled Content Materials:

- a. Structural Steel, steel deck and miscellaneous steel shall contain a minimum of 35% combined post-industrial/post consumer recycled content (the percentage of recycled content is based on the weight of the component materials). Certification of recycled content shall be in accordance with item 1.9, LEED Submittals below.

2. Regionally-manufactured/Harvested Materials

- a. The manufacturing location(s) for all structural steel products shall be documented in accordance with Item 1.9, LEED Submittals below. For the purposes of this LEED credit, the steel fabricator can be considered the manufacturer.
- b. The origin of the raw materials from which the structural steel and steel deck was manufactured shall be documented in accordance with Item 1.9, LEED Submittals below. For the purposes of this LEED credit, the steel mill can be considered the source of the raw material.

3. Low-emission Products:

- a. Field-applied adhesives, sealants, and paints shall meet the requirements of Item 1.11, Products, Sub-Item D., "VOC Limits for Low-Emitting Materials". Only those products used on the interior of the building (inside of the weatherproofing system) are required to comply with these requirements. VOC content shall be documented in accordance with Item 1.9, LEED Submittals below.

F. DIVISION 6 – WOODS, PLASTICS AND COMPOSITES shall be revised to state the following:

1. Certified Wood:

- a. The use of "FSC Certified" products is required in all wood products as listed under Item 1.11, Products where available. If a wood product with the "FSC Certified" label does not exist or is not available, a non "FSC Certified" product may be substituted in place. Any use of "FSC Certified" wood products (except recycled or salvaged wood) which have been harvested in accordance with the "FSC Principles and Criteria" for well-managed forests developed by the Forest Stewardship Council (FSC) shall be reported and documented in accordance with Item 1.9, LEED Submittals below.

2. Low-emission Products:

- a. All composite wood, engineered wood, or agrifiber products (e.g., plywood, particleboard, and medium-density fiberboard) shall contain no added urea-formaldehyde resins. Acceptable resins and binders include, but are not limited to, phenol formaldehyde and methyl diisocyanate (MDI). Certification of these products shall be in accordance with Item 1.9, LEED Submittals below.
- b. Field-applied adhesives, sealants, and paints shall meet the requirements of Item 1.11, Products, Sub-Item D., "VOC Limits for Low-Emitting Materials". Only those products used on the interior of the building (inside of the weatherproofing system) are required to comply with these requirements. VOC content shall be documented in accordance with Item 1.9, LEED Submittals below.

G. DIVISION 7 - THERMAL AND MOISTURE PROTECTION

1. Recycled Content Materials:

- a. The post-industrial and/or post-consumer recycled content (by weight) of fiberglass insulation products shall be reported and documented in accordance with Item 1.9, LEED Submittals below.
- b. The post-industrial and/or post-consumer recycled content (by weight) of Mineral-wool insulation products shall be reported and documented in accordance with Item 1.9, LEED Submittals below.

- c. The post-industrial and/or post-consumer recycled content (by weight) of metal wall panels shall be documented in accordance with Item 1.9, LEED Submittals below.
- d. The post-industrial and/or post-consumer recycled content (by weight) of metal roof panels shall be documented in accordance with Item 1.9, LEED Submittals below.
- e. The post-industrial and/or post-consumer recycled content (by weight) of Cementitious and/or fibrous fireproofing shall be reported and documented in accordance with Item 1.9, LEED Submittals below. Metal lath and reinforcing fabric shall contain a minimum of 25% (combined) post-industrial/post-consumer recycled content. Certification of recycled content shall be in accordance with Item 1.9, LEED Submittals below.
- f. The post-industrial and/or post-consumer recycled content (by weight) of Polystyrene Insulation products shall be reported and documented in accordance with Item 1.9, LEED Submittals below. Certification of recycled content shall be in accordance with Item 1.9, LEED Submittals below.

2. Regionally-manufactured/Harvested Materials

- a. The manufacturing location(s) for metal wall panels shall be documented in accordance with Item 1.9, LEED Submittals below. For the purposes of this LEED credit, the steel fabricator can be considered the manufacturer.
- b. The manufacturing location(s) for metal roof panels shall be documented in accordance with Item 1.9, LEED Submittals below. For the purposes of this LEED credit, the steel fabricator can be considered the manufacturer.
- c. The origin of the raw materials from which the metal wall panels were manufactured shall be documented in accordance with Item 1.9, LEED Submittals below. For the purposes of this LEED credit, the steel mill can be considered the source of the raw material.
- d. The origin of the raw materials from which the metal roof panels were manufactured shall be documented in accordance with Item 1.9, LEED Submittals below. For the purposes of this LEED credit, the steel mill can be considered the source of the raw material.
- e. Energy Star roof materials manufactured within 500 miles (by air) of the project site shall be documented in accordance with Item 1.9, LEED Submittals below.

3. Energy Star Roofing

- a. All exposed roofing products including membranes and pavers shall be ENERGY STAR® compliant and have a Solar Reflectance Index (SRI) of at least 78 when tested in accordance with ASTM E-1980. Any selected product with an SRI less than 78 requires the Architect's approval.

4. Low-emission Products:

- a. Field-applied adhesives, sealants, and paints shall meet the requirements of Item 1.11, Products, Sub-Item D., "VOC Limits for Low-Emitting Materials". Only those products used on the interior of the building (inside of the weatherproofing system) are required to comply with these requirements. VOC content shall be documented in accordance with Item 1.9, LEED Submittals below.

H. DIVISION 8 – DOORS AND WINDOWS

1. Recycled Content Materials:

- a. The post-industrial and/or post-consumer recycled content (by weight) of Aluminum curtain wall shall be reported and documented in accordance with Item 1.9, LEED Submittals below.
- b. Steel doors with recycled content shall be documented in accordance with Item 1.9 (LEED Submittals) below.

2. Regionally-manufactured/Harvested Materials

- a. Aluminum curtain wall systems manufactured within a 500 mile radius of the project shall be documented in accordance with Item 1.9, LEED Submittals below.
- b. Steel doors manufactured within a 500 mile radius of the project shall be documented in accordance with Item 1.9, LEED Submittals below.

3. Certified Wood

- a. Wood doors made from "FSC Certified" products (except recycled or salvaged wood) which have been harvested in accordance with the "FSC Principles and Criteria" for well-managed forests developed by the Forest Stewardship Council (FSC) shall be reported and documented in accordance with Item 1.9, LEED Submittals below.

4. Low-emission Products:

- a. Field-applied adhesives, sealants, and paints shall meet the requirements of Item 1.11, Products, Sub-Item D., "VOC Limits for Low-Emitting Materials". Only those products used on the interior of the building (inside of the weatherproofing system) are required to comply with these requirements. VOC content shall be documented in accordance with Item 1.9, LEED Submittals below.
- b. All composite wood, engineered wood, or agrifiber products (e.g., plywood, particleboard, and medium-density fiberboard) shall contain no added urea-formaldehyde resins. Acceptable resins and binders include, but are not limited to, phenol formaldehyde and methyl diisocyanate (MDI). Certification of these products shall be in accordance with Item 1.9, LEED Submittals below.

I. DIVISION 9 – FINISHES

1. Recycled Content Materials:

- a. Gypsum wallboard shall contain “synthetic” gypsum produced with a minimum of 90% post-industrial recycled content, if readily available. Recycled content shall be documented in accordance with Item 1.9, LEED Submittals below.
- b. Steel studs, track, and miscellaneous framing shall contain a minimum of 25% (combined) post-industrial/post-consumer recycled content (the percentage of recycled content is based on the weight of the component materials). Recycled content shall be documented in accordance with Item 1.9, LEED Submittals below.
- c. The post-industrial and/or post-consumer recycled content (by weight) of Mineral Fiber Acoustical Ceiling Panels shall be reported and documented in accordance with Item 1.9, LEED Submittals below.
- d. Steel ceiling grid and suspension system shall have a minimum of 25% (combined) post-industrial/post-consumer recycled content (the percentage of recycled content is based on the weight of the component materials). Recycled content shall be documented in accordance with Item 1.9, LEED Submittals below.
- e. The post-industrial and/or post-consumer recycled content (by weight) of Carpet tile face fibers and/or backings shall be reported and documented in accordance with Item 1.9, LEED Submittals below.
- f. The post-industrial and/or post-consumer recycled content (by weight) of Broadloom carpet shall be reported and documented in accordance with Item 1.9, LEED Submittals below.

2. Regionally-manufactured/Harvested Materials

- a. Gypsum wallboard products manufactured within 500 miles (by air) of the project site shall be documented in accordance with Item 1.9, LEED Submittals below.
- b. The origin of the raw materials from which the gypsum wallboard was manufactured shall be documented in accordance with Item 1.9, LEED Submittals below.
- c. The manufacturing location(s) for steel studs, track, and miscellaneous framing shall be documented in accordance with Item 1.9 LEED Submittals below. For the purposes of this LEED credit, the steel fabricator can be considered the manufacturer.
- d. Acoustical panel ceiling products manufactured within 500 miles (by air) of the project site shall be documented in accordance with Item 1.9, LEED Submittals below.
- e. The origin of the raw materials from which the miner fiber acoustical ceiling panels were manufactured shall be documented in accordance with Item 1.9, LEED Submittals below.

3. Low-emission Products:

- a. Field-applied adhesives, sealants, and paints shall meet the requirements of Item 1.11, Products, Sub-Item D., "VOC Limits for Low-Emitting Materials". Only those products used on the interior of the building (inside of the weatherproofing system) are required to comply with these requirements. VOC content shall be documented in accordance with Item 1.9, LEED Submittals below.
- b. Carpet, Carpet Backing and Carpet tiles and adhesives shall meet or surpass all criteria of the "Green Label Plus" Indoor Air Quality Test Program established by the Carpet and Rug Institute (CRI) of Dalton, Georgia.

J. DIVISION 10 – SPECIALTIES

1. Recycled Content Materials:

- a. The post-industrial and/or post-consumer recycled content (by weight) of Plastic toilet partitions shall be reported and documented in accordance with Item 1.9, LEED Submittals below.

2. Low-emission Products:

- a. Field-applied adhesives, sealants, and paints shall meet the requirements of Item 1.11, Products, Sub-Item D., "VOC Limits for Low-Emitting Materials". Only those products used on the interior of the building (inside of the weatherproofing system) are required to comply with these requirements. VOC content shall be documented in accordance with Item 1.9, LEED Submittals below.

K. DIVISION 11 – EQUIPMENT

1. Low-emission Products:

- a. Field-applied adhesives, sealants, and paints shall meet the requirements of Item 1.11, Products, Sub-Item D., "VOC Limits for Low-Emitting Materials". Only those products used on the interior of the building (inside of the weatherproofing system) are required to comply with these requirements. VOC content shall be documented in accordance with Item 1.9, LEED Submittals below.

L. DIVISION 12 – FURNISHINGS

1. Low-emission Products:

- a. Field-applied adhesives, sealants, and paints shall meet the requirements of Item 1.11, Products, Sub-Item D., "VOC Limits for Low-Emitting Materials". Only those products used on the interior of the building (inside of the weatherproofing system) are required to comply with these requirements. VOC content shall be documented in accordance with Item 1.9, LEED Submittals below.
- b. All composite wood, engineered wood, or agrifiber products (e.g., plywood, particleboard, and medium-density fiberboard) shall contain no added urea-formaldehyde resins. Acceptable resins and binders include, but are not limited to, phenol formaldehyde and methyl diisocyanate (MDI). Certification of these products shall be in accordance with Item 1.9, LEED Submittals.

M. DIVISION 13 – SPECIAL CONSTRUCTION

1. Low-emission Products:

- a. All composite wood, engineered wood, or agrifiber products (e.g., plywood, particleboard, medium density fiberboard) in fixed audience seating shall contain no added urea-formaldehyde resins. Acceptable resins and binders include, but are not limited to, phenol formaldehyde and methyl diisocyanate (MDI). Certification of these products shall be in accordance with Item 1.9, LEED Submittals below.
- b. Field-applied adhesives, sealants, and paints shall meet the requirements of Item 1.11, Products, Sub-Item D., "VOC Limits for Low-Emitting Materials". Only those products used on the interior of the building (inside of the weatherproofing system) are required to comply with these requirements. VOC content shall be documented in accordance with Item 1.9, LEED Submittals below.

N. DIVISION 14 – CONVEYING SYSTEMS

1. Low-emission Products:

- a. Field-applied adhesives, sealants, and paints shall meet the requirements of Item 1.11, Products, Sub-Item D., "VOC Limits for Low-Emitting Materials". Only those products used on the interior of the building (inside of the weatherproofing system) are required to comply with these requirements. VOC content shall be documented in accordance with Item 1.9, LEED Submittals below.

O. DIVISION 15 – MECHANICAL

1. Low-emission Products:

- a. Field-applied adhesives, sealants, and paints shall meet the requirements of Item 1.11, Products, Sub-Item D., "VOC Limits for

Low-Emitting Materials". Only those products used on the interior of the building (inside of the weatherproofing system) are required to comply with these requirements. VOC content shall be documented in accordance with Item 1.9, LEED Submittals below.

P. DIVISION 16 – ELECTRICAL

1. Low-emission Products:

- a. Field-applied adhesives, sealants, and paints shall meet the requirements of Item 1.11, Products, Sub-Item D., "VOC Limits for Low-Emitting Materials". Only those products used on the interior of the building (inside of the weatherproofing system) are required to comply with these requirements. VOC content shall be documented in accordance with Item 1.9, LEED Submittals below.

1.9 LEED SUBMITTALS

- A. LEED submittals are required for all installed materials in specification Divisions 2 through 12 and adhesives, sealants, and paints through Divisions 16. The GREEN BUILDING Submittal information shall be assembled into one (1) package per Specification section or sub-contractor. Two (2) copies of the submittals are required. Incomplete or inaccurate LEED Submittals may be used as the basis for rejecting the submitted products or assemblies. Contractor and/or subcontractors shall submit the following LEED BUILDING reporting items:

- 1. A completed GREEN BUILDING MATERIALS REPORTING FORM (GBMRF) for each trade (sample to be provided by architect). Information to be supplied for this form shall include:
 - a. Cost breakdowns for the materials included in the contractor's or subcontractor's work. Cost breakdowns shall include total installed cost and itemized material costs.
 - b. The amount of post consumer and/or post industrial recycled content in the supplied products.*
 - c. Identification (Y/N) of materials manufactured within 500 miles of the project site.*
 - d. Identification (Y/N) of materials harvested or extracted within 500 miles of the project site.*
 - e. Identification (Y/N) of "FSC Certified" wood products used.*
 - f. VOC content of all field applied adhesives, sealants, and paints used in interior applications.

*If applicable – see Item 1.8 (LEED Performance Criteria for Materials) above to determine the applicable reporting based on the material type.

- B. MATERIALS REPORTING FORM BACK-UP DOCUMENTATION: These documents are used to validate the information provided on the Green Building Materials Reporting Form (except cost data). For each material listed on the form, provide documentation to certify the material's LEED BUILDING attributes, as applicable:

- a. Recycled content: Provide published product literature or letter of certification on the manufacturer's letterhead certifying the amounts of post-consumer and/or post-industrial content.
 - b. Regional manufacturing (within 500 miles): Provide published product literature or letter of certification on the manufacturer's letterhead indicating the city/state where the manufacturing plant is located and the distance in miles from the project site.
 - c. Regional raw materials (within 500 miles): Provide published product literature or letter of certification on the manufacturer's letterhead indicating the city/state from which each of the raw materials in the product were extracted, harvested or recovered, and the distance in miles from the project site.
 - 1) If only some of the raw materials for a particular product or assembly originate within 500 miles of the project site, provide the percentage (by weight) that these materials comprise in the complete product.
 - d. FSC Certified Wood:
 - 1) Provide vendor invoices for each wood product that has been harvested in accordance with the "FSC Principles and Criteria" for well-managed forests developed by the Forest Stewardship Council (FSC) of Bonn, Germany. Invoices shall include chain-of-custody certificate numbers and itemized costs for all certified products.
 - 2) For assemblies, provide the percentage (by cost and by weight) of the assembly that is FSC-certified wood.
 - e. VOC content: Provide Material Safety Data Sheets (MSDS) certifying the Volatile Organic Compound (VOC) content of the adhesive, sealant, paint, or coating products. VOC content is to be reported in grams/liter or lbs/gallon. If the MSDS does not show the product's VOC content, this information must be provided through other published product literature from the manufacturer, or stated in a letter of certification from the product manufacturer on the manufacturer's letterhead.
- 1. PRODUCT CUT SHEETS: Provide product cut sheets with the Contractor's or sub-contractor's stamp, confirming that the submitted products are the products installed in the Project.
 - 2. CRI GREEN LABEL CERTIFICATION: For carpets and carpet cushions, provide published product literature or letter from the manufacturer (on the manufacturer's letterhead) verifying that the products comply with the "Green Label Plus" IAQ testing program of the Carpet and Rug Institute of Dalton, GA.

3. **CARPET COMPONENT IDENTIFICATION:** For all synthetic carpets, provide documentation from the manufacturer on the manufacturer's letterhead of the specific carpet component identification code that is printed on, or attached to, the carpet supplied for the project. The code must identify the carpet face fiber, and may identify its primary backing, secondary backing, adhesive, adhesive filler, and dyes.
4. **CERTIFICATION OF COMPOSITE WOOD OR AGRIFIBER RESINS:** For all composite wood, engineered wood and agrifiber products, provide published product literature or letter from the manufacturer (on the manufacturer's letterhead) verifying that the products do not contain added urea-formaldehyde resins.
5. **CERTIFICATION OF COMPOSITE WOOD OR AGRIFIBER LAMINATING ADHESIVES:** For all composite wood, engineered wood and agrifiber products, provide published product literature or letter from the manufacturer on the manufacturer's letterhead verifying that the products do not contain added urea-formaldehyde or phenol-formaldehyde resins.
6. **GREEN SEAL COMPLIANCE:** Provide published product literature or letter from the manufacturer (on the manufacturer's letterhead) verifying that the following product types comply with the VOC limits and chemical component restrictions developed by the Green Seal organization of Washington, DC (www.greenseal.org/):
 - a. Topcoat paints: refer to Green Seal standard GS-11 (1st edition, May 1993)
 - b. Anti-corrosive and Anti-rust paints: refer to Green Seal standard GS-03 (2nd Edition, January 1997)
 - c. Aerosol Adhesives: refer to Green Seal standard GS-36 (1st edition, October 2000)
7. **ENERGY STAR ROOFING:** For exposed roofing materials, including membranes and pavers, provide certification from the manufacturer of ENERGY STAR compliance for the Solar Reflectance Index (SRI). (An SRI of at least 78 when tested in accordance with ASTM E-1980).
8. **HIGH ALBEDO ROOFING:** For exposed roofing membranes, pavers, and ballast products, provide published product literature or letter from the manufacturer on the manufacturer's letterhead verifying the following minimum Solar Reflectance Index (SRI) values:
 - a. 78 for low-sloped roofing applications (slope \leq 2:12)
 - b. 29 for steep-sloped roofing applications (slope $>$ 2:12)
 - c. SRI values shall be calculated according to ASTM E 1980.
 - d. Reflectance shall be measured according to ASTM E 903, ASTM E 1918, or ASTM C 1549. Emittance shall be measured according to ASTM E 408 or ASTM C 1371.
 - e. Vegetated roof surfaces are exempt from the SRI criteria.

9. HIGH ALBEDO PAVEMENT AND WALKWAYS: For paving and walkway materials made from concrete or brick provide published product literature or letter from the manufacturer on the manufacturer's letterhead verifying a minimum Solar Reflectance Index (SRI) value of 29. SRI values shall be calculated according to ASTM E 1980. Reflectance shall be measured according to ASTM E 903, ASTM E 1918, or ASTM C 1549. Emittance shall be measured according to ASTM E 408 or ASTM C 1371.

C. CONSTRUCTION PROGRESS

1. Concurrent with each Application for Payment, submit reports comparing actual construction and purchasing activities with LEED action plans for the following:
2. Waste Reduction Progress Reports complying with Division 01524 Section "Construction Waste Management".
3. Regional Materials. Provide updated spreadsheet to track Regional Materials.
4. Recycled Content Materials. Provide updated spreadsheet to track Recycled Content.
5. FSC Certified Wood Products. Provide updated spreadsheet to track FSC Certified Wood Materials.
6. Low Emitting VOC Content Materials. Provide updated spreadsheet to track Low Emitting VOC Content Materials.
7. Low Emitting Composite Wood. Provide updated spreadsheet to track low emitting (non-urea-formaldehyde) composite and engineered wood products.

D. LEED ACTION PLANS

- a. The following plans are to be prepared by the Contractor and refer to work reviewed in Items 1.5, LEED Overview and General Requirements of this section.
- b. Erosion and Sedimentation Control Plan (ESC): Indicate what ESC for site work measures are anticipated and how they will be documented.

E. Construction Waste Management (CWM):

- a. General: Develop a plan consisting of waste identification, waste reduction work plan, and progress reporting per the requirements of Section 01524, Construction Waste Management. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.
1. Construction Indoor Air Quality Management (IAQ): A copy of the draft and final versions of the Construction IAQ Management Plan, as defined below.
 - a. General: Develop a plan in accordance with Section 01525, Construction IAQ Management where construction activities are planned to meet or exceed standards included in Chapter 3 of the SMACNA "IAQ Guidelines for Occupied Buildings Under Construction", First Edition, 1995.
 - b. Upon the Plan's approval by the Owner and Consultant, the Contractor and subcontractors shall implement the Plan through the duration of the construction process.

- 1) Develop a construction schedule outlining the start-up date and expected duration of all Construction IAQ Management Plan control measures.

1.10 QUALITY ASSURANCE

- A. Contractor's Quality Control Responsibilities: Contractor is solely responsible for the quality control of the work.
- B. Contractor's LEED Representative: Designate a Representative that is LEED accredited by the USGBC. Contractor's LEED Representative shall oversee the sustainable building for the project, shall instruct workers concerning these goals, and shall be present on site when work is in progress.
- C. LEED Certification Meetings: Schedule and conduct LEED Certification meetings monthly in addition to those outlined in Division 1 "Project Management and Coordination". Meeting attendees shall include at least the following: Owner's Representative, Architect, Contractor's Project Manager, Contractor's LEED Representative, and Sub-Contractor Representatives as appropriate to the stage of work. Discuss LEED Certification at Pre-bid, Pre-construction, and regular job site meetings.
- D. LEED Training: Provide environmental training for workers performing work on the project site. Training shall include the following:
 1. Overview of environmental issues related to the building industry
 2. LEED Building System – Requirements for this project

1.11 PRODUCTS

- A. Materials with Recycled Content
 1. Provide recycled content and/or report recycled content as indicated in Items 1.8, LEED Performance Criteria for Materials and 1.9, LEED Submittals.
- B. Regional Materials
 1. Report regional content as indicated in Items 1.8, LEED Performance Criteria for Materials and 1.9, LEED Submittals.
- C. Forest Stewardship Council Certified Materials
 1. Track and report (by cost) of permanently all installed wood-based materials that are produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."
 - a. Wood-based materials included, but are not limited to, the following materials when made from wood, engineered wood products, or wood based panels products:
 - 1) Rough carpentry
 - 2) Miscellaneous carpentry
 - 3) Heavy timber construction
 - 4) Wood decking
 - 5) Metal-plate-connected wood trusses

- 6) Structural glued-laminated timber
- 7) Finish carpentry
- 8) Architectural woodwork
- 9) Wood paneling
- 10) Wood veneer wall covering
- 11) Wood flooring
- 12) Wood lockers
- 13) Wood cabinets

D. VOC Limits for Low-Emitting Materials

1. Field-Applied Adhesives and Sealants:

- a. The VOC content of adhesives, adhesive bonding primers, or adhesive primers used in this project shall not exceed the limits defined in Rule 1168 "Adhesives and Sealant Applications" of the South Coast Air Quality Management District (SCAQMD) of the State of California.
- b. The VOC content of aerosol adhesives shall not exceed the limits defined in the Green Seal Standards for Commercial Adhesives GS-36, requirements in effect October 19, 2000.
- c. Sealants used as filler must meet or exceed California Bay Area Air Resources Board Reg. 8, Rule 51, Organic Compounds: Adhesive and Sealant Products (Adopted November 18, 1992, with Amendments through January 7, 1998).
- d. The VOC limits defined by SCAQMD (based on 1/7/05 amendments) are as follows. All VOC limits are defined in grams per liter, less water and less exempt compounds.
- e. General: Unless otherwise specified below, the VOC content of all adhesives, adhesive bonding primers, or adhesive primers shall not be in excess of 250 grams per liter.
- f. Non-General: For specified applications, the allowable VOC content is as follows (in grams/liter):
 - 1) Architectural Applications

a) Indoor carpet adhesive	50
b) Carpet pad adhesive	50
c) Outdoor carpet adhesive	150
d) Wood flooring adhesive	100
e) Rubber floor adhesive	60
f) Sub-floor adhesive	50
g) Ceramic tile adhesive	65
h) VCT and asphalt tile adhesive	50
i) Drywall and panel adhesive	50
j) Cove base adhesive	50
k) Multipurpose construction adhesive	70
l) Structural glazing adhesive	100
m) Single ply roof membrane adhesives	450
 - 2) Specialty Applications

a) PVC welding	510
b) CPVC welding	490
c) ABS welding	325

- | | | |
|----|--|-----|
| d) | Plastic cement welding | 250 |
| e) | Adhesive primer for plastic | 550 |
| f) | Contact adhesive | 80 |
| g) | Special purpose contact adhesive | 250 |
| h) | Structural wood member adhesive | 140 |
| i) | Sheet applied rubber lining operations | 850 |
| 3) | Substrate Specific Applications | |
| a) | Metal to metal | 30 |
| b) | Plastic foams | 50 |
| c) | Porous material (except wood) | 50 |
| d) | Wood | 30 |
| e) | Fiberglass | 80 |
2. If an adhesive is used to bond dissimilar substrates together, the adhesive with the highest VOC content shall be allowed.
 3. VOC limits for aerosol adhesives (defined as % of VOC weight in grams per liter less water):
 - a. General purpose mist spray 65% VOC by weight
 - b. General purpose web spray 55% VOC by weight
 - c. Special purpose aerosol adhesives 70% VOC by weight
 4. The VOC content of sealants or sealant primers used in this project shall not exceed the limits defined in Rule 1168 "Adhesives and Sealant Applications" of the South Coast Air Quality Management District (SCAQMD) of the State of California.
 5. The VOC limits defined by SCAQMD Rule 1168 are as follows. All VOC limits are defined in grams per liter, less water and less exempt compounds.
 - a. Sealants

1)	Architectural	250
2)	Marine deck	760
3)	Roadways	250
4)	Single ply roof material installation/repair	450
5)	Non-membrane roof installation/repair	300
6)	Other	420
 - b. Sealant Primer

1)	Architectural - nonporous	250
2)	Architectural - porous	775
3)	Other	750
 6. Paints and Coatings:
 - a. Paints and primers (non-specialized applications): Paints and primers used in non-specialized interior and exterior applications (i.e. For wallboard, plaster, wood, metal doors and frames, etc.) shall meet the VOC and chemical component limitations of the Green Seal Paint Standard GS-11, and anti-corrosive paints (IE used in preventing the corrosion of ferrous metal substrates) shall meet the VOC and chemical component limitations of Green Seal Standard GC-03 of Green Seal, Inc., Washington, DC. Product-specific environmental requirements are as follows:

- 1) VOC concentrations (in grams per liter) of the product shall not exceed those listed below as determined by U.S. Environmental Protection Agency (EPA) Reference Test Method 24. The calculation of VOC shall exclude water and tinting color added at the point of sale.
 - a) Interior coatings
 - i. Non-flat 150
 - ii. Flat 50
 - b) Interior anti-corrosive paints
 - i. Gloss 250
 - ii. Semi-gloss 250
 - iii. Flat 250
 - c) Exterior coatings
 - i. Non-flat 200
 - ii. Flat 100

- b. Chemical Component Limitations – Aromatic Compounds: The product must contain no more than 1.0% by weight of the sum total of aromatic compounds. Testing for the concentration of these compounds will be performed if they are determined to be present in the product during a material audit.

- c. Chemical Component Limitations – Other Chemicals: The manufacturer shall demonstrate that the following chemical compounds are not used as ingredients in the manufacture of the product.
 - 1) Halomethanes: methylene chloride
 - 2) Chlorinated ethanes: 1,1,1-trichloroethane
 - 3) Aromatic solvents: benzene, toluene (methylbenzene), ethylbenzene
 - 4) Chlorinated ethylenes: vinyl chloride
 - 5) Polynuclear aromatics: naphthalene
 - 6) Chlorobenzenes: 1,2-dichlorobenzene
 - 7) Phthalate esters: di (2-ethylhexyl) phthalate, butyl benzyl phthalate, di-n-butyl phthalate, di-n-octyl phthalate, diethyl phthalate, dimethyl phthalate
 - 8) Miscellaneous semi-volatile organics: isophorone
 - 9) Metals and their compounds: antimony, cadmium, hexavalent chromium, lead, mercury
 - 10) Preservatives (antifouling agents): formaldehyde
 - 11) Ketones: methyl ethyl ketone, methyl isobutyl ketone
 - 12) Miscellaneous volatile organics: acrolein, acrylonitrile

- d. Paints and other Architectural Coatings (specializes applications): Paints and other architectural coatings used in specialized interior and exterior applications (as defined below) shall meet the VOC limitations defined in Rule 1113, "Architectural Coatings" of SCAQMD, of the State of California. The VOC limits defined by

SCQMD, based on 7/9/04 amendments, are as follows. VOC limits are defined in grams per liter (g/L), less water and less exempt compounds.

- | | | |
|----|----------------------|-----|
| 1) | Clear wood finishes: | |
| | a) Varnish | 350 |
| | b) Lacquer | 550 |
| 2) | Sealers | |
| | a) Sanding | 275 |
| | b) Waterproofing | 250 |
| 3) | Floor Coatings | 100 |
| 4) | Stains | 250 |
- e. Low-Emitting Carpet Systems
- 1) Document that the installed carpets products and carpet backing are CRI Green Plus Certified.
 - 2) Document that all carpet adhesives contain fewer than 50 grams per liter VOC content.
- f. Non-Urea-Formaldehyde Resins in Engineered Woods
- 1) Document that the bonding resins in all engineered wood products do not contain added urea-formaldehyde or phenol-formaldehyde resins.
 - 2) Document that the adhesives used for field and shop applied laminations (veneers, plastics, metals) do not contain added urea-formaldehyde resins.

1.12 EXECUTION

A. EROSION AND SEDIMENTATION CONTROL (ESC)

1. Comply with requirements for Construction Activity Pollution Prevention as outlined in the Sedimentation and Erosion Control Plan.

B. CONSTRUCTION WASTE MANAGEMENT (CWM)

1. Comply with Section 01524, Construction Waste Management.
2. Maintain spreadsheet tracking waste material description, hauler or recycling location and tabulation of material diverted or recycled based on weight or volume.

C. RECYCLED CONTENT

1. Maintain a spreadsheet to track Recycled content of materials specified in Divisions 02-10. Include material description, material costs (without labor and equipment), post consumer recycled content, pre consumer recycled content and recycled content information source. Recycled content is based on the cost of qualifying materials as a percent of overall materials costs for Divisions 02 -10.

D. REGIONAL MATERIALS

1. Maintain a spreadsheet to track Regional Materials specified in Divisions 02-10. Include the product name, manufacturer, material cost (without labor and equipment), direct line distance from project to extraction/harvest location,

direct line distance from project to manufacturer's location and source of information regarding harvest/extraction and manufacturing locations.

E. (FSC) MATERIALS

1. Maintain a spreadsheet listing all new wood on the project. Identify which components are FSC certified, the source of the materials, the value of all FSC certified wood materials (as a % of total product value), and the COC number. Recycled wood fiber that qualifies as contributing to recycled content shall be excluded.

F. LOW EMITTING VOC CONTENT MATERIALS

1. Maintain a spreadsheet of all adhesives, sealants, and sealant primers, paints and coatings used on the project. Include product manufacturer, product name/model, VOC content, allowable VOC content as per Item 1.11, Products, Sub-Item D., VOC Limits for Low-Emitting Materials, the source of the VOC data, an estimated quantity of the product used on the project and an estimated cost for each product.

G. LOW EMITTING CARPET

1. Maintain a spreadsheet of all installed carpets and carpet backings. Include manufacturer, recycled content, manufacturing location, and confirmation that the product meets the requirements of the CRI 'Green Label Plus' program. Maintain a listing of all carpet adhesives including the manufacturer, product name and VOC content as reported by the manufacturer.
2. For all synthetic carpets maintain a spreadsheet including the manufacturer, the product name, the specific carpet component identification code that is printed on, or attached to, the carpet supplied for the project.

H. LOW EMITTING COMPOSITE WOOD

1. Maintain a spreadsheet of all install composite wood, engineered wood and agrifiber, including manufacturer, product name and confirmation that the product does not contain any added urea formaldehyde resins. Maintain a listing of the glues used for bonding veneers and laminates to substrates with confirmation that they do not contain any added urea-formaldehyde resins.

I. CONSTRUCTION INDOOR AIR QUALITY MANAGEMENT

1. Comply with the requirements for indoor air quality during construction activity as outlined in the Construction IAQ Management Plan, Section 01525.

END OF SECTION 01361

GREEN BUILDING MATERIALS REPORTING FORM						PROJECT NAME:				
CONTRACTOR:				TEL NO:		SPEC SECTION:				
		REQUIRED for ALL products identified in specifications		Is the product salvaged, refurbished or reused?	If Recycled	contains	100% Extracted & Manufactured 4 w/n 500 mile radius of	Partially Extracted & Manufactured 5 w/n 500 mile radius of	For Wood Product s: FSC Certified	VOC Content 8 (for adhesives, sealants, paints and
Product	Vendor or Manufacturer	Total Installed COST	Material COST (excluding labor & equipment)		% post-consumer	% Pre-consumer				
1.										
2.										
3.										
4.										
5.										
6.										
7.										

1. Salvaged: Material or product which has been recovered from existing buildings or construction sites and reused in other buildings (e.g., structural beams, doors, brick).
2. Post-Consumer Recycled Content: Portion of material or product which derives from discarded consumer waste that has been recovered for use as a raw material (e.g., plastic bottles, newspaper)
3. Pre-Consumer Recycled Content: Portion of material or product which derives from recovered industrial and mfg. materials that are diverted from municipal solid waste for use in a different mfg. process, prior to use by a consumer (e.g., fly-ash in concrete or synthetic gypsum board, both of which are by-products of coal-burning power plants). Note that spills and scraps from the original mfg. process that are combined with other constituents after a minimal amount of reprocessing for use in further production of the same product do not qualify.
4. Regional Extraction/Manufacture: Extracted: Extraction, harvesting or recovery of materials that are used for manufacturing of products to be installed in the building. Manufactured: Final assembly of components into a finished product that is furnished and installed by trades (e.g., If the lumber is from Missoula, MT, and the joist (the finished product in this case) is assembled in Kent, WA; then the location of final assembly is Kent, WA). Since Missoula, MT is within a 500 mile radius of Kent, WA the answer for this example would be 'Yes'
5. Partial Extraction/Manufacture: If only a fraction of the material is extracted/harvested/recovered and manufactured within a 500 mile radius then (only) that percentage (by weight) contributes to the regional value.
6. Rapidly Renewable: Materials and products made from raw materials that are harvested within a 10-year cycle (e.g., bamboo, cork, linoleum, fast-growing poplar, wheatboard, wool carpet)
7. FSC Certified: Wood-based products which are certified by the Forest Stewardship Council and carry a Chain-of-Custody certificate number from the vendor or manufacturer.

8. VOC Content: The quantity of volatile organic compounds contained in products such as adhesives, sealants and architectural coatings. VOC content is to be reported in grams/liter or lbs/gallon

Contractor Certification:

I, _____ a duly authorized representative of _____ hereby certify that the material information contained herein is an accurate representation of the material qualifications to be provided by us, as components of the final building construction. Furthermore, I understand that any change in such qualifications during the purchasing period will require prior written approval from the Construction Manager and Owner.

SIGNATURE OF AUTHORIZED REPRESENTATIVE: _____ Date: _____ p. ____ of ____

**NEW PASSENGER TERMINAL
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**SECTION 01400 - QUALITY CONTROL -
TESTING SERVICES**

1. GENERAL

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections apply to this Section.
- B. This section specifies the general requirements for testing and inspection services.
- C. Cooperate with Owner's testing laboratory and all others responsible for testing and inspecting the Work.
- D. Provide other testing and inspecting as specified to be furnished by the Contractor in this Section and/or elsewhere in these Specifications.
- E. Provide quality control by the observation and acceptance of work by others being built upon.
- F. Related work described elsewhere:
 - 1. Requirements for testing are described in Divisions 2, 3, 4 and 5 product sections of these Specifications.
 - 2. Where no testing requirements are described, but the Construction Manager decides that testing is required, he may direct that such testing be performed under current standards for testing and Section 7.7 of the General Conditions.
- G. Selection of testing laboratory: The Owner shall hire and pay for an independent testing laboratory.

2. CODES AND STANDARDS

- A. Testing, when required, will be in accordance with pertinent codes and regulations and with selected standards of the American Society for Testing and Materials.

3. REVIEW OF THE CONTRACT DOCUMENTS

- A. On all Project Drawings, figures take precedence over measurement by scale, and any scaling is done at the Contractor's own risk. Before ordering any materials or performing any Work, the Contractor shall verify all measurements at the project site and be responsible for the correctness of same.
- B. Promptly respond to test reports and related instructions to ensure necessary retesting and replacement of materials with the least possible delay in progress of the Work.

4. FIELD CONDITIONS

- A. The Contractor shall take field measurements and verify field conditions and shall carefully compare such field measurements and conditions with the Contract Documents and any shop drawings and product data before commencing any related work. Errors, inconsistencies or omissions shall be reported to the Construction Manager and the Architect at once.

5. PAYMENT FOR TESTING

- A. Initial Services: The Owner's Testing Laboratory shall be responsible for initial testing services as outlined in various sections and Section 7.7 of the General Conditions.
- B. Re-Testing Services: When initial tests indicate non-compliance with the Contract Documents, all subsequent retesting occasioned by the non-compliance shall be performed by the same testing agency and the costs thereof will be borne by the Contractor responsible for the work that is non-compliant.

6. TESTING

- A. Code Compliance Testing: Inspections and tests required by codes or ordinances, or by a plan approval authority, and which are made by a legally constituted authority, shall be the responsibility of and shall be paid for by the Contractor, unless otherwise provided in the Contract Documents.
- B. Contractor's Convenience Testing: Inspecting and testing performed exclusively for the Contractor's convenience shall be the sole responsibility of the Contractor.

7. INSPECTION

- A. Inspection by Owner's Personnel: From time to time, personnel in the employ of the Owner may inspect the Work where the Work is in progress, but shall have no authority to direct the Contractor or request changes in the Work except through the Construction Manager and the Architect.
- B. Inspection of Work by Others: Each Contractor shall inspect Work of others which will receive or is adjacent to his Work before commencing his Work. Do not proceed until conditions which would result in a less than first class installation are satisfactorily corrected. Commencing Work shall be construed as acceptance of the Work of others, by the Contractor, as satisfactory to receive his Work. The Contractor shall bear all costs to correct the unsatisfactory Work.

8. COOPERATION WITH TESTING LABORATORY

- A. Representatives of the testing laboratory shall have access to the Work at all times. Provide facilities for such access in order that the laboratory may properly perform its function.
- B. Specimens and samples for testing, unless otherwise provided in the Contract Documents, will be taken by the testing personnel. Sampling equipment and personnel will be provided by the testing laboratory. Deliveries of specimens and samples to the testing laboratory will be performed by the testing laboratory.

- C. Test results and reports shall be furnished simultaneously to the Engineer (2 copies) and the Construction Manager (1 copy) within one week of testing.

9. TESTING SCHEDULE

- A. The Owner shall pre-qualify and identify qualified independent inspection agencies in a timely manner, allowing Engineer adequate time for review and approval.
- B. Special Structural Testing Schedule to be implemented per specifications.
- C. When changes of construction schedule are necessary during construction, the Construction Manager shall coordinate such changes of schedule with the testing laboratory as required.
- D. When the testing laboratory is ready to test according to the established schedule, but is prevented from testing or taking specimens due to incompleteness of the Work, all extra charges for testing attributable to the delay may be backcharged to the Contractor and shall not be borne by the Owner.

END OF SECTION 01400

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**SECTION 01421 – STANDARDS
AND DEFINITIONS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this section.

1.2 DEFINITIONS

- A. General: Basic contract definitions are included in the Conditions of the Contract.
- B. "Indicated": The term "indicated" refers to graphic representations, notes, or schedules on the Drawings; or to other paragraphs or schedules in the Specifications and similar requirements in the Contract Documents. Terms such as "shown," "noted," "scheduled," and "specified" are used to help the user locate the reference. No limitation on location is intended.
- C. "Directed": Terms such as "directed," "requested," "authorized," "selected," "approved," "required," and "permitted" mean directed by the Architect, requested by the Architect, and similar phrases. However, no such implied meaning will be interpreted to extend the Architect's responsibility into Contractor's area of construction supervision.
- D. "Approved": The term "approved," when used in conjunction with the Architect's action on the Contractor's submittals, applications, and requests, is limited to the Architect's duties and responsibilities as stated in the Conditions of the Contract.
- E. "Regulations": The term "regulations" includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish": The term "furnish" means to supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": The term "install" describes operations at the Project site including the actual unloading, temporary storage, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
- H. "Provide": The term "provide" means to furnish and install, complete and ready for the intended use.
- I. "Installer": An installer is the Contractor or another entity engaged by the Contractor, either as an employee, subcontractor, or contractor of lower tier, to perform a particular construction activity, including installation, erection, application, or similar operations. Installers are required to be experienced in the operations they are engaged to perform.

1. Trades: Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespersons of the corresponding generic name.
- J. "Project Site" is the space available to the Contractor for performing construction activities, either exclusively or in conjunction with others performing other work as part of the Project. The extent of the Project site is shown on the Drawings and may or may not be identical with the description of the land on which the Project is to be built.
- K. "Testing Agencies, Laboratories or Service": All terms interchangeably refer to an independent entity engaged to perform specific inspections or tests, either at the Project site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.
- L. "Nationally Recognized Testing Laboratories": The term "nationally recognized testing laboratory (NRTL)" shall mean a firm or organization which is recognized by OSHA in accordance with 29 CFR Part 1910.7 to test and approve (i.e., certify, label or list) equipment or materials as being safe for the intended use. Labeling and / or listing of products by NRTL is acceptable wherever a reference to the UL or FMRC label is made in the specifications.
- M. "Label": The label must be provided by a nationally recognized testing laboratory. The Contractor shall provide a statement from the testing laboratory attesting that the laboratory has been approved by OSHA to certify the category of product(s) being submitted for approval.

1.3 SPECIFICATION FORMAT AND CONTENT EXPLANATION

- A. Specification Content: These Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
 1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be interpolated as the sense requires. Singular words shall be interpreted as plural and plural words interpreted as singular where applicable as the context of the Contract Documents indicates.
 2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by the Contractor. At certain locations in the Text, subjective language is used for clarity to describe responsibilities that must be fulfilled indirectly by the Contractor or by others when so noted.
 - a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

1.4 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
 - 1. Reference standards (standards referenced directly in the contract documents) take precedence over standards that are not referenced but generally recognized in the industry for applicability to the work.
 - 2. Unreferenced Standards: Except as otherwise limited by the contact documents, standards not referenced but recognized in the construction industry as having direct applicability will be enforced for performance of the work. The decision as to whether an industry code or standard is applicable, or as to which of several standards are applicable, is the sole responsibility of the Architect.

- B. Publication Dates: Comply with the standards in effect as of the date of the Contract Documents.
 - 1. Updated Standards: Submit a change order proposal where an applicable industry code or standard has been revised and reissued after the date of the Contract Documents and before the performance of the work affected. The Architect will decide whether to issue a change order to proceed with the updated standard.

- C. Conflicting Requirements: Where compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different but apparently equal to the Architect for a decision before proceeding.
 - 1. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of the requirements. Refer uncertainties to the Architect for a decision before proceeding.
 - 2. The Architect is the sole interpreter of what constitutes "minimum requirements" in any given situation. Exceeding minimum requirements in one or more aspects of any given specification does not cancel or replace the need to meet minimum requirements of any other aspect of that specification.

- D. Copies of Standards: Each entity engaged in construction on the Project must be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
 - 1. Where copies of standards are needed to perform a required construction activity, the Contractor shall obtain copies directly from the publication source and make them available on request.

- E. Abbreviations and Names: Trade association names and titles of general standards are frequently abbreviated. Where abbreviations and acronyms are used in the Specifications or other Contract Documents, they mean the recognized name of the trade association, standards-generating organization, authorities having jurisdiction, or other entity applicable to the context of the text provision. Refer to Gale

Research's "Encyclopedia of Associations" or Columbia Books' "National Trade & Professional Associations of the U.S.," which are available in most libraries.

1.5 GOVERNING REGULATIONS AND AUTHORITIES

- A. The Architect has contacted authorities having jurisdiction where necessary to obtain information necessary for preparation of Contract Documents. Contact authorities having jurisdiction directly for information and decision having a bearing on the work.

1.6 SUBMITTALS

- A. Permits, Licenses, and Certificates: For the Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01421

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**SECTION 01450 – STRUCTURAL TESTS
AND SPECIAL INSPECTIONS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 INTENT AND CONDITIONS

- A. Intent:
1. For compliance with the Minnesota State Building Code, the Owner shall employ and pay for a special inspector (or inspectors) as required by Chapter 17 of the International Building Code.
 2. Duties and responsibilities of the special inspector(s) shall be as outlined in Chapter 17 of the International Building Code and as herein specified.
 3. Define and coordinate structural tests and special inspection services.
 4. Define and coordinate conventional testing and inspection services.
 5. Testing and Inspection services are intended to assist in determining probable compliance of the work with requirements specified. These services do not relieve the Contractor of responsibility for compliance with the requirements of the Contract Documents.
- B. Conditions:
1. If inspection of fabricator's work is required, the Owner's representative may require testing and inspection of the work at the plant, before shipment. Owner, Architect and Structural Engineer of Record (SER) reserve the right to reject material not complying with Contract Documents.
 2. Perform testing and inspection in accordance with industry standard used as reference for specific material or procedure unless other criteria are specified. In the absence of a referenced standard, accomplish tests in accordance with generally accepted industry standards.
 3. Failure to detect defective work or materials shall in no way prevent later rejection if defective work or materials are discovered.

1.3 RELATED REQUIREMENTS

- A. Refer to individual technical specification sections for additional qualifications, inspections, tests, frequency and standards required.

1.4 DEFINITIONS

- A. Testing: Evaluation of systems, primarily requiring physical manipulation and analysis of materials, in accordance with approved standards.
- B. Inspection: Evaluation of systems, primarily requiring observation and judgment.

- C. Structural Tests and Special Inspections: Structural Tests and Special Inspection Services herein include items required by Chapter 17 of the International Building Code as adopted by the current Minnesota State Building Code, and other items which in the professional judgment of the Structural Engineer of Record, are critical to the integrity of the building structure.
- D. Conventional Testing and Inspections: Conventional Testing and Inspection Services herein describe those items not specially required by Code but may be considered essential to the proper performance of the building systems.
- E. Architect of Record: The prime consultant in charge of overall design and coordination of the Project.
- F. Structural Engineer of Record (SER): The Licensed Engineer in responsible charge of the structural design for the Project.
- G. Licensed Structural Engineer: A professional engineer with education and experience in the design of structures similar to this Project and licensed in Minnesota.
- H. Testing Agency (TA):
 - a. Testing Agency: Approved independent testing agency acceptable to the Owner, Architect, SER and as noted below:
 - b. Authorized to operate in the State of Minnesota and experienced with the requirements and testing methods specified in the Contract Documents.
 - c. Meeting applicable requirements of references stated in paragraph 1.4.
 - d. Calibrate testing equipment at reasonable intervals by devices of accuracy traceable to either the National Bureau of Standards, or to accepted values of natural physical constants.
- I. Special Inspector (SI): A properly qualified individual or firm performing special inspections.
- J. The categories of special inspector are:
 - 1. Special Inspector - Technical I, II and III: Usually an employee of a testing agency:
 - a. Technical I (Division 02) - Technician shall be under the direct supervision of a licensed civil/geotechnical engineer regularly engaged in this type of work. Work shall be performed in a qualified geotechnical/testing laboratory.
 - b. Technical I (Division 03)
 - 1) ACI Certified Concrete Field Testing Technician – Grade I.
 - 2) ACI Certified Concrete Strength Testing Technician.
 - 3) ACI Certified Concrete Laboratory Testing Technician – Grade 1.
 - 4) ACI Certified Concrete Construction Inspector-In-Training.
 - 5) Inspector shall be employed by a testing laboratory, experienced in the type of work being performed, and under the direct supervision of a licensed civil/structural engineer.
 - c. Technical I (Division 04) - Technician shall be under the direct supervision of a licensed civil/structural engineer regularly engaged in testing and inspection of this type of work. The licensed engineer shall review and approve all inspection reports.

- d. Technical I (Division 05) - Non-destructive Testing Technician SNT-TC-1A Level I, and/or AWS Certified Associate Weld Inspector (CAWI).
- e. Technical I (Division 07) - Shall be familiar with the interpretation and use of ASTM E 605, and have prior field experience in testing and inspection of spray-applied fireproofing. Shall be supervised by an engineer licensed to practice in the state of Minnesota.
- f. Technical II (Division 02) - Technician with a minimum of 2 years' experience, or a graduate engineer, and is an employee of a qualified and approved geotechnical/technical laboratory, under the direct supervision of a licensed civil/geotechnical engineer regularly engaged in this type of work.
- g. Technical II (Division 03)
 - 1) ACI Certified Concrete Laboratory Testing Technician - Grade II.
 - 2) ACI Certified Laboratory Aggregate Testing Technician.
 - 3) ACI Certified Concrete Construction Inspector.
 - 4) Inspector shall be employed by a testing laboratory, experienced in the type of work being performed, and under the direct supervision of a licensed civil/structural engineer.
- h. Technical II (Division 04) - Graduate civil/structural engineer, with experience in this type of work. Supervised by a licensed civil/structural engineer. The licensed engineer shall review and approve all inspection reports.
- i. Technical II (Division 05) - Non-destructive Testing Technician ASNT TC-1A Level II, (NDE Technician II), AWS/CAWI, with minimum 3 years' experience, or an AWS/CWI.
- j. Technical III (Division 02) - A civil/geotechnical engineer regularly engaged in this type of work with a minimum of 4 years' experience, licensed in the state of Minnesota, and is an employee of a qualified and approved geotechnical/testing laboratory. This licensed engineer shall review and approve all final field reports.
- k. Technical III (Division 03) - A civil/structural engineer regularly engaged in this type of work, with a minimum of 4 years' experience and licensed in the state of Minnesota and is an employee of a qualified and approved testing laboratory. The licensed engineer shall review and approve all reports.
- l. Technical III (Division 05) - ASNT Level III with a minimum of 10 years' experience or an AWS/CWI with a minimum of 10 years' experience.
- 2. Special Inspector - Structural I and II: Usually an employee of the Structural Engineer of Record.
 - a. Structural I (Division 03) - Graduate civil/structural engineer, or other personnel acceptable to the SER, with experience in the design of structural systems of this type. Inspections shall be performed under the direct supervision of a licensed civil/structural engineer.
 - b. Structural II (Division 03) - Civil/structural engineer regularly engaged in the design of structural systems of this type, licensed in the state of Minnesota. The licensed engineer shall review and approve all inspection reports.
- K. Building Official: The Officer or duly authorized representative charged with the administration and enforcement of the State Building Code.

1.5 REFERENCES

- A. ANSI/ASTM E329 – Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction.
- B. ASTM E543 – Standard Practice for Agencies Performing Non-destructive Testing.
- C. ASTM C1077 – Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation.
- D. ASTM C1093 – Standard Practice for the Accreditation of Testing Agencies for Unit Masonry.
- E. ANSI/ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
- F. Minnesota State Building Code.
- G. International Building Code.
- H. See technical specification sections for specific references.

1.6 RESPONSIBILITIES/AUTHORITY

- A. Structural Tests and Special Inspections:
 - 1. Special Inspector:
 - a. Attend all pre-installation meetings to review scope of structural tests and special inspections.
 - b. Test and/or inspect the work assigned for conformance with the building department approved plans, specifications, and applicable material and workmanship provisions of the code. Perform testing and inspection in a timely manner to avoid delay of work.
 - c. Bring nonconforming items to the immediate attention of the Contractor for correction, then, if uncorrected after a reasonable period of time, to the attention of the Structural Engineer of Record, the Building Official, and to the Architect.
 - d. Submit test and/or inspection reports to the Building Official, Contractor, the Structural Engineer of Record, and other designated persons in accordance with the Structural Testing and Special Inspection Schedule.
 - e. Submit a final signed report stating whether the work requiring special inspection was, to the best of the inspector's knowledge, in conformance with the approved plans, specifications and the applicable workmanship provisions of the code.
 - f. Sign the Structural Testing and Special Inspection Schedule in conjunction with other responsible parties prior to commencing construction.
 - 2. Architect:
 - a. Coordinate the flow of reports and related information to expedite resolution of construction issues.
 - b. Attend pertinent pre-installation meetings to review scope of structural testing and special inspection.

- c. Complete and sign the Structural Testing and Special Inspection Schedule in conjunction with other responsible parties prior to commencing construction. Provide a completed copy of the schedule to all signed parties including Building Official.
- 3. Structural Engineer of Record:
 - a. Identify items requiring structural testing and special inspection including special cases.
 - b. Define "type" of special inspector required for "description" of work indicated on the Structural Testing and Special Inspection Schedule.
 - c. Attend pertinent pre-installation meetings to review scope of structural testing and special inspection.
 - d. Complete and sign the Structural Testing and Special Inspection Schedule in conjunction with other responsible parties prior to commencing construction.
 - e. Review reports issued by all special inspectors.
 - f. If engaged as a special inspector, provide structural testing and special inspection services as noted in Article 1.6.A.1.
- 4. Testing Agency:
 - a. When engaged as a special inspector, provide structural testing and special inspection services as noted in Item 1.6.A.1.
 - b. Sign the Structural Testing and Special Inspection Schedule in conjunction with other responsible parties prior to commencing construction.
 - c. Attend pertinent pre-installation meetings to review scope of structural testing and special inspection.
- 5. Contractor:
 - a. Arrange and attend all pre-installation meetings to review scope of structural testing and special inspection. Include the Building Official, Owner, Architect, SER, Testing Agency and other parties concerned.
 - b. Post or make available the Structural Testing and Special Inspection Schedule within project site office. Provide timely notification to those parties designated on the schedule so they may properly prepare for and schedule their work.
 - c. Provide special inspector access to the approved plans and specifications at the project site.
 - d. Review all reports issued by special inspectors.
 - e. Retain at the project site all reports submitted by the special inspectors for review by the building official upon request.
 - f. Correct in a timely manner, deficiencies identified in inspection and/or testing reports.
 - g. Provide safe access to the work requiring inspection and/or testing.
 - h. Provide labor and facilities to provide access to the work and to obtain, handle and deliver samples, to facilitate testing and inspection and for storage and curing of test samples.
 - i. Sign the Structural Testing and Special Inspection Schedule in conjunction with other responsible parties prior to commencing construction.
 - j. Verification of conformance of work within specified tolerances is solely the responsibility of the Contractor.
- 6. Fabricator:
 - a. Submit a Certificate of Compliance to the Building Official, Special Inspector, and Structural Engineer of Record stating the work was performed in accordance with the Contract Documents.

- b. Sign the Structural Testing and Special Inspection Schedule in conjunction with other responsible parties prior to commencing construction.
- 7. Building Official:
 - a. Review all special inspector qualifications.
 - b. Review all fabricators who perform work in their shop, which requires special inspection.
 - c. Accept and sign completed Structural Testing and Special Inspection Schedule.
 - d. Review reports and recommendations submitted by special inspector.
 - e. Review the "final signed reports" submitted by special inspector. These documents must be accepted and approved by the building department prior to issuance of a Certificate of Occupancy.
 - f. Determine work, which, in the Building Officials opinion, involves unusual hazards or conditions.
- 8. Owner:
 - a. Provide and pay cost of structural testing and special inspection services.
 - b. Provide special inspector with Contract Documents and accepted shop drawings.
 - c. Provide special inspectors and testing agencies with full access to the site at all times.
 - d. Sign the Structural Testing and Special Inspection Schedule in conjunction with other responsible parties prior to commencing construction.

- B. Inspections by Building Official: provide timely notice for inspections performed by the building official, as required by IBC Chapter 17, the State Building Code, and local ordinance.

1.7 INSPECTION NOTICES

- A. Contractor: Provide minimum of 24 hours notice for all items requiring testing or inspection. Do not place items requiring testing and inspection services prior to or during placement until testing and inspection services are available. Do not enclose or obscure items requiring testing and inspection services after placement until testing and inspection services are performed.

1.8 REPORTS

- A. Testing agency and/or special inspectors shall submit a report in accordance with the Structural Testing and Special Inspection Schedule and shall conduct and interpret tests and inspections and state in each report whether; (1) test specimens and observations comply with Contract Documents, and specifically state any deviations, (2) record types and locations of defects found in work, (3) record work required and performed, to correct deficiencies.
- B. Submit reports for structural testing and special inspection, in timely manner to the Contractor, Building Official, SER, and Architect.
 - 1. Submit reports for ongoing work, to provide the information noted below:
 - a. Date issued.
 - b. Project title and number.
 - c. Firm name and address.
 - d. Name and signature of tester or inspector.

- e. Date and time of sampling.
 - f. Date of test or inspection.
 - g. Identification of product and specification section.
 - h. Location in project, including elevations, grid location and detail.
 - i. Type of test or inspections.
 - j. Results of tests or inspections and interpretation of same.
 - k. Observations regarding compliance with Contract Documents or deviations there from.
2. Submit final signed report stating that, to the best of the special inspector's knowledge, the work requiring testing and/or inspection conformed to the Contract Documents.

1.9 FREQUENCY OF TESTING AND INSPECTION

- A. For detailed requirements see individual technical specification sections, and Part 3 of this section.

1.10 PROTECTION AND REPAIR

- A. Upon completion of testing, sample-taking, or inspection, repair damaged work and restore substrates and finishes to eliminate deficiencies, including deficiencies in the visual qualities of exposed surfaces, as judged solely by the Architect/Engineer of Record. Protect work exposed by or for testing and/or inspection and protect repaired work. Repair and protection is the Contractor's responsibility, regardless of the assignment of responsibility for testing and/or inspection.

1.11 TESTS TO DEMONSTRATE QUALIFICATION

- A. If the Contractor proposes a product material, method, or other system that has not been pre-qualified, the Architect or SER may require applicable tests, to establish a basis for acceptance or rejection. These tests will be paid for by the Contractor.
- B. The Architect or SER reserves the right to require certification or other proof that the system proposed, is in compliance with any tests, criteria or standards called for. The certificate shall be signed by a representative of an independent testing agency.

PART 2 - PRODUCTS (NOT USED)

2.1

PART 3 - EXECUTION

3.1 SCOPE OF STRUCTURAL TESTS AND SPECIAL INSPECTIONS

- A. Refer to individual specification section articles for Quality Control testing and inspection items.

3.2 STRUCTURAL TESTS AND SPECIAL INSPECTIONS PROGRAM SUMMARY

- A. The parties involved shall complete and sign the Structural Testing and Special Inspection Schedule. The completed schedule is an element of the Contract Documents and after permit issuance, becomes part of the building department approved plans and specifications. The completed schedule shall include the following:
 - 1. Specific listing of items requiring inspection and testing.
 - 2. Associated specification section which defines applicable standards by which to judge conformance with approved plans and specifications in accordance with IBC Chapter 17 as adopted by the State Building Code. The specification section should also include the degree or basis of inspection and testing; i.e., intermittent/will-call or full-time/continuous.
 - 3. Frequency of reporting, i.e., intermittent, weekly, monthly, per floor, etc.
 - 4. Parties responsible for performing inspection and testing work.
 - 5. Required acknowledgments by each designated party.
- B. See attached "Structural Testing and Special Inspection Schedule".

END OF SECTION 01450

Structural Tests and Special Inspections Schedule

Project Name: _____
 Location: _____
 Permit No.: _____ (1)

STRUCTURAL TESTS AND SPECIAL INSPECTIONS				
Specification Reference (2)	Description (3)	Type of Inspector (4)	Report Frequency (5)	Assigned Firm (6)
03100	Concrete Formwork	Tech II	Periodic	
03200	Concrete Reinforcement Footings, Foundation Walls, and Columns	Tech II	Periodic	
03300	Cast-In-Place Concrete Material Sampling & Testing	Tech I	Daily	
03300	Cast-In-Place Concrete Concrete Mix Verification	Tech I	Daily	
03300	Cast-In-Place Concrete Concrete Placement	Tech I	Daily	
03300	Cast-In-Place Concrete Protection & Curing	Tech II	Daily	
03300	Cast-In-Place Concrete Embedded Items	Tech II	Periodic	
04200	Unit Masonry Material Testing	Tech II	Periodic	
04200	Unit Masonry Preparation & Placement	Tech II	Periodic	
04200	Unit Masonry Reinforcement	Struc I	Periodic	
04200	Unit Masonry Grouting	Tech II	Daily	
05120	Structural Steel High Strength Bolting	Tech II	Periodic	
05120	Structural Steel Welding	Tech I / Tech II	Periodic	
05120	Structural Steel Headed Shear Studs	Tech I	Periodic	
05120	Structural Steel Mechanical Fasteners	Tech I	Periodic	
05 20	Structural Steel General Configuration	Struc I	Periodic	
05310	Steel Roof Deck Welding	Tech II	Periodic	
02220	Earthwork	Tech II	Daily	

Notes: This schedule to be filled out and included in the project specification. Information unavailable at that time shall be filled out when applying for a building permit.

Permit No. to be provided by the Building Official.

Reference to specific technical scope section in program.

Use descriptions per IBC Chapter 17, as adopted by State Building Code.

Special Inspector – Technical, Special Inspector – Structural.

Weekly, monthly, per test/inspection, per floor, etc.

Firm contracted to perform services.

ACKNOWLEDGEMENTS

Each appropriate representative shall sign below:

Owner:	Firm:	Date:
Contractor:	Firm:	Date:
Architect:	Firm:	Date:
SER:	Firm:	Date:
SI-S:	Firm:	Date:
TA:	Firm:	Date:
SI-T:	Firm:	Date:
TA:	Firm:	Date:
SI-T:	Firm:	Date:
F:	Firm:	Date:
F:	Firm:	Date:

* The individual names of all prospective special inspectors and the work they intend to observe shall be identified. (Use reverse side of form, if more room is needed.).

LEGEND:

SER = Structural Engineer of Record

SI-S = Special Inspector – Structural

TA = Testing Agency

SI-T = Special Inspector – Technical

F = Fabricator.

Accepted for the Building Department By _____

Date. _____

**NEW PASSENGER TERMINAL
DULUTH INTERNATIONAL AIRPORT
DULUTH, MINNESOTA**

**SECTION 01500 - CONSTRUCTION
FACILITIES AND TEMPORARY
CONTROLS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this section.
- B. Temporary heaters and fuel for heating the enclosed building will be provided by the CM. Any other misc. temp. heat equipment, fuel and associated costs are by the corresponding Work Scope.
- C. Temporary electric service: The CM will contract the work to bring in one - 100 amp temporary power panel per level centrally located.

1.2 SUMMARY

- A. This section includes requirements for temporary services and facilities, including temporary utilities, support facilities, security and protection.
- B. Temporary utilities include, but are not limited to, the following:
 - 1. Water service and distribution.
 - 2. Temporary electric power and light.
 - 3. Temporary heat.
 - 4. Ventilation.
 - 5. Telephone service.
 - 6. Sanitary facilities, including drinking water.
 - 7. Storm and sanitary sewer.
- C. Temporary construction and support facilities include, but are not limited to, the following:
 - 1. Field offices and storage sheds.
 - 2. Temporary roads and paving.
 - 3. Dewatering facilities and drains.
 - 4. Temporary enclosures.
 - 5. Temporary project identification signs and bulletin boards.
 - 6. Waste disposal services.
 - 7. Rodent and pest control.
 - 8. Construction aids and miscellaneous services and facilities.
- D. Security and protection facilities include, but are not limited to, the following:
 - 1. Temporary fire protection.
 - 2. Barricades, warning signs, and lights.
 - 3. Sidewalk bridge or enclosure fence for the site.
 - 4. Environmental protection.

1.3 QUALITY ASSURANCE

- A. Regulations: Comply with industry standards and applicable laws and regulations of authorities having jurisdiction including, but not limited to, the following:
 - 1. Building Code requirements.
 - 2. Health and safety regulations.
 - 3. Utility company regulations.
 - 4. Police, Fire Department, and Rescue Squad rules.
 - 5. Environmental protection regulations.
- B. Inspections: Arrange for authorities having jurisdiction to inspect and test each temporary utility before use. Obtain required certifications and permits.

1.4 PROJECT CONDITIONS

- A. Conditions of Use: Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Relocate temporary services and facilities as the work progresses. Do not overload facilities or permit them to interfere with progress. Take necessary fire-prevention measures. Do not allow hazardous, dangerous, or unsanitary conditions, or public nuisances to develop or persist on-site.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Use qualified personnel for installation of temporary facilities. Locate facilities where they will serve the Project adequately and result in minimum interference with performance of the work. Relocate and modify facilities as required.
- B. Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY CONSTRUCTION AND SUPPORT FACILITIES INSTALLATION

- A. Locate field offices, storage sheds, and other temporary construction and support facilities for easy access.
 - 1. Maintain support facilities until near Substantial Completion. Remove prior to Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to the Owner.
- B. Contractor's Facilities: Provide a field office building and sheds adequate in size and accommodation for all Contractor's offices, supply and storage.
 - 1. Within the Contractor's facilities, provide enclosed space adequate for holding project meetings. Furnish with all required tables, chairs and utilities.
 - 2. The entire facilities, including furniture, will remain the property of the Contractor and shall be removed from the site after completion of the work.

CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

Bid Package 2C – Issue for Bid

- C. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities.
 - 1. Where heat is needed and the permanent building enclosure is not complete, provide temporary enclosures where there is no other provision for containment of heat or as required by conditions to allow continuation of scheduled construction activities. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.
 - 2. Protection and temporary closures shall be provided at all exterior openings in the building including doors, walls and roof to maintain the building weather and dust tight. All protection shall be substantial so that it will not be disturbed by wind and weather normal to the area and season.
 - 3. Openings in floors shall be protected and closures provided to prevent floor to floor transfer of dust, debris and conditioned air. Conform to fire and safety regulations of the authorities having jurisdiction.
- D. Project Identification and Temporary Signs: Furnish and install and maintain one project identification sign of the size, graphic design, style of lettering and construction as shown on the drawings or included at the end of this section.
 - 1. Finishes and painting materials shall be adequate to resist weathering and fading for the scheduled construction period.
 - 2. Location: Unless noted otherwise, erect on the site at a lighted location of high public visibility, adjacent to the main entrance to the site, as approved by the Architect.
 - 3. Informational Signs: Provide informational signs with painted lettering, or standard products. Size of signs and lettering shall be as required by regulatory agencies, or as appropriate to the usage. Colors as required by regulatory agencies, otherwise of uniform colors throughout the project. Erect at appropriate locations to provide the required information and at a height for optimum visibility.
 - 4. Materials: Structure and framing may be preservative-treated wood or steel, in sound condition and structurally adequate to the work and suitable specified finish. Paint is specified in Division 9.
 - 5. Maintenance: Maintain signs and supports in a neat, clean condition, and repair damages to structure, framing or sign as required.
 - 6. Relocate informational signs as required by progress of the work.
 - 7. Remove signs, framing, supports and foundations at project completion.
- E. No other signs or advertising of any kind shall be allowed on the job site, except as specifically approved by the Architect.

3.3 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Except for use of permanent fire protection as soon as available, do not change over from use of temporary security and protection facilities to permanent facilities until Substantial Completion, or longer, as requested by the Architect.
- B. Temporary Fire Protection: Until fire-protection needs are supplied by permanent facilities, install and maintain temporary fire-protection facilities of the types needed to protect against reasonably predictable and controllable fire losses. Comply with

NFPA 10 "Standard for Portable Fire Extinguishers" and NFPA 241 "Standard for Safeguarding Construction, Alterations, and Demolition Operations."

1. Locate fire extinguishers where convenient and effective for their intended purpose, but not less than one extinguisher on each floor at or near each usable stairwell.
 2. Store combustible materials in containers in fire-safe locations.
 3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire-protection facilities, stairways, and other access routes for fighting fires. Prohibit smoking in hazardous fire-exposure areas.
 4. Provide supervision of welding operations, combustion-type temporary heating units, and similar sources of fire ignition.
- C. Barricades, Warning Signs, and Lights: Comply with standards and code requirements for erection of structurally adequate barricades. Paint with appropriate colors, graphics, and warning signs to inform personnel and the public of the hazard being protected against. Where appropriate and needed, provide lighting, including flashing red or amber lights.
- D. Covered Walkway: Comply with regulations of authorities having jurisdiction as necessary if determined required by applicable codes erect a structurally adequate, protective covered walkway for passage of persons along the adjacent public street. Coordinate with entrance gates, other facilities, and obstructions.
1. Construct covered walkways using scaffold or shoring framing. Provide wood plank overhead decking, protective plywood enclosure walls, handrails, barricades, warning signs, lights, safe and well-drained walkways, and similar provisions for protection and safe passage. Extend the back wall beyond the structure to complete the enclosure fence. Paint and maintain in a manner acceptable to the Owner and the Architect.
- E. Security Enclosure and Lockup: Install substantial temporary enclosure of partially completed areas of construction. Provide locking entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.
- F. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations, and minimize the possibility that air, waterways, and subsoil might be contaminated or polluted or that other undesirable effects might result. Avoid use of tools and equipment that produce harmful noise. Restrict use of noise-making tools and equipment to hours that will minimize complaints from persons or firms near the site.

3.4 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. Limit availability of temporary facilities to essential and intended uses to minimize waste and abuse.
- B. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage by freezing temperatures and similar elements.
1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
 2. Protection: Prevent water-filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.

CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

Bid Package 2C – Issue for Bid

- C. Termination and Removal: Unless the Architect requests that it be maintained longer, remove each temporary facility when the need has ended, when replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with the temporary facility. Repair damaged work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
1. Materials and facilities that constitute temporary facilities are the Contractor's property. The Owner reserves the right to take possession of project identification signs.
 2. Remove temporary paving not intended for or acceptable for integration into permanent paving. Where the area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil in the area. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at the temporary entrances, as required by the governing authority.
 3. At Substantial Completion, clean and renovate permanent facilities used during the construction period including, but not limited to, the following:
 - a. Replace air filters and clean inside of ductwork and housings.
 - b. Replace significantly worn parts and parts subject to unusual operating conditions.
 - c. Replace lamps burned out or noticeably dimmed by hours of use.

END OF SECTION 01500

**NEW PASSENGER TERMINAL
DULUTH INTERNATIONAL TERMINAL
DULUTH, MINNESOTA**

**SECTION 01631 – PRODUCTS
AND SUBSTITUTIONS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this section.

1.2 SUMMARY

- A. This section includes administrative and procedural requirements for handling requests for substitutions made after award of the Contract.
- B. Related Sections: The following sections contain requirements that relate to this section:
 - 1. Division 1, Section 01421 "Standards and Definitions" specifies the applicability of industry standards to products specified.
 - 2. Division 1, Section 01300 "Submittals" specifies requirements for submitting the Contractor's Construction Schedule and the Submittal Schedule.

1.3 DEFINITIONS

- A. Definitions in this Article do not change or modify the meaning of other terms used in the Contract Documents.
 - 1. "Products" are items purchased for incorporation in the work, whether purchased for the Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - a. "Named Products" are items identified by the manufacturer's product name, including make or model number or other designation, shown or listed in the manufacturer's published product literature that is current as of the date of the Contract Documents.
 - 2. "Materials" are products substantially shaped, cut, worked, mixed, finished, refined or otherwise fabricated, processed, or installed to form a part of the work.
 - 3. "Equipment" is a product with operational parts, whether motorized or manually operated, that requires service connections, such as wiring or piping.
- B. Substitutions: Changes in products, materials, equipment, and methods of construction required by the Contract Documents proposed by the Contractor after award of the Contract are considered to be requests for substitutions. The following are not considered to be requests for substitutions:
 - 1. Substitutions requested by bidders during the bidding period, and accepted prior to award of Contract, are considered as included in the Contract Documents and are not subject to requirements specified in this section for substitutions.
 - 2. Revisions to the Contract Documents requested by the Owner or Architect.

3. Specified options of products and construction methods included in the Contract Documents.
4. The Contractor's determination of and compliance with governing regulations and orders issued by governing authorities.

1.4 SUBMITTALS

- A. Materials, products, equipment and systems are specified in the Contract Documents by manufacturer, trade name or distributor to establish a standard of the required criteria, including function, performance, dimension, appearance and quality to be met by any proposed substitution. Unless otherwise specified, application for substitutions will be considered by the Owner and the Architect after execution of the agreement. The burden of proof of merit of proposed substitute is upon the proposer. Substitute items shall not be incorporated in the work without prior written approval of the item by the Architect.
- B. Where an item is specified by one or more manufacturer's model number or specific item identification and "or approved equal" is included, only the item(s) that is specified by manufacturer's model number or specific identification is approved and any other item must be submitted for approval as a substitution.
- C. Where an item is specified by a referenced standard, the item must be submitted for approval same as a substitute.
- D. Submit three (3) copies of each request for substitution for consideration. Submit requests in the form and according to procedures required for change-order proposals.
- E. Identify the product or the fabrication or installation method to be replaced in each request. Include related Specification Section and drawing numbers.
- F. Provide complete documentation showing compliance with the requirements for substitutions, and the following information, as appropriate:
 1. Coordination information, including a list of changes or modifications needed to other parts of the work and to construction performed by the Owner and separate contractors that will be necessary to accommodate the proposed substitution.
 2. A detailed comparison of significant qualities of the proposed substitution with those of the work specified. Significant qualities may include elements such as performance, weight, size, durability, and visual effect.
 3. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 4. Samples, where applicable or requested.
 5. A statement indicating the substitution's effect on the Contractor's Construction Schedule compared to the schedule without approval of the substitution. Indicate the effect of the proposed substitution on overall Contract Time.
 6. Cost information, including a proposal of the net change, if any in the Contract Sum.
 7. The Contractor's certification that the proposed substitution conforms to or exceeds requirements in the Contract Documents in every respect and is appropriate for the applications indicated. Include the Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of the failure of the substitution to perform adequately.

- G. Architect's Action: If necessary, the Architect will request additional information or documentation for evaluation within one week of receipt of a request for substitution. The Architect will notify the Contractor of acceptance or rejection of the substitution within two (2) weeks of receipt of the request, or one week of receipt of additional information or documentation, whichever is later. Acceptance will be in the form of a change order. If a decision on use of a proposed substitute cannot be made or obtained within the time allocated, use the product specified.

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION

- A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, new at the time of installation.
1. Provide products complete with accessories, trim, finish, safety guards, and other devices and details needed for a complete installation and the intended use and effect.
 2. Standard Products: Where available, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 3. Compliance with Standards, Codes, and Regulations: Where Specifications only require compliance with an imposed code, standard, or regulation, select a product that complies with the standards, codes, or regulations specified.
 4. Visual Matching: Where Specifications require matching an established Sample, the Architect's decision will be final on whether a proposed product matches satisfactorily.
 - a. Where no product available within the specified category matches satisfactorily and complies with other specified requirements, comply with provisions of the Contract Documents concerning "substitutions" for selection of a matching product in another product category.
 5. Visual Selection: Where specified product requirements include the phrase "... as selected from manufacturer's standard colors, patterns, textures ..." or a similar phrase, select a product and manufacturer that complies with other specified requirements. The Architect will select the color, pattern, and texture from the product line selected.
- B. Nameplates: Except for required labels and operating data, do not attach or imprint manufacturers or producer's nameplates or trademarks on exposed surfaces of products that will be exposed to view in occupied spaces or on the exterior.
1. Labels: Locate required product labels and stamps on concealed surfaces or, where required for observation after installation, on accessible surfaces that are not conspicuous.
 2. Equipment Nameplates: Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate on an easily accessible surface that is inconspicuous in occupied spaces. The nameplate shall contain the following information and other essential operating data:
 - a. Name of product and manufacturer.
 - b. Model and serial number.
 - c. Capacity.

- d. Speed.
- e. Ratings.

2.2 SUBSTITUTIONS

- A. Conditions: The Architect will receive and consider the Contractor's request for substitution when one or more of the following conditions are satisfied, as determined by the Architect. If the following conditions are not satisfied, the Architect will return the requests without action except to record noncompliance with these requirements.
 - 1. The specified product or method of construction cannot be provided within the Contract Time. The Architect will not consider the request if the product or method cannot be provided as a result of failure to pursue the work promptly or coordinate activities properly.
 - 2. The request is directly related to an "or-equal" clause or similar language in the Contract Documents.
 - 3. The requested substitution offers the Owner a substantial advantage, in cost, time, energy conservation, or other considerations, after deducting offsetting responsibilities the Owner may be required to bear. The Owner's additional responsibilities may include additional compensation to the Architect for redesign and evaluation services, increased cost of other construction by the Owner or separate Contractors, and similar considerations.
 - 4. The specified product or method of construction cannot receive necessary approval by a governing authority, and the requested substitution can be approved.
 - 5. The specified product or method of construction cannot be provided in a manner that is compatible with other materials and where the Contractor certifies that the substitution will overcome the incompatibility.
 - 6. The specified product or method of construction cannot be coordinated with other materials and where the Contractor certifies that the proposed substitution can be coordinated.
 - 7. The specified product or method of construction cannot provide a warranty required by the Contract Documents and where the Contractor certifies that the proposed substitution provides the required warranty.
- B. The Contractor's submittal and the Architect's acceptance of shop drawings, product data, or samples for construction activities not complying with the Contract Documents do not constitute an acceptable or valid request for substitution, nor do they constitute approval.
- C. Whether or not the Architect and Owner accept a proposed substitution, the Contractor shall reimburse the Owner for the Architect's cost for the Architect and the Architect's consultants for evaluating any proposed substitute including changes required in the Contract Documents for the substitute.
- D. The Architect's decision of approval or disapproval of a proposed substitution shall be final.
- E. All costs that may be incurred associated with a substitution proposed by the Contractor shall be borne by the Contractor. This shall apply to all interfacing components recognized prior to or after approval of the substitution by the Architect.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01631

**NEW PASSENGER TERMINAL
DULUTH INTERNATIONAL AIRPORT
DULUTH, MINNESOTA**

**SECTION 01700 - CONTRACT
CLOSEOUT**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.1 SUMMARY

- A. This section includes administrative and procedural requirements for contract closeout including, but not limited to, the following:
 - 1. Inspection procedures.
 - 2. Project record document submittal.
 - 3. Operation and maintenance manual submittal.
 - 4. Submittal of warranties.
 - 5. Final cleaning.
- B. Closeout requirements for specific construction activities are included in the appropriate sections in Divisions 2 through 17.
- C. Definitions: Closeout is hereby defined to include general requirements near the end of Contract time, in preparation for final acceptance, final payment, normal termination of contract, occupancy by Owner and similar actions evidencing completion of the work. Specific requirements for individual units of work are specified in sections of Division 2 through 17. Special requirements for mechanical and electrical work are specified in Divisions 15 and 16 sections, respectively. Time of closeout is directly related to "Substantial Completion" and, therefore, may be either a single time period for entire work or a series of time periods for individual parts of the work which have been certified as substantially complete at different dates. That time variation (if any) shall be applicable to other provisions of this section, regardless of whether resulting from "phased completion" originally specified by the Contract Documents or subsequently agreed upon by Owner and Contractor.

1.2 SUBSTANTIAL COMPLETION

- A. Certificates of Substantial Completion: Certificates of Substantial Completion will be filled out with punch lists attached and shall define the areas of the work which are being accepted. Procedures required to call for inspections and to request certificates shall be as required in this section.
- B. Preliminary Procedures: Before requesting inspection for certification of Substantial Completion, for either the entire work or portions thereof, complete the following. List exceptions in the request.
 - 1. In the Application for Payment that coincides with, or first follows, the date Substantial Completion is claimed, show 100 percent completion for the portion of the work claimed as substantially complete.

- a. Include supporting documentation for completion as indicated in these Contract Documents and a statement showing an accounting of changes to the Contract Sum.
 - b. If 100 percent completion cannot be shown, include a list of incomplete items, the value of incomplete construction, and reasons the work is not complete.
 - 2. Advise the Owner of pending insurance changeover requirements.
 - 3. Submit specific warranties, workmanship bonds, maintenance agreements, final certifications, and similar documents.
 - 4. Obtain and submit releases enabling the Owner unrestricted use of the work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - 5. Deliver tools, spare parts, extra stock, and similar items.
 - 6. Make final changeover of permanent locks and transmit keys to the Owner. Advise the Owner's personnel of changeover in security provisions.
 - 7. Complete startup testing of systems and instruction of the Owner's operation and maintenance personnel. Discontinue or change over and remove temporary facilities and services from the site, along with mockups, construction tools, and similar elements.
 - 8. Complete final cleanup requirements, including touchup painting. Touch up and otherwise repair and restore marred, exposed finishes.
- C. Inspection Procedures: On receipt of a request for inspection, the Architect will either proceed with inspection or advise the Contractor of unfilled requirements. The Architect will prepare the Certificate of Substantial Completion following inspection or advise the Contractor of construction that must be completed or corrected before the certificate will be issued.
- 1. The Architect will repeat inspection when requested and assured that the work is substantially complete.
 - 2. Results of the completed inspection will form the basis of requirements for final acceptance.

1.3 FINAL ACCEPTANCE

- A. Preliminary Procedures: Before requesting final inspection for certification of final acceptance and final payment, complete the following. List exceptions in the request.
- 1. Submit the final payment request with releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.
 - 2. Submit an updated final statement, accounting for final additional changes to the Contract Sum.
 - 3. Submit a certified copy of the Architect's final inspection list of items to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance, endorsed and dated by the Architect.
 - 4. Submit final meter readings for utilities, a measured record of stored fuel, and similar data as of the date of Substantial Completion or when the Owner took possession of and assumed responsibility for corresponding elements of the work.
 - 5. Submit consent of surety to final payment.
 - 6. Submit a final liquidated damages settlement statement.
 - 7. Submit evidence of final, continuing insurance coverage complying with insurance requirements.

8. Submit record documents, final project photographs, property survey and similar final record information.
- B. Reinspection Procedure: The Architect will reinspect the work upon receipt of notice that the work, including inspection list items from earlier inspections, has been completed, except for items whose completion is delayed under circumstances acceptable to the Architect.
1. Upon completion of reinspection, the Architect will prepare a certificate of final acceptance. If the work is incomplete, the Architect will advise the Contractor of work that is incomplete or of obligations that have not been fulfilled but are required for final acceptance.
 2. If necessary, reinspection will be repeated. Contractor will promptly reimburse the Architect for all incurred costs.

1.4 RECORD DOCUMENT SUBMITTALS

- A. General: Do not use record documents for construction purposes. Protect record documents from deterioration and loss in a secure, fire-resistant location. Provide access to record documents for the Architect's reference during normal working hours.
- B. Record Drawings: Maintain a clean, undamaged set of blue or black line white-prints of Contract Drawings and Shop Drawings. Mark the set to show the actual installation where the installation varies substantially from the work as originally shown. Mark which drawing is most capable of showing conditions fully and accurately. Where Shop Drawings are used, record a cross-reference at the corresponding location on the Contract Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date.
1. Mark record sets with red erasable pencil. Use other colors to distinguish between variations in separate categories of the work.
 2. Mark new information that is important to the Owner but was not shown on Contract Drawings or Shop Drawings.
 3. Note related change-order numbers where applicable.
 4. Organize record drawing sheets into manageable sets. Bind sets with durable-paper cover sheets; print suitable titles, dates, and other identification on the cover of each set.
 5. Preparation of Transparencies: In preparation for certification of Substantial Completion on the last major portion of the work, review completed markup of record drawings with Architect. When authorized, proceed with preparation of a full set of corrected transparencies for Contract Drawings and shop drawings. Incorporate changes and additional information previously marked-up on print sets, by erasing and redrawing where applicable, and by adding details and notations where applicable; refer instances of uncertainty to Architect for determination. Identify and date each updated drawing.
 6. One set of transparencies of original Contract Drawings will be furnished by Architect to Contractor for use in recording changes and additional information. Other printing as required herein is Contractor's responsibility.
 7. Review of Transparencies: Prior to forwarding to Architect, submit corrected transparencies to Architect for review and acceptance. Architect will review each transparency for general scope of changes and information recorded thereon, and of the general quality of draftsmanship thereon (erasures and drafting). Transparencies will be returned to Contractor for organizing into a set and for final submittal.

8. Copies, Distribution: At the completion of the Work the Contractor shall forward one set of original marked-up transparencies to Architect for distribution to Owner. Organize transparencies into a set matching print sets, place set in a durable tube-type drawing container (with end caps), and mark end cap with suitable identification.
- C. Record Specifications: Maintain one complete copy of the Project Manual, including addenda. Include with the Project Manual one copy of other written construction documents, such as Change Orders and modifications issued in printed form during construction.
1. Mark these documents to show substantial variations in actual work performed in comparison with the text of the Specifications and modifications.
 2. Give particular attention to substitutions and selection of options and information on concealed construction that cannot otherwise be readily discerned later by direct observation.
 3. Note related record drawing information and Product Data.
 4. Upon completion of the work, submit record Specifications to the Architect for the Owner's records.
- D. Record Sample Submitted: Immediately prior to the date or dates of Substantial Completion, the Contractor shall meet with the Architect and the Owner's personnel at the site to determine which of the submitted samples that have been maintained during progress of the work are to be transmitted to the Owner for record purposes. Comply with the Owner's instructions regarding packaging, identification marking and delivery to the Owner's designated storage area. Dispose of other samples in a manner specified for disposal of surplus and waste materials, unless otherwise indicated by the Architect.
- E. Miscellaneous Record Submittals: Refer to other Specification Sections for requirements of miscellaneous record keeping and submittals in connection with actual performance of the work. Immediately prior to the date or dates of Substantial Completion, complete miscellaneous records and place in good order. Identify miscellaneous records properly and bind or file, ready for continued use and reference. Submit to the Architect for the Owner's records.
- F. Maintenance Manuals: Organize operation and maintenance data into suitable sets of manageable size. Bind properly indexed data in individual, heavy-duty, 2-inch, 3-ring, vinyl-covered binders, with pocket folders for folded sheet information. Mark appropriate identification on front and spine of each binder. Provide the Architect with two (2) copies of each manual. Include the following types of information:
1. Emergency instructions.
 2. Spare parts list.
 3. Copies of warranties.
 4. Wiring diagrams.
 5. Recommended "turn-around" cycles.
 6. Inspection procedures.
 7. Shop Drawings and Product Data.
 8. Fixture lamping schedule.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 CLOSEOUT PROCEDURES

- A. Operation and Maintenance Instructions: Arrange for each Installer of equipment that requires regular maintenance to meet with the Owner's personnel to provide instruction in proper operation and maintenance. Provide instruction by manufacturer's representatives if installers are not experienced in operation and maintenance procedures. Include a detailed review of the following items:
 - 1. Maintenance manuals.
 - 2. Record documents.
 - 3. Spare parts and materials.
 - 4. Tools.
 - 5. Lubricants.
 - 6. Fuels.
 - 7. Identification systems.
 - 8. Control sequences.
 - 9. Hazards.
 - 10. Cleaning.
 - 11. Warranties and bonds.
 - 12. Maintenance agreements and similar continuing commitments.
- B. As part of instruction for operating equipment, demonstrate the following procedures:
 - 1. Startup.
 - 2. Shutdown.
 - 3. Emergency operations.
 - 4. Noise and vibration adjustments.
 - 5. Safety procedures.
 - 6. Economy and efficiency adjustments.
 - 7. Effective energy utilization.

3.2 FINAL CLEANING

- A. General: The General Conditions require general cleaning during construction. Regular site cleaning is included in Division 1, Section 01500 - CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to the condition expected in a normal, commercial building cleaning and maintenance program. Comply with manufacturers' instructions.
 - 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion.
 - a. Remove labels that are not permanent labels.
 - b. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other substances that are noticeable vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials.
 - c. Clean exposed exterior and interior hard-surfaced finishes to a dust-free condition, free of stains, films, and similar foreign substances. Restore reflective surfaces to their original condition. Except as otherwise indicated, avoid disturbance of natural

- weathering of exterior surfaces. Leave concrete floors broom clean. Vacuum carpeted surfaces.
 - d. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication and other substances. Clean plumbing fixtures to a sanitary condition. Clean light fixtures and lamps.
 - e. Clean the site, including landscape development areas, of rubbish, litter, and other foreign substances. Sweep paved areas broom clean; remove stains, spills, and other foreign deposits. Rake grounds that are neither paved nor planted to a smooth, even-textured surface.
 - f. Remove debris and surface dust from limited access spaces including roofs, plenums, shafts, trenches, equipment vaults, man-holes, attics and similar spaces.
- C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid the Project of rodents, insects, and other pests. Submit report (letter) of compliance from exterminator.
- D. Removal of Protection: Remove temporary protection and facilities installed for protection of the work during construction, where applicable.
- E. Compliance: Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from the site and dispose of in a lawful manner.
- 1. Where extra materials of value remain after completion of associated work, they become the Owner's property. Dispose of these materials as directed by the Owner.

END OF SECTION 01700

**NEW PASSENGER TERMINAL
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DULUTH, MN**

SECTION 01710 - CLEANING UP

1. GENERAL

- A. The Contractors shall furnish all labor, materials, tools, equipment, and perform all work and services necessary for cleaning up required in conjunction with work performed, as shown on drawings and as specified, in accordance with provisions of the Contract Documents and completely coordinated with work of all other trades.
- B. Although such work is not specifically indicated, furnish and install all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation.
- C. This Section specifies administrative and procedural requirements for final cleaning at Substantial Completion.
 - 1) Special cleaning requirements for specific elements of the Work are included in appropriate Sections of Divisions 2 through 16.
 - 2) Multiple Prime Contracts: Except as otherwise indicated, each Prime Contractor is responsible for coordination of final cleaning where more than one Prime Contractor is involved in final cleaning a single area or piece of equipment.
 - 3) Environmental Requirements: Conduct cleaning and waste disposal operations in compliance with local laws and ordinances. Comply fully with federal and local environmental and anti-pollution regulations.
 - a. Do not dispose of volatile wastes such as mineral spirits, oil or paint thinner in storm or sanitary drains.
 - b. Burning or burying of debris, rubbish or other waste material on the premises will not be permitted.
 - 4) Related work specified elsewhere:
 - a. Section 01700 - Contract Closeout, include general project closeout requirements.
 - b. Section 01500 - Temporary Facilities, include general cleanup and waste removal requirements.

2. MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by the manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property, or that might damage finished surfaces.

3. DURING CONSTRUCTION

- A. Oversee cleaning and ensure that building and grounds are maintained free from accumulation of waste and rubbish.
 - 1) Special attention shall be given to cleaning up the site of debris, waste and rubbish. The Owner is extremely concerned over items left in the open that can be thrown through windows.
- B. Sprinkle dusty debris with water.
- C. At reasonable intervals, minimum once a week, clean up site and access and dispose of debris.
- D. Provide metal containers for collection of debris.
- E. Remove debris from site. Legally dispose of off Owner's site.
- F. Vacuum interior areas when ready for painting.
- G. Handle waste materials in a controlled manner. Do not drop or throw materials from heights.
- H. Schedule cleaning operations so that contaminants resulting from cleaning do not fall on wet painted surfaces.

END OF SECTION 01710

**NEW PASSENGER TERMINAL
DULUTH INTERNATIONAL AIRPORT
DULUTH, MINNESOTA**

**SECTION 01720 - PROJECT RECORD
DOCUMENTS**

1. GENERAL

- A. This section covers the furnishing of all labor, materials, tools, equipment, and performing all work and services to provide record documents as specified, in accordance with the provisions of the Contract Documents, and completely coordinated with work of all other trades.
- B. This Section specifies administrative and procedural requirements for Project Record Documents.
 - 1) Project Record Documents required include:
 - a. Marked-up copies of Contract Drawings.
 - b. Marked-up copies of Shop Drawings.
 - c. Newly prepared Drawings.
 - d. Marked-up copies of Specifications, addenda and Change Orders.
 - e. Marked-up Product Data submittals.
 - f. Record Samples.
 - g. Field records for variable and concealed conditions.
 - h. Record information on Work that is recorded only schematically.
 - 2) Maintenance of Documents and Samples: Store record documents and Samples in the field office apart from Contract Documents used for construction. Do not permit Project Record Documents to be used for construction purposes. Maintain record documents in good order, and in a clean, dry, legible condition. Make documents and Samples available at all times for inspection by the Architect.
- C. Related work specified elsewhere:
 - 1) Section 01700 - Contract Closeout, includes general project closeout requirements.
 - 2) Section 01300 - Submittals, includes general requirements for submittal of Project Record Documents.

2. RECORD DRAWINGS

- A. Mark-Up Procedure: During the construction period, maintain a set of blue- or black-line white-prints of Contract Drawings and Shop Drawings for Project Record Document purposes. Include the printed designation "PROJECT RECORD DRAWINGS" in a prominent location on each Drawing.
 - 1) Mark these Drawings to indicate the actual installation where the installation varies appreciably from the installation shown originally. Give particular attention to information on concealed elements which would be difficult to identify or measure and record later. Items required to be marked include but are not limited to:

- a. Dimensional changes to the Drawings.
 - b. Revisions to details shown on the Drawings.
 - c. Changes made by Change Order.
 - d. Details not on original Contract Drawings.
 - e. RFPs, SIs, PCOs.
- 2) Mark completely and accurately record prints of Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions. Where Shop Drawings are marked, show cross-reference on Contract Drawings location.
 - 3) Mark record sets with red erasable colored pencil; use other colors to distinguish between changes for different categories of the Work at the same location.
 - 4) Mark important additional information which was either shown schematically or omitted from original Drawings.
 - 5) Note construction change directive numbers, alternate numbers, Change Order numbers and similar identification.
 - 6) Responsibility for Mark-Up: Where feasible, the individual or entity who obtained record data, whether the individual or entity is the installer, subcontractor, or similar entity, is required to prepare the mark-up on record Drawings.
 - a. Accurately record information in an understandable Drawing technique.
 - b. Record data as soon as possible after it has been obtained. In the case of concealed installations, record and check the mark-up prior to concealment.
 - c. At time of Substantial Completion, submit three (3) copies of the record Drawings to Construction Manager for the Architect's approval. Upon Architect's approval, the Drawings will then become the Owner's records. Organize into sets, bind and label sets for Owner's continued use.

3. RECORD SPECIFICATIONS

- A. During the construction period, maintain one copy of the Project Specifications, including addenda and modifications issued, for Project Record Document purposes.
 - 1) Mark the Specifications to indicate the actual installation where the installation varies substantially from that indicated in Specifications and modifications issued. Note related Project Record Drawing information, where applicable. Give particular attention to substitutions, selection of product options, and information on concealed installations that would be difficult to identify or measure and record later.
 - a. In each Specification Section where products, materials or units of equipment are specified or scheduled, mark the copy with the proprietary name and model number of the product furnished.
 - 2) Upon completion of mark-up, submit record Specifications to the Construction Manager for Owner's records.

4. RECORD PRODUCT DATA

- A. During the construction period, maintain one copy of each Product Data submittal for Project Record Document purposes.
- 1) Mark Product Data to indicate the actual product installation where the installation varies substantially from that indicated in Product Data submitted. Include significant changes in the product delivered to the site, and changes in manufacturer's instructions and recommendations for installation.
 - 2) Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 - 3) Note related Change Orders and mark-up of record Drawings, where applicable.
 - 4) Upon completion of mark-up, submit a complete set of record Product Data to the Construction Manager for the Owner's records.
 - 5) Where record Product Data is required as part of maintenance manuals, submit marked-up Product Data as an insert in the manual, instead of submittal as record Product Data.
 - 6) Each prime Contractor is responsible for mark-up and submittal of record Product Data for its own Work.

5. MISCELLANEOUS RECORD SUBMITTALS

- A. Refer to other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Immediately prior to Substantial Completion, complete miscellaneous records and place in good order, properly identified and bound or filed, ready for use and reference. Submit to the Construction Manager for the Owner's records.
- 1) Categories of requirements resulting in miscellaneous records include, but are not limited to the following:
 - a. Field records on excavations and foundations.
 - b. Field records on underground construction and similar Work.
 - c. Survey showing locations and elevations of underground lines.
 - d. Invert elevations of drainage piping.
 - e. Surveys establishing building lines and levels.
 - f. Authorized measurements utilizing unit prices or allowances.
 - g. Records of plant treatment.
 - h. Ambient and substrate condition tests.
 - i. Certifications received in lieu of labels on bulk products.
 - j. Batch mixing and bulk delivery records.
 - k. Testing and qualification of tradesmen.
 - l. Documented qualification of installation firms.
 - m. Load and performance testing.
 - n. Inspections and certifications by governing authorities.
 - o. Leakage and water-penetration tests.

- p. Fire resistance and flame spread test results.
- q. Final inspection and correction procedures.

6. RECORDING

- A. Post changes and modifications to the Documents as they occur. Do not wait until the end of the Project.

END OF SECTION 01720

**NEW PASSENGER TERMINAL
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DULUTH, MINNESOTA**

**SECTION 01732 – SELECTIVE
DEMOLITION**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Demolition and removal of selected portions of building or structure.
 - 2. Demolition and removal of selected site elements.
 - 3. Salvage of existing items to be reused or recycled.
- B. Related Requirements:
 - 1. Division 1 Section 01010 "Summary of Work" for restrictions on the use of the premises, Owner-occupancy requirements, and phasing requirements.
 - 2. Division 2 Section 02221 "Building Demolition" for general demolition requirements and removal of below-grade structures.

1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or removed and reinstalled.
- B. Remove and Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner.
- C. Remove and Reinstall: Detach items from existing construction, prepare for reuse, and reinstall where indicated.
- D. Existing to Remain: Existing items of construction that are not to be permanently removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.4 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.
- B. Historic items and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.
 - 1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.5 PREINSTALLATION MEETINGS

- A. Pre-demolition Conference: Conduct conference at Project site.

1. Inspect and discuss condition of construction to be selectively demolished.
2. Review structural load limitations of existing structure.
3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review requirements of work performed by other trades that may rely on substrates exposed by selective demolition operations.
5. Review areas where existing construction is to remain and requires protection.
6. Review and finalize protection requirements.
7. Review procedures for noise control and dust control.
8. Review procedures for protection of adjacent buildings.
9. Review items to be salvaged and returned to Owner.

1.6 INFORMATIONAL SUBMITTALS

- A. Proposed Protection Measures: Submit report, including drawings, that indicates the measures proposed for protecting individuals and property for environmental protection, dust control and for noise control. Indicate proposed locations and construction of barriers.
- B. Schedule of Selective Demolition Activities: Indicate the following:
 1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's and other tenants' on-site operations are uninterrupted.
 2. Interruption of utility services. Indicate how long utility services will be interrupted.
 3. Coordination for shutoff, capping, and continuation of utility services.
 4. Use of elevator and stairs.
 5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
- C. Inventory: Submit a list of items to be removed and salvaged and deliver to Owner prior to start of demolition.
- D. Pre-demolition Photographs or Video: Submit before Work begins.
- E. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

1.7 CLOSEOUT SUBMITTALS

- A. Inventory: Submit a list of items that have been removed and salvaged.
- B. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.8 QUALITY ASSURANCE

- A. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

- B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- C. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

1.9 FIELD CONDITIONS

- A. Owner will occupy portions of building adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.
 - 1. Provide not less than seventy-two (72) hours notice of activities that will affect operations of adjacent occupied buildings.
 - 2. Maintain access to existing walkways, exits, and other facilities used by occupants of adjacent buildings.
 - a. Do not close or obstruct walkways, exits, or other facilities used by occupants of adjacent buildings without written permission from authorities having jurisdiction.
- B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
 - 1. Hazardous materials will be removed by Owner before start of the Work.
 - a. If suspected hazardous materials are encountered, do not disturb; immediately notify Owner. Hazardous materials will be removed by Owner under a separate contract.
- E. Storage or sale of removed items or materials on-site is not permitted.
- F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
 - 1. Maintain fire-protection facilities in service during selective demolition operations.

1.2 COORDINATION

- A. Arrange demolition schedule so as not to interfere with Owner's on-site operations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting selective demolition operations.
- B. Review record documents of existing construction provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in record documents.
- C. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- D. Inventory and record the condition of items to be removed and salvaged. Provide photographs or video of conditions that might be misconstrued as damage caused by salvage operations.
- E. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.
- F. Engage a professional engineer licensed in the State of Minnesota to perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.
 - 1. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.
 - a. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs and / or preconstruction video.
- G. Inventory and record the condition of items to be removed and salvaged. Provide photographs or video of conditions that might be misconstrued as damage caused by salvage operations.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services / Systems to Remain: Maintain Services / Systems indicated to remain and protect them against damage.
 - 1. Comply with requirements for existing Services / Systems interruptions specified in Division 1 Section "Summary".
- B. Existing Services / Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
 - 1. Owner will arrange to shut off indicated Services / Systems when requested by Contractor.
- 2. If Services / Systems are required to be removed, relocated, or abandoned, provide temporary Services / Systems that bypass area of selective demolition and that maintain continuity of Services / Systems to other parts of building.
- 3. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated to be removed.

1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
 2. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.
 3. Equipment to Be Removed: Disconnect and cap services and remove equipment.
 4. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
 5. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
 6. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
 7. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material.
- C. Refrigerant: Remove refrigerant from mechanical equipment to be selectively demolished according to 40 CFR 82 and regulations of authorities having jurisdiction.

3.3 PREPARATION

- A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
- B. Comply with requirements for access and protection specified in Division 1 Section "Temporary Facilities and Controls."
- C. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
- D. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
- E. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
- F. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
- G. Cover and protect furniture, furnishings, and equipment that have not been removed.
- H. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Division 1 Section "Temporary Facilities and Controls."
- I. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
 1. Strengthen or add new supports when required during progress of selective demolition.

3.4 SELECTIVE DEMOLITION, GENERAL

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
- B. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
- C. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
- D. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
- E. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
- F. Maintain adequate ventilation when using cutting torches.
- G. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
- H. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
- I. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
- J. Dispose of demolished items and materials promptly. Comply with requirements in Division 1 Section "Construction Waste Management."
- K. Removed and Salvaged Items:
 - 1. Clean salvaged items.
 - 2. Pack or crate items after cleaning. Identify contents of containers.
 - 3. Store items in a secure area until delivery to Owner.
 - 4. Transport items to Owner's storage area designated by Owner.
 - 5. Protect items from damage during transport and storage.
- L. Removed and Reinstalled Items:
 - 1. Clean and repair items to functional condition adequate for intended reuse.
 - 2. Pack or crate items after cleaning and repairing. Identify contents of containers.
 - 3. Protect items from damage during transport and storage.
 - 4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

- M. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and reinstalled in their original locations after selective demolition operations are complete.

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

- A. Concrete: Demolish in small sections. Using power-driven saw, cut concrete to a depth of at least 3/4 inch (19 mm) at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.
- B. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.
- C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.
- D. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings." Do not use methods requiring solvent-based adhesive strippers.
- E. Roofing: Remove existing roofing so that interior of building to remain remains weathertight.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.
 - 1. Do not allow demolished materials to accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 - 3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
 - 4. Comply with requirements specified in Division 1 Section "Construction Waste Management."
- B. Burning: Do not burn demolished materials.
- C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.7 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 01732

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DULUTH INTERNATIONAL AIRPORT
DULUTH, MINNESOTA**

SECTION 01740 – WARRANTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this section.

1.2 SUMMARY

- A. This section specifies general administrative and procedural requirements for warranties required by the Contract Documents, including manufacturer's standard warranties on products and special warranties.
 - 1. Refer to the General Conditions for terms of the Contractor's period for correction of the work and special warranty of workmanship and materials.
- B. The Contractor will provide a warranty on all project work (including that added by subsequent change order after execution of the construction contract) for a period of one (1) year following the formal declaration of Substantial Completion. This one (1) year warranty will be separate from and in no way affect other standard product / manufacturer or workmanship warranties that extend beyond this one (1) year period for goods and services provided to this project.
- C. Related Sections: The following sections contain requirements that relate to this section:
 - 1. Division 1, Section 01300 - SUBMITTALS specifies procedures for submitting warranties.
 - 2. Division 1, Section 01700 - CONTRACT CLOSEOUT specifies contract closeout procedures.
 - 3. Divisions 2 through 16 sections for specific requirements for warranties on products and installations specified to be warranted.
 - 4. Certifications and other commitments and agreements for continuing services to Owner are specified elsewhere in the Contract Documents.
- D. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the work that incorporates the products. Manufacturer's disclaimers and limitations on product warranties do not relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

1.3 WARRANTY REQUIREMENTS

- A. Related Damages and Losses: When correcting failed or damaged warranted construction, remove and replace other work that has been damaged as a result of such failure or must be removed and replaced to provide access for correction of warranted construction.
- B. Reinstatement of Warranty: When work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written

endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.

- C. Replacement Cost: Upon determination that work covered by a warranty has failed, replace or rebuild the work to an acceptable condition complying with requirements of the Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective work regardless of whether the Owner has benefited from use of the work through a portion of its anticipated useful service life.
- D. Owner's Recourse: Expressed warranties made to the Owner are in addition to implied warranties and shall not limit the duties, obligations, rights, and remedies otherwise available under the law. Expressed warranty periods shall not be interpreted as limitations on the time in which the Owner can enforce such other duties, obligations, rights, or remedies.
 - 1. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
- E. Where the Contract Documents require a special warranty, or similar commitment on the work or part of the work, the Owner reserves the right to refuse to accept the work, until the Contractor presents evidence that entities required to countersign such commitments are willing to do so.

1.4 SUBMITTALS

- A. Submit written warranties to the Architect prior to the date certified for Substantial Completion. If the Architect's Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the work, or a designated portion of the work, submit written warranties upon request of the Architect.
 - 1. When a designated portion of the work is completed and occupied or used by the Owner, by separate agreement with the Contractor during the construction period, submit properly executed warranties to the Architect within fifteen (15) days of completion of that designated portion of the work.
- B. When the Contract Documents require the Contractor, or the Contractor and a subcontractor, supplier or manufacturer to execute a special warranty, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Owner, through the Architect, for approval prior to final execution.
 - 1. Refer to Divisions 2 through 16 sections for specific content requirements and particular requirements for submitting special warranties.
- C. Form of Submittal: At Final Completion compile two (2) copies of each required warranty properly executed by the Contractor, or by the Contractor, subcontractor, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the table of contents of the Project Manual.
- D. Bind warranties and bonds in heavy-duty, commercial-quality, durable 3-ring, vinyl-covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
 - 1. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed

- description of the product or installation, including the name of the product, and the name, address, and telephone number of the Installer.
2. Identify each binder on the front and spine with the typed or printed title "WARRANTIES AND BONDS," Project title or name, and name of the Contractor.
 3. When warranted construction requires operation and maintenance manuals, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01740

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**SECTION 01742 - CONSTRUCTION
WASTE MANAGEMENT**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for the following:
 - 1. Salvaging non-hazardous demolition and construction waste
 - 2. Recycling non-hazardous demolition and construction waste
 - 3. Disposing of non-hazardous demolition and construction waste
- B. Related Sections include the following:
 - 1. Division 1 Section 01040 "Coordination" for coordination of responsibilities for waste management
 - 2. Division 1 Section 01361 "Sustainable Design Requirements"
 - 3. Division 1 Section 01500 "Temporary Facilities and Controls" for environmental-protection measures during construction
 - 4. Division 1 Section 02221 "Building Demolition" for disposition of waste resulting from demolition of buildings, structures, and site improvements.

1.3 DEFINITIONS

- A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, paint, or the like
- B. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- C. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations
- D. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction
- E. Diversion: Avoidance of demolition and construction waste sent to landfill or incineration. Diversion does not include using materials for landfill, alternate daily cover on landfills, or materials used as fuel in waste-to-energy processes
- F. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitability, corrosiveness, toxicity or reactivity

- G. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse
- H. Recycling: The process of sorting, cleansing, treating, and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.
- I. Salvage: Recovery of demolition or construction waste and subsequent reuse or sale in another facility
- J. Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work
- K. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste
- L. Toxic: Poisonous to humans either immediately or after a long period of exposure
- M. Trash: Any product or material unable to be reused, returned, recycled, or salvaged
- N. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.4 PERFORMANCE REQUIREMENTS

- A. The Owner has established that this Project shall generate the least amount of waste possible and that processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors shall be employed.
- B. Of the waste that is generated, as many of the waste materials as economically feasible shall be reused, salvaged, or recycled. Waste disposal in landfills or incinerators shall be minimized, thereby reducing disposal costs.
- C. Develop a construction waste management plan that results in end-of-Project rates for salvage / recycling of 95% (by weight) of construction and demolition waste.
- D. Salvage / Recycle Requirements: Salvage and recycle as much non-hazardous demolition and construction waste as possible, including the following materials:
 - 1. Demolition Waste:
 - a. Asphaltic concrete paving
 - b. Concrete
 - c. Concrete reinforcing steel
 - d. Brick
 - e. Concrete masonry units
 - f. Wood studs
 - g. Wood joists
 - h. Plywood and oriented strand board
 - i. Wood paneling
 - j. Wood trim
 - k. Structural and miscellaneous steel

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- l. Rough hardware
- m. Roofing
- n. Insulation
- o. Doors and frames
- p. Door hardware
- q. Windows
- r. Glazing
- s. Metal studs
- t. Gypsum board
- u. Acoustical tile and panels
- v. Carpet
- w. Carpet pad
- x. Demountable partitions
- y. Equipment
- z. Cabinets
- aa. Plumbing fixtures
- bb. Piping
- cc. Supports and hangers
- dd. Valves
- ee. Sprinklers
- ff. Mechanical equipment
- gg. Refrigerants
- hh. Electrical conduit
- ii. Copper wiring
- jj. Lighting fixtures
- kk. Lamps
- ll. Ballasts
- mm. Electrical devices
- nn. Switchgear and panelboards
- oo. Transformers
- 2. Construction Waste:
 - a. Masonry and CMU
 - b. All untreated wood, including lumber and finish materials
 - c. Wood sheet materials
 - d. Wood trim
 - e. Metals
 - f. Roofing
 - g. Insulation
 - h. Carpet and pad
 - i. Gypsum board
 - j. Unused (leftover) paint
 - k. Piping
 - l. Electrical conduit
 - m. Packaging: Regardless of salvage / recycle goal indicated above, salvage or recycle 100 percent of the following uncontaminated packaging materials:
 - 1) Paper
 - 2) Cardboard
 - 3) Boxes
 - 4) Plastic sheet and film
 - 5) Polystyrene packaging
 - 6) Wood crates
 - 7) Plastic pails

CONSTRUCTION WASTE MANAGEMENT

Bid Package 2C – Issue for Bid

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n. Beverage and packaged food containers

1.5 SUBMITTALS

- A. Construction Waste Management Plan (CWMP): It is the intent of this specification to maximize the diversion of demolition and construction waste from landfill disposal. Accordingly, not more than 30 days after receipt of Notice to Proceed and prior to the generation of any waste, prepare and submit a draft Construction Waste Management Plan in accordance with Section 01742 including, but not limited to, the following:
1. Procedures for Recycling / Reuse Program to divert a minimum of 95% (by weight) of construction and demolition waste from landfill disposal, including waste resulting from demolition of any existing building and site paving scheduled for demolition; any site paving is required to be ground on site and reused as granulated fill on site.
 2. Approval of the Contractor's CWMP shall not relieve the Contractor of responsibility for adequate and continuing control of pollutants and other environmental protection measures.
- B. Submit a 3-ring binder with calculations on end-of-project recycling rates, salvage rates, and landfill rates itemized by waste material, demonstrating that a minimum of 75% of construction wastes were recycled or salvaged and diverted from landfill. Include documentation of recovery rate (if commingled); waste hauling certificates or receipts, and a brief narrative explaining how and to where each waste type has been diverted.
- C. Construction Waste Management Plan: Submit four copies of plan within forty-five (45) days of date established for the Notice to Proceed.
- D. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit four (4) copies of report. Include separate reports for demolition and construction waste. Include the following information:
1. Material category
 2. Generation point of waste
 3. Total quantity of waste in tons
 4. Quantity of waste salvaged, both estimated and actual in tons
 5. Quantity of waste recycled, both estimated and actual in tons
 6. Total quantity of waste recovered (salvaged plus recycled) in tons
 7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste
 8. Include up-to-date records of donations, sales, recycling and landfill / incinerator manifests, weight tickets, hauling receipts, and invoices.
- E. Waste Reduction Calculations: Before request for Substantial Completion, submit four copies of calculated end-of-project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work. Complete a table similar to the example below.

Recycled / Salvaged / Diverted Materials	Hauler or Location	Quantity of Material (tons)

Total Construction Waste Diverted		
Landfilled Materials		
Total Construction Waste Landfilled		

Total Construction Waste		Total Construction Waste Diverted + Total Construction Waste Landfilled
Percentage of Construction Waste Diverted from Landfill		(Total Construction Waste Diverted / Total Construction Waste)*100

- F. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax-exempt.
- G. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax-exempt.
- H. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- I. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills (or transfer stations) and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

1.6 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with all applicable local ordinances and regulations.
- B. Waste Management Meetings: Conduct an initial conference at Project Site to comply with requirements in Division 1 Section "Project Management and Coordination." Contractor shall include discussions on construction waste management requirements in the preconstruction meeting. Contractor shall include discussions on construction waste management requirements in the regular job meetings conducted during the course of the Project; at these meetings, review methods and procedures related to waste management including, but not limited to, the following:
 - 1. Review and discuss waste management plan including responsibilities of the Waste Management Coordinator.

2. Review requirements for documenting quantities of each type of waste and its disposition.
3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
5. Review waste management requirements for each trade.

1.7 CONSTRUCTION WASTE MANAGEMENT PLAN

- A. General: Develop and implement a CWMP consisting of waste identification, waste reduction work plan, and cost/revenue analysis. Include separate sections in plan for demolition and construction waste. Indicate quantities by weight or volume, but use the same units of measure throughout the CWMP.
- B. Draft Construction Waste Management Plan: Within 30 days after receipt of Notice to Proceed, or prior to any waste removal, whichever occurs sooner, the Contractor shall submit to the Owner and Architect a Draft Waste Management Plan.
- C. Final Construction Waste Management Plan: Once the Owner has determined which of the recycling options addressed in the draft Waste Management Plan are acceptable, the Contractor shall submit, within 10 calendar days, a Final Waste Management Plan.
- D. Waste Identification: Indicate anticipated types and quantities of demolition, site-clearing, and construction waste generated by the Work. Include estimated quantities and assumptions for estimates.
- E. Landfill Options: Indicate the name of the landfill(s) and / or transfer station(s) and / or incinerator(s) where trash will be disposed of, the applicable landfill tipping fee(s), and the projected cost of disposing of all Project waste in the landfill(s).
- F. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, reused, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.
 1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
 2. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
 3. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
 4. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
 5. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
 6. Handling and Transportation Procedures: Describe method that will be used for separating recyclable waste, including sizes of containers, container labeling, and designated location on Project Site where materials separation will be located.

- G. Materials: The following list of required materials, at a minimum, must be included for salvaging / recycling:
1. Cardboard
 2. Clean dimensional wood
 3. Beverage and food containers
 4. Paper
 5. Concrete
 6. Concrete Masonry Units (CMUs)
 7. Asphalt: Include the approximate weight of the asphalt paving to be crushed and utilized as granulated fill from the existing paving as a component of waste material diverted from the landfill.
 8. Ferrous and non-ferrous metals (banding, stud trim, ductwork, piping, rebar, roofing, other trim, steel, iron, galvanized sheet steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze)
 9. Stretch and shrink wrap
 10. Gypsum wallboard
 11. Paint containers and other clean, empty plastic containers
- H. Meetings: Provide a description of the regular meetings to be held to address waste management.
- I. Materials Handling Procedures: Provide a description of the means by which any waste materials identified will be protected from contamination, and a description of the means to be employed in recycling the above materials consistent with requirements for acceptance by designated facilities.
- J. Transportation: Provide a description of the means of transportation of the recyclable materials (whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler and removed from the site) and destination of materials.

1.8 CONSTRUCTION WASTE MANAGEMENT RESOURCES

- A. General information contacts regarding construction and demolition waste:
1. EPA Construction and demolition (C&D) debris website:
<http://www.epa.gov/epaoswer/non-hw/debris-new/bytype.htm>
 2. Directory of Wood-Framed Building Deconstruction and Reused Building Materials Companies:
http://www.fpl.fs.fed.us/documnts/fplgtr/fpl_gtr150.pdf
 3. Additional resources to be developed by Contractor with assistance from Owner and Architect, as requested.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

- A. General: Implement waste management plan as approved by Architect and Owner. Provide handling, containers, storage, signage, transportation, and other

items as required to implement waste management plan during the entire duration of the Contract.

1. Comply with Division 1 Section "Temporary Facilities and Controls" for operation, termination, and removal requirements.
- B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan. Coordinator shall be present at the Project Site full-time for duration of Project.
- C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project Site.
1. Distribute waste management plan to everyone concerned within three days of submittal return.
 2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.
- D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
1. Designate and label specific areas on Project Site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
 2. Recycling and waste bin areas are to be kept neat, and clean, and clearly marked in order to avoid contamination of materials.
 3. Comply with Division 1 Section "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.
- E. Hazardous Wastes: Hazardous wastes shall be separated, stored, and disposed of according to local regulations and should not be included in Construction Waste Management Plan's calculations of waste.

3.2 SALVAGING DEMOLITION WASTE

- A. Salvaged Items for Reuse in the Work:
1. Clean salvaged items.
 2. Pack or crate items after cleaning. Identify contents of containers.
 3. Store items in a secure area until installation.
 4. Protect items from damage during transport and storage.
 5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.
- B. Salvaged Items for Owner's Use:
1. Clean salvaged items.
 2. Pack or crate items after cleaning. Identify contents of containers.
 3. Store items in a secure area until delivery to Owner.
 4. Transport items to Owner's storage area designated by Owner.
 5. Protect items from damage during transport and storage.
 6. Doors and Hardware: Brace open end of door frames. Except for removing door closers, leave door hardware attached to doors.

CONSTRUCTION WASTE MANAGEMENT

Bid Package 2C – Issue for Bid

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3.3 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

- A. General: Recycle paper and beverage containers used by on-site workers.
- B. Recycling Receivers and Processors: List below is provided for information only; available recycling receivers and processors include, but are not limited to, the following:
 - 1. List to be developed by Contractor.
- C. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Contractor.
- D. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project Site to the maximum extent practical.
 - 1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project Site. Include list of acceptable and unacceptable materials at each container and bin.
 - a. Inspect containers and bins for contamination and remove contaminated materials if found.
 - 2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 - 3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
 - 4. Store components off the ground and protect from the weather.
 - 5. Remove recyclable waste off Owner's property and transport to recycling receiver or processor.

3.4 RECYCLING DEMOLITION WASTE

- A. Asphaltic Concrete Paving: Break up and transport paving to asphalt-recycling facility or recycle on-site into new paving.
- B. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.
 - 1. Pulverize concrete to maximum 4-inch (100-mm) size.
 - 2. Crush concrete and screen to comply with requirements in Division 2 Section "Earthwork" for use as satisfactory soil for fill or subbase.
- C. Masonry: Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.
 - 1. Pulverize masonry to maximum 1-1/2-inch (38-mm) size.
 - a. Crush masonry and screen to comply with requirements in Division 2 Section "Earthwork" for use as general fill or subbase.
 - b. Crush masonry and screen to comply with requirements in Division 2 Section "Exterior Plants" for use as mineral mulch.
 - 2. Clean and stack undamaged, whole masonry units on wood pallets.
- D. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, and panel products for reuse and /

or recycling. Separate wood material treated with heavy metal preservatives for reuse or landfill disposal.

- E. Metals: Separate metals by type.
 - 1. Structural Steel: Stack members according to size, type of member, and length.
 - 2. Remove and dispose of bolts, nuts, washers, and other rough hardware.
- F. Asphalt Shingle Roofing: Separate organic and glass-fiber asphalt shingles and felts for recycling into asphalt paving or by other recycling entities.
- G. Gypsum Board: Stack large, clean pieces on wood pallets and store in a dry location for recycling off-site. Remove edge trim and sort with other metals. Remove and dispose of fasteners.
 - 1. Moisture-damaged gypsum board with evidence of significant mold growth shall be disposed of in accordance with New York City's "Guidelines on Assessment and Remediation of Fungi in Indoor Environments": <http://www.nyc.gov/html/doh/html/epi/moldrpt1.shtml>
- H. Acoustical Ceiling Panels and Tile: Stack large, clean pieces on wood pallets and store in a dry location.
 - 1. Separate suspension system, trim, and other metals from panels and tile and sort with other metals.
- I. Carpet and Pad: Roll large pieces tightly after removing debris, trash, adhesive, and tack strips.
 - 1. Store clean, dry carpet and pad in a closed container or trailer provided by a carpet recycler or manufacturer-related carpet reclamation agency.
- J. Equipment: Drain tanks, piping, and fixtures. Seal openings with caps or plugs. Protect equipment from exposure to weather.
- K. Plumbing Fixtures: Separate by type and size.
- L. Piping: Reduce piping to straight lengths and store by type and size. Separate supports, hangers, valves, sprinklers, and other components by type and size.
- M. Lighting Fixtures: Separate lamps by type and protect from breakage.
- N. Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panelboards, circuit breakers, and other devices by type.
- O. Conduit: Reduce conduit to straight lengths and store by type and size.

3.5 RECYCLING CONSTRUCTION WASTE

- A. Packaging:
 - 1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
 - 2. Polystyrene Packaging: Separate and bag materials.
 - 3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project Site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.

4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.
- B. Site-Clearing Wastes: Chip brush, branches, and trees on-site.
 1. Comply with requirements in Division 2 Section "Exterior Plants" for use of chipped organic waste as organic mulch.
- C. Wood Materials:
 1. Clean Cut-Offs of Lumber: Grind or chip into material appropriate for mulch or erosion control.
 2. Lumber Treated with Heavy-Metal Preservatives: Do not grind, chip, or incinerate; must be reused or landfilled.
- D. Gypsum Board: Stack large, clean pieces on wood pallets and store in a dry location for recycling and / or reuse on-site or off-site.
 1. Moisture-damaged gypsum board with evidence of significant mold growth shall be disposed of in accordance with New York City's "Guidelines on Assessment and Remediation of Fungi in Indoor Environments": <http://www.nyc.gov/html/doh/html/epi/moldrpt1.shtml>
 2. Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.
 - a. Comply with requirements in Division 2 Section "Exterior Plants" for use of clean ground gypsum board as inorganic soil amendment.
- E. Miscellaneous: Anything called out to be ground and used on site should utilize an on-site grinder.
 1. Grinder should be able to accommodate a variety of materials including masonry, asphalt shingles, wood, and drywall.

3.6 DISPOSAL OF WASTE

- A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project Site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
 1. Except as otherwise specified, do not allow waste materials that are to be disposed of to accumulate on site.
 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 3. Do not burn or bury waste materials on or off site. Appropriate on-site topical application of ground gypsum or wood, or use of site paving as granulated fill is considered reuse, not waste.

END OF SECTION 01742

**NEW PASSENGER TERMINAL
DULUTH INTERNATIONAL AIRPORT
DULUTH, MINNESOTA**

**SECTION 02220 - BUILDING
EARTHWORK**

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section

1.2 SUMMARY

- A. Provide building excavation, dewatering, fill, backfill and compaction specified and shown on the drawings. Included is preparation of subgrade for footings, slabs and pavement within the general building area.

1.3 SUBMITTALS

- A. Test Reports: The independent testing lab shall submit copies of the following reports to the Architect-Engineer and Owner:
 - 1. Report and certification of backfill and fill materials.
 - 2. Test reports on borrow material.
 - 3. Verification of each footing subgrade.
 - 4. Field density test reports.
 - 5. One optimum moisture-maximum density curve for each type of soil encountered.
 - 6. Other tests and material certificates, as required.

1.4 QUALITY ASSURANCE

- A. Codes and Standards: Comply with the provisions of the following codes, specifications and standards except as otherwise shown or specified:
 - 1. Governing Local Building Code.
 - 2. American Society for Testing and Materials (ASTM) C136 -- Standard Test for Sieve Analysis of Fine and Coarse Aggregates
 - 3. ASTM D 698 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³)
 - 4. ASTM D1556 Standard Test method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
 - 5. ASTM D 1557 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³)
 - 6. ASTM D 2487 – Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)
 - 7. ASTM D 2922 – Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
- B. Regulations: Perform excavation work in compliance with applicable requirements of governing authorities having jurisdiction.
- C. Inspection Testing Laboratory: The Owner shall employ and pay an independent geotechnical testing laboratory, acceptable to the Architect-Engineer, to perform

sampling and testing of soil materials proposed for use in the work, field observation and testing for quality control during earthwork operations. All testing and inspection shall be performed by an Inspector Type Technical II as indicated in Division 01 Structural Tests and Special Inspections.

1.5 PROJECT / SITE CONDITIONS

- A. Site Information: The data on subsurface conditions shall be as interpreted in the Project Geotechnical Report and the General Conditions. Additional test borings and other exploratory operations may be made at no cost to the Owner.
- B. Verify that survey bench marks and intended elevations for the Work are as indicated in the Contract Documents.
- C. Existing Utilities: Locate existing underground utilities in the areas of work. If utilities are to remain in place, provide adequate means of protecting during excavation operations.
 - 1. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult the utility owner immediately for directions. Cooperate with the Owner, the public and private utility companies in keeping their respective services and facilities in operation. Repair damaged utilities to the satisfaction of the utility Owner.
 - 2. Do not interrupt existing utilities serving facilities occupied and used by the Owner or others, except when permitted in writing by the Architect-Engineer and then only after acceptable temporary utility services have been provided.
 - 3. Demolish and completely remove from the site existing underground utilities indicated to be removed. Coordinate with local utility companies for shut-off of services if lines are active.
- D. Use of explosives is not permitted.
- E. Protection: Protect structures, utilities, sidewalks, pavements and other facilities from damages caused by settlement, lateral movement, undermining, washout and other hazards created by excavation operations.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. Non-Frost Susceptible (NFS) Engineered Fill: Gradation as defined in the Project Geotechnical Report.
- B. General Engineered Fill: Non-organic granular material as defined in the Project Geotechnical Report. Excavated on-site soils can also be used as engineered fill under conditions noted in the Project Geotechnical Report.
- C. Future Aircraft Pavement Backfill: As defined in the Contract Documents.

2.2 COMPACTION EQUIPMENT

- A. Vibratory Rollers: The vibratory drum roller shall have the following minimum requirements:
 - 1. Drum Roller: 36 to 48 inches in diameter.

2. Static at Drum Weight: 6,000 to 10,000 pounds.
 3. Approved compactors include Galion, Dynapac and Bros.
 4. Vibratory compaction shall be performed so as not to damage existing structures. Rollers shall not be used adjacent to the existing structures or within a distance which will have an adverse effect. When compacting within 15 feet of the existing structure, a lightweight walk-behind sled or roller compactor should be used. Use mechanical hand equipment or alternate compaction equipment as needed.
- B. Alternate Compaction Equipment: Steel wheeled or pneumatic-tired nonvibratory rollers capable of meeting the compaction requirements specified herein. Use for clayey fine sands and adjacent to existing structures.
- C. Mechanical Hand Equipment: Hand vibratory sleds, rollers and tampers shall be capable of meeting the compaction requirements specified herein. Total weight shall be on the order of 100 to 500 pounds.

2.3 SOURCE QUALITY CONTROL

- A. Testing: The independent testing laboratory shall perform the following:
1. Test soil materials proposed for use in the work and promptly submit test result reports.
 2. Provide one optimum moisture-maximum density curve for each type of soil encountered in subgrade and fills under building slabs and foundations and paved areas. Determine maximum densities in accordance with ASTM D1557.
 3. For backfill and fill materials, perform a mechanical analysis, AASHTO T88; plasticity index, AASHTO T90; and moisture-density curve, AASHTO T180 or ASTM D1557.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine the areas and conditions under which building excavation and fill is to be performed and do not proceed with the work prior to correcting unsatisfactory conditions.

3.2 CLEARING AND STRIPPING BUILDING AREAS

- A. Clear and strip the entire building area to at least 10 feet beyond perimeter to building footings and foundation, walks and slabs to remove existing vegetation, concrete and asphalt pavement layers and other obstructions to the work.
- B. Strip topsoil from areas within the building and slab areas and stockpile on the site for future use in site grading.

3.3 COMPACTION OF EXPOSED SOILS

- A. No compactive effort should be used on exposed soils.

3.4 EXCAVATION

- A. Excavation consists of the removal and disposal of materials encountered when establishing the required grade elevations for the site including footings, utilities and all other items indicated in the drawings and specifications.
- B. If any existing or former building foundations or any other unexpected subsurface conditions are encountered in the required excavation, notify the Architect-Engineer immediately.
- C. Earth excavation includes the removal and disposal of pavement and other obstructions visible on the ground surface, under-ground structures and utilities to be demolished and removed, material of any classification indicated in data on subsurface conditions, and other materials encountered that are not classified as unauthorized excavation.
- D. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or side dimensions –indicated in the Project Geotechnical Report. Unauthorized excavation, as well as remedial work shall be at the Contractor's expense. Backfill and compact unauthorized excavations as specified for authorized excavations of the same classification, unless otherwise directed by the Architect - Engineer.
- E. Additional Excavation:
 - 1. When excavation has reached required subgrade elevations, notify the independent testing laboratory which shall make an inspection of conditions.
 - 2. If unsuitable bearing materials are encountered at the required subgrade elevations, carry excavations deeper and replace the excavated material as directed by the Geotechnical Engineer.
 - 3. If an excavation extends below the bottom of footing elevation in suitable bearing material, a 1H:1V excavation oversize shall be required for every foot of new fill placed below the base of the footing. The contractor shall not receive additional compensation.
 - 4. Removal of unsuitable material in excess of one foot in depth and its replacement as directed will be paid on the basis of contract conditions relative to changes in the work.
- F. Stability of Excavations:
 - 1. Comply with local codes and ordinances and requirements of agencies having jurisdiction. Slope sides of excavations as necessary for stability and compliance. Shore and brace where sloping is not possible either because of space restrictions or stability of material excavated. Maintain sides and slopes of excavations in a safe condition until completion of backfilling. Refer to the Geotechnical Report for further excavation stability requirements.
 - 2. Shoring and Bracing: Provide shoring and bracing designed for and adequate to resist all imposed loads.
- G. Dewatering:
 - 1. Prevent surface water and subsurface or ground water from flowing into the excavations and flooding the project site and surrounding area.
 - 2. Do not allow water to accumulate in excavations. Remove water from excavations to prevent softening of foundation bottoms, undercutting footings and soil changes detrimental to the stability of subgrades and foundations. Provide and maintain pumps, well points, sumps, suction and discharge lines

- and other dewatering system components necessary to convey the water away from excavations.
3. Convey water removed from excavations and rainwater to collecting or run-off area. Establish and maintain temporary drainage ditches and other diversions outside the excavation limits for each structure. Do not use trench excavations for site utilities as temporary drainage ditches.
 4. Provide groundwater control as required to maintain groundwater levels at least 12 inches below the bottom of any excavation made during construction and at least 24 inches below the surface of any vibratory compaction operations.
- H. Material Storage:
1. Stockpile excavated materials classified as satisfactory soil material where directed, until required for backfill or fill. Place, grade and shape stockpiles for proper drainage.
 2. Locate and retail fill materials away from edges of excavations.
 3. Dispose of excess soil material and waste materials as herein specified.
- I. Excavation for Structures:
1. Conform to the elevations and dimensions shown on the drawings, within a tolerance of plus or minus 0.10 foot, and extending a sufficient distance from footings and foundations to permit placing and removal of concrete formwork, installation of services, other construction and for inspection.
 2. After excavating footings and foundations to approximate bearing elevations, perform final excavation in the presence of the Inspection and Testing Service Representative.
 - a. In excavating for final grading of footings and foundations, take care not to disturb the bottom of the excavation. Excavate by hand to final grade just before concrete reinforcement is placed. Trim bottoms to the required lines and grades to leave a solid base to receive concrete.
- J. Excavation for Trenches: Dig trenches to the uniform width required for the particular item to be installed, sufficiently wide to provide ample working room.
1. Excavate trenches to the depth indicated or required. Carry the depth of trenches for piping to establish the indicated flow lines and invert elevations. Beyond the building perimeter, keep bottoms of trenches sufficiently below finish grade to avoid freeze-ups.
 2. Grade bottom of trenches as indicated, notching under pipe bells to provide solid bearing for the entire body of the pipe.
 3. Backfill trenches with concrete where trench excavations pass within 18 inches of column or wall footings and which are carried below the bottom of such footings, or which pass under wall footings. Place concrete to the level of the bottom of adjacent footing. Concrete is specified in Division 3.
 4. Do not backfill trenches until tests and inspections have been made and backfilling authorized by the Architect-Engineer. Use care in backfilling to avoid damage or displacement of pipe systems.
- K. Closing Abandoned Underground Utilities: Fully grout any abandoned underground utilities not indicated to be removed.
- L. Cold Weather Protection: Protect excavation bottoms against freezing when the atmospheric temperature is less than 35 degrees F.

3.5 BACKFILL AND FILL

A. General:

1. In all excavations, use satisfactory excavated or borrow material that has been sampled, tested and approved by the soil testing agency.
2. Backfill excavations as promptly as the work permits, but not until completion of the following:
 - a. Completion of construction below finish grade including, where applicable, damproofing, waterproofing and perimeter insulation.
 - b. Inspection, testing, approval and recording locations of underground utilities.
 - c. Removal of concrete framework.
 - d. Removal of shoring and bracing, and backfilling of voids with satisfactory materials. Cut off temporary sheet piling driven below bottom of structures and remove in manner to prevent settlement of the structure or utilities, or leave in place if required.
 - e. Removal of trash and debris.
 - f. Permanent or temporary horizontal bracing is in place on horizontally supported walls.

B. Placement and Compaction:

1. Place backfill and fill materials in layers not more than 8 to 10 inches in loose depth for material compacted by vibratory compaction equipment and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
2. Before compaction, moisten or aerate each layer as necessary to provide the optimum moisture content of the soil material. Compact each layer to the required percentage of maximum dry density or relative dry for each area classification. Do not place backfill or fill material on surfaces that are muddy, frozen or contain frost or ice.
3. Place backfill and fill materials evenly adjacent to structures, to the required elevations. Take care to prevent wedging action of the backfill against structures by carrying the material uniformly around the structure to approximately the same elevation in each lift. Do not overcompact against retaining walls and structures. Provide temporary bracing for retaining walls which are backfilled prior to construction of any restraining slab or other element.

C. Backfill at Specific Locations:

1. Building footings shall bear directly on undisturbed native soils or lean-mix concrete over undisturbed native soil as defined by the Addendum to the Project Geotechnical Report dated January 29, 2010, and the Contract Documents. Determination of all footing bearing elevations shall be made in the field by a qualified geotechnical engineer.
2. Floor slabs shall bear on a 6 inch thick clean sand layer over engineered fill as defined in the Project Geotechnical Report.
3. Retaining Wall Backfill: Backfill within 6 horizontal feet of retaining walls shall consist of NFS sand fill with gradation as defined in the Project Geotechnical Report.

3.6 COMPACTION

- A. General: Control soil compaction during construction for compliance with the percentage of density specified.
- B. Percentage of Maximum Density Requirements: Compact soil to the following percentages of maximum dry density determined in accordance with ASTM D1557:
 - 1. Typical Floor Slab Supporting Areas: Prepare slab subgrade areas as defined in the Project Geotechnical Report. Compact each layer of engineered fill material to not less than 95 percent maximum dry density determined in accordance with ASTM D1557.2.
 - 2. Against Retaining Structures: Compact to not less than 95 percent maximum dry density determined in accordance with ASTM D1557.
 - 3. Lawn and Planting Areas: Compact top 6 inches of subgrade and each layer of backfill or fill material to 90 percent maximum dry density.
- C. Moisture Control:
 - 1. Where the subgrade or layer of soil material must be moisture conditioned before compaction uniformly apply water to the surface of subgrade, or layer of soil material, to prevent free water appearing on the surface during or subsequent to compaction operations.
 - 2. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.
 - 3. Soil material that has been removed because it is too wet to permit compaction may be stockpiled or spread and allowed to dry. Assist drying by discing, harrowing or pulverizing, until the moisture content is reduced to a satisfactory value.

3.7 FIELD QUALITY CONTROL

- A. Allow independent testing laboratory to inspect and approve subgrades and fill layers before further construction work is performed.
- B. The independent testing laboratory shall perform the following:
 - 1. Field density tests in accordance with ASTM D1556 (sand cone method) or ASTM D2922 (nuclear method).
 - 2. Footing Subgrade: For each strata of soil on which footings will be placed, conduct, at least one density test to verify the required design bearing capacities. Subsequent verification and approval of each footing subgrade may be based on a visual comparison of each subgrade with the related tested strata, when acceptable to the Architect-Engineer.
 - 3. Paved Areas and Building Slab Subgrade: Make at least one field density test of the subgrade and each lift of compacted fill for every 5,000 square feet of paved area or building slab, but in no case less than three tests at each level.
- C. If, in the opinion of the Architect-Engineer, based on testing service reports and inspection, the subgrade or fills which have been placed are below the specified density, provide additional compaction and testing at no additional expense.
 - 1. The results of density tests will be considered satisfactory when the average of any four consecutive test are each instance equal to or greater than the specified density, and if not more than one density test out of five has a value greater than two percent below the required density.

3.8 PROTECTION

- A. Protection of Graded Areas:
 - 1. Protect newly graded areas from traffic and erosion. Keep free of trash and debris.
 - 2. Repair and re-establish grades in settled, eroded and rutted areas to the specified tolerances.
- B. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify the surface, re-shape and compact to the required density prior to further construction. Use hand tamping for re-compaction over underground utilities and underfloor subdrains, if any.

3.9 DISPOSAL OF EXCESS AND WASTE MATERIAL

- A. Removal from Owner's Property: Remove all waste materials, including excavated material classified as unsatisfactory soil material, trash and debris, and legally dispose of it off the Owner's property.

3.10 TESTING AND INSPECTION

- A. General: Inspection and testing of soils shall conform to the requirements of Section 1704.7 of the International Building Code, 2006 Edition in addition to other requirements as stated herein.

END OF SECTION 02220

**NEW PASSENGER TERMINAL
DULUTH INTERNATIONAL AIRPORT
DULUTH, MINNESOTA**

**SECTION 02221 – BUILDING
DEMOLITION**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

- 1. Demolition and removal of buildings and site improvements.
 - 2. Removing below-grade construction.

- B. Related Sections:

- 1. Division 1 Section 01010 "Summary of Work" for use of the premises and phasing requirements.
 - 2. Division 1 Section 01732 "Selective Demolition" for partial demolition of buildings, structures, and site improvements.

1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged.
- B. Remove and Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner. Include fasteners or brackets needed for reattachment elsewhere.

1.4 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.
- B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.
 - 1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.5 INFORMATIONAL SUBMITTALS

- A. Proposed Protection Measures: Submit informational report, including Drawings, that indicates the measures proposed for protecting individuals and property. Indicate proposed locations and construction of barriers.

- B. Schedule of Building Demolition Activities: Indicate the following:
 - 1. Detailed sequence of demolition work, with starting and ending dates for each activity.
 - 2. Temporary interruption of utility services.
 - 3. Shutoff and capping or re-routing of utility services.
- C. Pre-demolition Photographs: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by demolition operations. Submit before the Work begins.
- D. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.6 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.
- C. Pre-demolition Conference: Conduct conference at Project site.
 - 1. Inspect and discuss condition of construction to be demolished.
 - 2. Review structural load limitations of existing structures.
 - 3. Review and finalize building demolition schedule and verify availability of demolition personnel, equipment, and facilities needed to make progress and avoid delays.
 - 4. Review and finalize protection requirements.
 - 5. Review procedures for noise control and dust control.
 - 6. Review procedures for protection of adjacent buildings.
 - 7. Review items to be salvaged and returned to Owner.

1.7 PROJECT CONDITIONS

- A. Buildings to be demolished will be vacated and their use discontinued before start of the Work.
- B. Buildings immediately adjacent to demolition area may be occupied. Conduct building demolition so operations of occupied buildings will not be disrupted.
 - 1. Provide not less than seventy-two (72) hours notice of activities that will affect operations of adjacent occupied buildings.
 - 2. Maintain access to existing walkways, exits, and other facilities used by occupants of adjacent buildings.
 - a. Do not close or obstruct walkways, exits, or other facilities used by occupants of adjacent buildings without written permission from authorities having jurisdiction.
- C. Owner assumes no responsibility for buildings and structures to be demolished.

1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
1. Hazardous materials will be removed by Owner before start of the Work.
 2. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.
- E. On-site storage or sale of removed items or materials is not permitted.

1.8 COORDINATION

- A. Arrange demolition schedule so as not to interfere with Owner's on-site operations.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting demolition operations.
- B. Review Project Record Documents of existing construction provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.
- C. Inventory and record the condition of items to be removed and salvaged. Provide photographs or video of conditions that might be misconstrued as damage caused by salvage operations.
- D. Engage a Professional Engineer licensed in the State of Minnesota to perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during building demolition operations.

3.2 PREPARATION

- A. Temporary Shoring: Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent unexpected movement or collapse of construction being demolished.
 1. Strengthen or add new supports when required during progress of demolition.

3.3 PROTECTION

- A. Existing Facilities: Protect adjacent walkways, loading docks, building entries, and other building facilities during demolition operations. Maintain exits from existing buildings.
- B. Existing Utilities: Maintain utility services to remain and protect from damage during demolition operations.
 - 1. Do not interrupt existing utilities serving adjacent occupied or operating facilities unless authorized in writing by Owner and authorities having jurisdiction.
 - 2. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and authorities having jurisdiction.
 - a. Provide at least seventy-two (72) hours notice to occupants of affected buildings if shutdown of service is required during changeover.
- C. Temporary Protection: Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction and as indicated. Comply with requirements in Division 1 Section 01500 "Construction Facilities and Temporary Controls."
 - 1. Protect adjacent buildings and facilities from damage due to demolition activities.
 - 2. Protect existing site improvements, appurtenances, and landscaping to remain.
 - 3. Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
 - 4. Provide protection to ensure safe passage of people around building demolition area and to and from occupied portions of adjacent buildings and structures.
 - 5. Protect walls, windows, roofs, and other adjacent exterior construction that are to remain and that are exposed to building demolition operations.
 - 6. Erect and maintain dustproof partitions and temporary enclosures to limit dust, noise, and dirt migration to occupied portions of adjacent buildings.
- D. Remove temporary barriers and protections where hazards no longer exist. Where open excavations or other hazardous conditions remain, leave temporary barriers and protections in place.

3.4 DEMOLITION, GENERAL

- A. General: Demolish buildings and site improvements as necessary to perform the scope of work included in this Bid Package. Use methods required to complete the Work within limitations of governing regulations and as follows:
 - 1. Do not use cutting torches until work area is cleared of flammable materials. Maintain portable fire-suppression devices during flame-cutting operations.
 - 2. Maintain fire watch during and for at least 2 hours after flame cutting operations.
 - 3. Maintain adequate ventilation when using cutting torches.
 - 4. Locate building demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

- B. Engineering Surveys: During demolition, perform surveys to detect hazards that may result from building demolition activities.
- C. Site Access and Temporary Controls: Conduct building demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - 1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
 - 2. Use water mist and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations. Do not use water when it may damage adjacent construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.
- D. Explosives: Use of explosives is not permitted.

3.5 DEMOLITION BY MECHANICAL MEANS

- A. Proceed with demolition of structural framing members systematically, in accordance with a sequence of operations reviewed by a Professional Engineer.
- B. Below-Grade Construction: Demolish foundation walls and other below-grade construction that are within footprint of new construction and extending 5 feet outside footprint indicated for new construction. Abandon below-grade construction outside this area.
 - 1. Remove all structural foundation remnants to a depth of a minimum of 6 feet below proposed finished grade.
 - 2. Remove of all mechanical ductwork and piping; all electrical conduit, cable tray and panel boxes; all doors and frames; and all windows and frames and any other non-structural elements from building basement and foundations left in-place below the minimum of 6-foot cut-off elevation prior to back filling. The removal of these items shall be verified by the Engineer prior to backfilling.
 - 3. A minimum 5-foot wide section of the basement floor slab (full thickness) shall be removed down the center of the building following the existing floor drains. The two elevator pits shall be removed. The top slabs of the three tunnels shall be removed. Remove pits remaining below concrete stair "silos" on the apron.

3.6 SITE RESTORATION

- A. Below-Grade Areas: Rough grade below-grade areas ready for further excavation or new construction.
- B. Site Grading: Uniformly rough grade area of demolished construction to a smooth surface, free from irregular surface changes. Provide a smooth transition between adjacent existing grades and new grades.

3.7 REPAIRS

- A. Promptly repair damage to adjacent buildings caused by demolition operations.

3.8 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove demolition waste materials from Project site and legally dispose of them in an EPA-approved landfill acceptable to authorities having jurisdiction. See Division 1 Section "Construction Waste Management" for recycling and disposal of demolition waste.
 - 1. Do not allow demolished materials to accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Do not burn demolished materials.

3.9 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by building demolition operations. Return adjacent areas to condition existing before building demolition operations began.
 - 1. Clean roadways of debris caused by debris transport.

END OF SECTION 02221

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**SECTION 02466 – DRILLED CONCRETE
PIERS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Dry-installed drilled piers.
- B. Related Sections:
 - 1. Division 01 Section "Project Record Documents."
 - 2. Division 01 Section "Construction Facilities and Temporary Controls."
 - 3. Division 03 Section "Cast-In-Place Concrete".
 - 4. Division 31 Section "Site Clearing" for preparation of subgrade for drilled-pier operations including removal of vegetation, topsoil, debris, obstructions, and deleterious materials from ground surface.

1.3 REFERENCES

- A. American Concrete Institute (ACI):
 - 1. ACI 301 – Specification for Structural Concrete.
 - 2. ACI 336.1 – Reference Specification for the Construction of Drilled Piers.
- B. American Society for Testing and Materials (ASTM).
- C. American Welding Society (AWS):
 - 1. AWS D1.4 - Structural Welding Code - Reinforcing Steel.
- D. Concrete Reinforcing Steel Institute (CRSI): Manual of Standard Practice.

1.4 UNIT PRICES

- A. Unit prices are included in Division 01 Section "Unit Prices."
- B. Drilled Piers: Actual net volume of drilled piers in place and approved. Actual length, shaft diameter, and bell diameter if applicable, may vary, to coincide with elevations where satisfactory bearing strata are encountered. These dimensions may also vary with actual bearing value of bearing strata determined by an independent testing and inspecting agency. Adjustments will be made on net variation of total quantities, based on design dimensions for shafts.
 - 1. Base bids on indicated number of drilled piers and, for each pier, the design length from top elevation to bottom of shaft, and the diameter of shaft.

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2. Unit prices include labor, materials, tools, equipment, and incidentals required for excavation, trimming, shoring, casings, dewatering, reinforcement, concrete fill, testing and inspecting, removal of boulders (rocks with a diameter greater than 12 inches), and all other items for complete drilled-pier installation.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
 1. Indicate amounts of mixing water to be withheld for later addition at Project site.
- C. Shop Drawings: For concrete reinforcement detailing fabricating, bending, supporting, and placing.
- D. Welding certificates, if applicable.
- E. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
 1. Aggregates.
- F. Field quality-control reports.
- G. Sustainable Design Submittals:
 1. LEED Credit: Product Data for Credit MR 4.1: For products having recycled content, documentation indicating weights, costs, and percentages by weight of postconsumer and preconsumer recycled content.
 - a. Include statement indicating material weights and costs for each product having recycled content.
 2. LEED Credit: Product Data for Credit MR 5.1: For products having Regional content (Extracted, and processed or manufactured within 500 miles of site), documentation indicating total weights, costs and percentages by weight of regional content.
 - a. Include statement indicating material weights, and costs for each product having regional content.
- H. Other Informational Submittals:
 1. Record drawings.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer that has specialized in drilled-pier work.
- B. Testing Agency Qualifications: Qualified according to ASTM C 1077, ASTM D 3740, and ASTM E 329 for testing indicated.
- C. Welding Qualifications: Qualify procedures and personnel according to the following:

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1. AWS D1.1, "Structural Welding Code - Steel."
 2. AWS D1.4, "Structural Welding Code - Reinforcing Steel."
- D. Drilled-Pier Standard: Comply with ACI 336.1 unless modified in this Section.
- E. Preinstallation Conference: Conduct conference at project site.
1. Review methods and procedures related to drilled piers including, but not limited to, the following:
 - a. Review geotechnical report.
 - b. Discuss existing utilities and subsurface conditions.
 - c. Review coordination with temporary controls and protections.

1.7 PROJECT CONDITIONS

- A. Existing Utilities: Locate existing underground utilities before excavating drilled piers. If utilities are to remain in place, provide protection from damage during drilled-pier operations.
1. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, adapt drilling procedure if necessary to prevent damage to utilities. Cooperate with Owner and utility companies in keeping services and facilities in operation without interruption. Repair damaged utilities to satisfaction of utility owner.
- B. Interruption of Existing Utilities: Do not interrupt any utility to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility according to requirements indicated:
1. Notify Construction Manager and Owner no fewer than three days in advance of proposed interruption of utility.
 2. Do not proceed with interruption of utility without Construction Manager's and Owner's written permission.
- C. Project-Site Information: A geotechnical report has been prepared for this Project and is available for information only. The opinions expressed in this report are those of geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by geotechnical engineer. Owner will not be responsible for interpretations or conclusions drawn from this data.
1. Make additional test borings and conduct other exploratory operations necessary for drilled piers.
 2. The geotechnical report is included elsewhere in the Project Manual.
- D. Survey Work: Engage a qualified land surveyor or professional engineer to perform surveys, layouts, and measurements for drilled piers. Before excavating, lay out each drilled pier to lines and levels required. Record actual measurements of each drilled pier's location, shaft diameter, bottom and top elevations, deviations from specified tolerances, and other specified data.
1. Record and maintain information pertinent to each drilled pier and cooperate with Owner's testing and inspecting agency to provide data for required reports.

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PART 2 - PRODUCTS

2.1 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.

2.2 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of same type, brand, and source, throughout Project:
 - 1. Portland Cement: ASTM C 150, Type I. Supplement with the following:
 - a. Fly Ash: ASTM C 618.
- B. Normal-Weight Aggregate: ASTM C 33, graded, 1-1/2 inch nominal maximum coarse-aggregate size. Provide aggregate from a single source
 - 1. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Water: ASTM C 94 and potable.
- D. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
 - 1. Water-Reducing Admixture: ASTM C 494, Type A.
 - 2. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.
 - 3. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494, Type G.
 - 4. Plasticizing and Retarding Admixture: ASTM C 1017, Type II.

2.3 STEEL CASINGS

- A. Steel Pipe Casings: ASTM A 283, Grade C, or ASTM A 36, carbon-steel plate, with joints full-penetration welded according to AWS D1.1.
- B. Liners: Comply with ACI 336.1.

2.4 CONCRETE MIXTURES

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement to 15%.
- C. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.
- D. Proportion normal-weight concrete mixture as follows:
 - 1. Compressive Strength (28 Days): 4000 psi.
 - 2. Maximum Water-Cementitious Materials Ratio: 0.50.

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3. Minimum Slump: Capable of maintaining the following slump until completion of placement:
 - a. 4 inches for dry, uncased, or permanent-cased drilling method.
 - b. 6 inches for temporary-casing drilling method.
 - c. 7 inches for slurry displacement method.
4. Air Content: Do not air entrain concrete.

2.5 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.6 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94, and furnish batch ticket information.
 1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, vibration, and other hazards created by drilled-pier operations.

3.2 EXCAVATION

- A. Unclassified Excavation: Excavate to bearing elevations regardless of character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions.
 1. Obstructions: Unclassified excavated materials may include removal of unanticipated boulders, concrete, masonry, or other subsurface obstructions. Payment for removing obstructions that cannot be removed by conventional augers fitted with soil or rock teeth, drilling buckets, or underreaming tools attached to drilling equipment of size, power, torque, and downthrust necessary for the Work will be according to Contract provisions for changes in the Work.
- B. Prevent surface water from entering excavated shafts. Conduct water to site drainage facilities.
- C. Excavate shafts for drilled piers to indicated elevations. Remove loose or disturbed material from bottom of excavation exposing undisturbed native soils or bedrock.
 1. Excavate bottom of drilled piers to level plane within 1:12 tolerance.
 2. Remove water from excavated shafts before concreting.
 3. Excavate rock sockets of dimensions indicated.
 4. Cut series of grooves about perimeter of shaft to height from bottom of shaft, vertical spacing, and dimensions indicated.

DRILLED CONCRETE PIERS

- D. Notify and allow testing and inspecting agency to test and inspect bottom of excavation. If unsuitable bearing stratum is encountered, make adjustments to drilled piers as determined by Architect.
 - 1. Do not excavate shafts deeper than elevations indicated unless approved by Architect.
 - 2. Payment for additional authorized excavation will be according to Contract provisions for changes in the Work.
- E. Excavate shafts for closely spaced drilled piers and for drilled piers occurring in fragile or sand strata only after adjacent drilled piers are filled with concrete and allowed to set.
- F. Temporary Casings: Install watertight steel casings of sufficient length and thickness to prevent water seepage into shaft; to withstand compressive, displacement, and withdrawal stresses; and to maintain stability of shaft walls.
 - 1. Remove temporary casings, maintained in plumb position, during concrete placement and before initial set of concrete.
- G. Tolerances: Construct drilled piers to remain within ACI 336.1 tolerances.
 - 1. If location or out-of-plumb tolerances are exceeded, provide corrective construction. Submit design and construction proposals to Architect for review before proceeding.

3.3 STEEL REINFORCEMENT

- A. Comply with recommendations in CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
- B. Clean reinforcement of loose rust and mill scale, earth, and other materials that reduce or destroy bond with concrete.
- C. Fabricate and install reinforcing cages symmetrically about axis of shafts in a single unit.
- D. Accurately position, support, and secure reinforcement against displacement during concreting. Maintain minimum cover over reinforcement.
- E. Use templates to set anchor bolts, leveling plates, and other accessories furnished in work of other Sections. Provide blocking and holding devices to maintain required position during final concrete placement.
- F. Protect exposed ends of extended reinforcement, dowels, or anchor bolts from mechanical damage and exposure to weather.

3.4 CONCRETE PLACEMENT

- A. Place concrete in continuous operation and without segregation immediately after inspection and approval of shaft by Owner's independent testing and inspecting agency.
 - 1. Construction joints are not allowed without written permission from the Architect.

DRILLED CONCRETE PIERS

- B. Dry Method: Place concrete to fall vertically down the center of drilled pier without striking sides of shaft or steel reinforcement.
 - 1. Where concrete cannot be directed down shaft without striking reinforcement, place concrete with chutes, tremies, or pumps.
 - 2. Vibrate top 60 inches of concrete.
- C. Coordinate withdrawal of temporary casings with concrete placement to maintain at least a 60-inch head of concrete above bottom of casing.
 - 1. Vibrate top 60 inches of concrete after withdrawal of temporary casing.
- D. Screed concrete at cutoff elevation level and apply scoured, rough finish. Where cutoff elevation is above the ground elevation, form top section above grade and extend shaft to required elevation.
- E. Protect concrete work, according to ACI 301, from frost, freezing, or low temperatures that could cause physical damage or reduced strength.
 - 1. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 - 2. Do not use calcium chloride, salt, or other mineral-containing antifreeze agents or chemical accelerators.
- F. If hot-weather conditions exist that would seriously impair quality and strength of concrete, place concrete according to ACI 301 to maintain delivered temperature of concrete at no more than 90 deg F.
 - 1. Place concrete immediately on delivery. Keep exposed concrete surfaces and formed shaft extensions moist by fog sprays, wet burlap, or other effective means for a minimum of seven days.

3.5 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
 - 1. Drilled piers.
 - 2. Excavation.
 - 3. Concrete.
 - 4. Steel reinforcement welding.
- B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- C. Drilled-Pier Tests and Inspections: For each drilled pier, before concrete placement.
 - 1. Soil Testing: Bottom elevations, bearing capacities, and lengths of drilled piers indicated have been estimated from available soil data. Actual drilled-pier lengths below existing adjacent ground surface and bearing capacities will be determined by testing and inspecting agency. Final evaluations and approval of data will be determined by Architect.
- D. Concrete Tests and Inspections: ASTM C 172 except modified for slump to comply with ASTM C 94.

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1. Slump: ASTM C 143; one test at point of placement for each compressive-strength test but no fewer than one test for each concrete load.
 2. Concrete Temperature: ASTM C 1064; 1 test hourly when air temperature is 40 deg F and below and 80 deg F and above, and 1 test for each set of compressive-strength specimens.
 3. Compression Test Specimens: ASTM C 31; one set of four standard cylinders for each compressive-strength test unless otherwise indicated. Mold and store cylinders for laboratory-cured test specimens unless field-cured test specimens are required.
 4. Compressive-Strength Tests: ASTM C 39; one set for each drilled pier but not more than one set for each truck load. One specimen will be tested at 7 days, 2 specimens will be tested at 28 days, and 1 specimen will be retained in reserve for later testing if required.
 5. If strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
 6. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
 7. Report test results in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. List Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests in reports of compressive-strength tests.
 8. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
 9. Additional Tests: Testing and inspecting agency will make additional tests of concrete if test results indicate that slump, compressive strengths, or other requirements have not been met, as directed by Architect.
 - a. Continuous coring of drilled piers may be required, at Contractor's expense, if temporary casings have not been withdrawn within specified time limits or if observations of placement operations indicate deficient concrete quality, presence of voids, segregation, or other possible defects.
 10. Perform additional testing and inspecting, at Contractor's expense, to determine compliance of replaced or additional work with specified requirements.
 11. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.
- E. An excavation, concrete, or a drilled pier will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports for each drilled pier as follows:
1. Actual top and bottom elevations.
 2. Actual drilled-pier diameter at top and bottom.
 3. Description of soil materials.
 4. Description, location, and dimensions of obstructions.
 5. Final top centerline location and deviations from requirements.

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6. Variation of shaft from plumb.
7. Shaft excavating method.
8. Design and tested bearing capacity of bottom.
9. Levelness of bottom and adequacy of cleanout.
10. Ground-water conditions and water-infiltration rate, depth, and pumping.
11. Description, purpose, length, wall thickness, diameter, tip, and top and bottom elevations of temporary casings. Include anchorage and sealing methods used and condition and weather tightness of splices if any.
12. Description of soil or water movement, sidewall stability, loss of ground, and means of control.
13. Date and time of starting and completing excavation.
14. Inspection report.
15. Condition of reinforcing steel and splices.
16. Position of reinforcing steel.
17. Concrete placing method, including elevation of consolidation and delays.
18. Elevation of concrete during removal of casings.
19. Locations of construction joints.
20. Concrete volume.
21. Concrete testing results.
22. Remarks, unusual conditions encountered, and deviations from requirements.

3.6 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it as directed by the Owner and/or Construction Manager.

END OF SECTION 02466

DRILLED CONCRETE PIERS

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**SECTION 02781 – SITE
FURNISHINGS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Benches.
 - 2. Trash Receptacles.
 - 3. Picnic Table.
- B. Related Sections:
 - 1. Division 2 Section 02783, "Concrete Unit Pavers".

1.3 DEFINITIONS

- A. Finish Grade: Elevation of finished surface.

1.4 ACTION SUBMITTALS

- A. Product Data: For each product indicated. Provide manufacturers literature.
- B. Samples: Samples: Submit two, illustrating color and type of material.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each product indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to project site in manufacturer's original packaging with labels intact and seals unbroken.

PART 2 - PRODUCTS

2.1 BENCH TYPE A

- A. Bench shall be as listed or approved equal.
 - 1. Manufacturer: Landscapeforms, Austin series, 6' aluminum extruded boards.
 - 2. Finish: Powder coated -Titanium color to match other site furnishings.
 - 3. Description: 22" x 18" x 72" backless, no arms, exterior use.
 - 4. Secure with surface mount.

2.2 BENCH TYPE B

- A. Bench shall be as listed or approved equal.
 - 1. Manufacturer: Landscapeforms, Austin series, 6' Ipe wood boards.
 - 2. Finish: Arms and base to be Powder coated -Titanium color to match other site furnishings, wood to be Ipe.
 - 3. Description: 22" x 18" x 72" backless, no arms, exterior use.
 - 4. Secure with surface mount.

2.3 TRASH RECEPTACLES

- A. Trash receptacle to be made of steel or approved equal.
 - 1. Manufacturer: LandscapeForm, Lakeside Series- Grass; top-opening .
www.landscapeforms.com.
 - 2. Finish: powder coated – Titanium to match other site furnishings.
 - 3. Surface mount, 30 gallon top opening, steel panel with plasma cut grass design pattern.

2.4 PICNIC TABLE

- A. Picnic table to be made of PolySite recycled plastic or approved equal.
 - 1. Manufacturer: LandscapeForm, ADA-Compliant, Gretchen style, exterior use. www.landscapeforms.com.
 - 2. Finish: Metal base powder coated – color Matte Black.
 - 3. Surface mount with glides.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Install on clean, level and clear of any debris base.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. All site furnishings shall be set level and well anchored to foundations.

3.8 CLEANING AND PROTECTION

- A. Clean all site amenities of dirt and grease, leave in usable condition.
- B. All site furnishings shall be protected from other construction operations as needed.

END OF SECTION 02781

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**SECTION 02783 – CONCRETE
UNIT PAVERS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes the following:
 - 1. Concrete Pavers.
 - 2. Joint Sand.
 - 3. Setting Bed Sand.
 - 4. Base Aggregate.
 - 5. Subbase Aggregate.
- B. Related Sections:
 - 1. Division 2 Section 02781, "Site Furnishings".
 - 2. Division 2 Section 02930, "Plants".

1.3 ACTION SUBMITTALS

- A. Concrete Pavers:
 - 1. Samples for verification: Three representative full-size samples of each paver type, thickness, color and finish that indicate the range of color variation and texture expected upon project completion.
 - 2. Accepted samples become the standard of acceptance for the product produced.
 - 3. Test results from an independent testing laboratory for compliance of concrete pavers with ASTM C 936.
 - 4. Manufacturer's catalog product data, installation instructions, and material safety data sheets for the safe handling of the specified materials and products.
- B. Joint and Setting Bed Sand:
 - 1. Provide two representative 1/4 pound samples in containers of Joint Sand materials.
 - 2. Provide two representative 1/4 pound samples in containers of Setting Bed Sand materials.
 - 3. Test results from an independent testing laboratory for sieve analysis per ASTM C 136 conforming to the grading requirements of ASTM C 144.
- C. Base and Subbase Aggregate:
 - 1. Test results from an independent testing laboratory for sieve analysis per ASTM C 136.
- D. Paving Installation Contractor:

1. Job references from a minimum of three projects similar in size and complexity. Provide Owner/Client/General Contractor names, postal address, phone, fax, and email address

1.4 QUALITY ASSURANCE

- A. Utilize a Manufacturer having at least ten years of experience manufacturing concrete pavers on projects of similar nature or project size.
- B. Source Limitations:
 1. Obtain Concrete Pavers from one source location with the resources to provide products of consistent quality in appearance and physical properties.
 2. Obtain Joint and Setting Bed Sands from one source with the resources to provide materials and products of consistent quality in appearance and physical properties.
- C. Paving Contractor Qualifications:
 1. Utilize an installer having successfully completed concrete paver installation similar in design, material, and extent indicated on this project.
 2. Utilize a Contractor conforming to all local, state/provincial licensing and bonding requirements.
- D. Mockups:
 1. Install a 3 ft x 3 ft paver area per each paving pattern.
 2. Use this area to determine surcharge of the Setting Bed Sand layer, joint sizes, lines, laying pattern(s) and levelness.
 3. This area will be used as the standard by which the work will be judged.
 4. Subject to acceptance by owner, mock-up may be retained as part of finished work.
 5. If mock-up is not retained, remove and properly dispose.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. In accordance with Conditions of the Contract and Division 1 Product Requirement Section.
- B. Manufacturer required to complete production of materials within 30 days after order has been placed to avoid construction delays.
- C. Deliver Concrete Pavers in manufacturer's original, unopened and undamaged container packaging with identification labels intact.
 1. Coordinate delivery and paving schedule to minimize interference with normal use of streets and sidewalks adjacent to paver installation.
 2. Deliver Concrete Pavers to the site in steel banded, plastic banded or plastic wrapped packaging capable of transfer by forklift or clamp lift.
 3. Unload Concrete Pavers at job site in such a manner that no damage occurs to the product or adjacent surfaces.
- D. Store and protect materials free from mud, dirt and other foreign materials.
- E. Prevent Joint and Setting Bed Sand from exposure to rainfall or removal by wind with secure, waterproof covering.

1.6 PROJECT/SITE CONDITIONS

- A. Environmental Requirements:
 - 1. Do not install concrete pavers on frozen or saturated Setting Bed Sand.
 - 2. Do not install pavers on frozen Base or Subbase Aggregate materials.
 - 3. Do not install Base or Subbase Aggregates over frozen subgrade.
 - 4. Do not install Setting Bed Sand or Concrete Pavers during heavy rain or snowfall.

1.7 CONCRETE PAVER OVERAGE AND ATTIC STOCK

- A. Provide a minimum of 5% additional material for overage to be used during construction.
- B. Contractor to provide 100 square feet of each product and size used to owner for maintenance and repair. Furnish Pavers from the same production run as installed materials.
- C. Manufacture to supply maintenance and reinstatement manuals for Concrete Paver units.

PART 2 - PRODUCTS

2.1 CONCRETE PAVERS

- A. Basis-of-Design Product: The Concrete Paver shapes are based on:
 - 1. Unilock: or as approved.
 - a. Il Campo, as manufactured by Unilock Chicago, 301 E. Sullivan Rd., Aurora, IL 60505. Contact: Brad Swanson – (630) 742-4168 or your local Territory Manager.
 - 2. The specified products establish minimum requirements that substitutions must meet to be considered acceptable.
 - a. To obtain acceptance of unspecified products, submit written requests at least 7 days before the Bid Date.
 - b. Requests received after this time will not be considered. Refer to Section 01631 – Products & Substitutions for requirements and procedures for requesting substitutions.
- B. Product requirements:
 - 1. Unilock- Il Campo or approved equal.
 - a. Color: Heritage Brown.
 - b. Finish: face mix finish.
 - c. Pattern: To be determined.
 - d. Size: Manufacture the sizes indicated with a maximum tolerance of plus or minus 1/16 in all directions.
 - e. Perimeter to be banded with contrasting color- see submitted detail.
- C. Provide pavers meeting the minimum material and physical properties set forth in ASTM C 936, Standard Specification for Interlocking Concrete Paving Units. Efflorescence is not a cause for rejection.
 - 1. Average compressive strength 8000 psi (55MPa) with no individual unit under 7,200 psi.
 - 2. Average absorption of 5% with no unit greater than 7% when tested according to ASTM C 140.
 - 3. Resistance to 50 freeze-thaw cycles, when tested according to ASTM C1645, with no breakage greater than 1.0% loss in dry weight of any

individual unit. Conduct this test method not more than 12 months prior to delivery of units.

Note: Efflorescence is a whitish powder-like deposit that sometimes appears on concrete products. Calcium hydroxide and other water-soluble materials form or are present during the hydration of Portland cement. Pore water becomes saturated with these materials, and diffuses to the surface of the concrete. When this water evaporates, the soluble materials remain as a whitish deposit on the concrete surface. The calcium hydroxide is converted to calcium carbonate during a reaction with carbon dioxide from the atmosphere. The calcium carbonate is difficult to remove with water. However, the efflorescence will wear off with time, and it is advisable to wait a few months before attempting to remove any efflorescence. Commercially available cleaners can be used, provided directions are carefully followed. Some cleaners contain acids that may alter the color of the pavers.

- D. Accept only pigments in concrete pavers conforming to ASTM C 979. ACI Report No. 212.3R provides guidance on the use of pigments.
- E. Maximum allowable breakage of product is 5%.

2.2 JOINT SAND

- A. Provide natural Joint Sand as follows:
 1. Washed, clean, non-plastic, free from deleterious or foreign matter, symmetrically shaped, natural or manufactured from crushed rock.
 2. Do not use limestone screenings, stone dust, or sand for the Joint Sand material that does not conform to the grading requirements of ASTM C 33.
 3. Utilize sands that are as hard as practically available where concrete pavers are subject to vehicular traffic.
 4. Gradation as shown in Table 1 below:

**TABLE 1 – JOINT SAND
GRADATION REQUIREMENTS FOR JOINT SAND**

ASTM C 144		
Sieve Size	Natural Sand Percent Passing	Manufactured Sand Percent Passing
No. 4 (4.75 mm)	100	100
No. 8 (2.36 mm)	95 to 100	95 to 100
No. 16 (1.18 mm)	70 to 100	70 to 100
No. 30 (0.600 mm)	40 to 75	40 to 75
No. 50 (0.300 mm)	10 to 30	20 to 40
No. 100 (0.150 mm)	2 to 15	10 to 25
No. 200 (0.075)	0 to 1	0 to 10

2.3 SETTING BED SAND

- A. Provide Setting Bed Sand as follows:

1. Washed, clean, non-plastic, free from deleterious or foreign matter, symmetrically shaped, natural or manufactured from crushed rock.
2. Do not use limestone screenings, stone dust, or sand material that does not conform to the grading requirements of ASTM C 33..
3. Do not use mason sand or sand conforming to ASTM C 144.
4. Utilize sands that are as hard as practically available where concrete pavers are subject to vehicular traffic.
5. Conform to the grading requirements of ASTM C 33 with modifications as shown in Table 2 below:

**TABLE 2 – SETTING BED SAND
GRADATION REQUIREMENTS FOR SETTING BED SAND**

ASTM C 33	
Sieve Size	Percent Passing
3/8 in (9.5 mm)	100
No. 4 (4.75 mm)	95 to 100
No. 8 (2.36 mm)	85 to 100
No. 16 (1.18 mm)	50 to 85
No. 30 (0.600 mm)	25 to 60
No. 50 (0.300 mm)	10 to 30
No. 100 (0.150 mm)	2 to 10
No. 200 (0.075)	0 to 1

Note: Coarser sand than that specified in Table 1 above may be used for joint sand including C 33 material as shown in Table 2. Use material where the largest sieve size easily enters the smallest joints. For example, if the smallest paver joints are 2 mm wide, use sand 2 mm and smaller in particle size. If C 33 sand is used for joint sand, extra effort may be required in sweeping material and compacting the pavers in order to completely fill the joints.

2.4 EDGE RESTRAINTS

- A. Plastic Edge Restraints:
 1. Manufacturer: Pave Tech.
 - a. Material Type: Plastic.
 - b. Model: Pave Edge Industrial or equal.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas indicated to receive paving for compliance with requirements for installation tolerances and other conditions affecting performance before placing the Concrete Pavers.
 1. Verify that subgrade preparation, compacted density and elevations conform to specified requirements.
 2. Verify that the Base and Subbase aggregate materials, thickness, compacted density, surface tolerances and elevations conform to specified requirements.

3. Provide written density test results for soil subgrade, Base and subbase Aggregate materials to the Owner, General Contractor and paver installation subcontractor.
 4. Verify location, type, and elevations of edge restraints, concrete curbing, concrete collars around utility structures, and drainage inlets.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
1. Beginning of Bedding Sand and Concrete Paver installation signifies acceptance of Base and edge restraints.

3.2 PREPARATION

- A. Beginning of Bedding Sand and Concrete Paver installation signifies acceptance of Base and edge restraints.
- B. Stockpile Setting Bed Sand, Joint Sand, Base aggregate materials such that they are free from standing water, uniformly graded, free of any organic material or sediment, debris, and ready for placement.
- C. Remove any excess thickness of soil applied over the excavated soil subgrade to trap sediment from adjacent construction activities before placing the aggregate materials.
- D. Keep area where pavement is to be constructed free from sediment during entire job. Remove and replace all Joint Sand, Setting Bed Sand, Base aggregate materials contaminated with sediment with clean materials.
- E. Complete all subdrainage of underground services within the pavement area in conjunction with subgrade preparation and before the commencement of Base aggregate construction.
- F. Do not damage underdrain pipes, overflow pipes, observation wells, or inlets and other drainage appurtenances during installation. Report all damage immediately.
- G. Compact soil subgrade uniformly to at least 95 percent of Standard Proctor Density per ASTM D 698 for pedestrian areas. Compact soil subgrade uniformly to at least 98 percent Modified Proctor per ASTM D 1557 for vehicular areas. Stabilization of the subgrade and/or base material may be necessary with weak or saturated subgrade soils.
- H. Backfill all service trenches within the pavement area to the sub-grade level with approved material placed in uniform lifts not exceeding 4 in. (100 mm) loose thickness. Compact each lift to at least 100 percent Standard Proctor Density as specified in ASTM D 698.
- I. Trim the subgrade to within 0 to ½ in. (0 to 13mm) of the specified grades. Do not deviate the surface of the prepared subgrade by more than 3/8 in. (10mm) from the bottom edge of a 39 in. (1m) straight edge laid in any direction.
- J. Do not proceed with further pavement construction, under any circumstances, until the subgrade has been inspected by the Architect/Engineer.

Note: Mechanical tampers (jumping jacks) are recommended for compaction of soil subgrade and aggregate base around lamp standards, utility structures, building edges,

curbs, tree wells and other protrusions. Compact areas, not accessible to roller compaction equipment, to the specified density with mechanical tampers.

CAUTION – *Proceed with care around the perimeters of excavations, buildings, curbs, etc. These areas are especially prone to consolidation and settlement. Do not place wedges of backfill in these areas. If possible particularly in these areas, proceed with backfilling and compacting in shallow lifts, parallel to the finished surface.*

3.3 INSTALLATION

A. Edge Restraints.

1. Provide plastic edge restraints as indicated.
 - a. Provide plastic edge restraints along the perimeter of all paving as indicated and supported on a minimum of 6 inches (150 mm) of Base Aggregate.
 - b. Provide 10" spiral galvanized steel spike to fasten plastic edge restraint at 24 inches on center for straight sections and 12 inches on center for curved sections.
 - c. Do not extend subbase into planting bed more than 12 inches

B. Base and Subbase Aggregate.

1. Provide the Subbase Aggregate in uniform lifts not exceeding 6 in., (150 mm) loose thickness and compact to at least 100 percent Standard Proctor Density as per ASTM D 698.
2. Compact the Subbase Aggregate material with at least two passes in the vibratory mode then at least two in the static mode with a minimum 10 ton vibratory roller until there is no visible movement. Do not crush aggregate with the roller.
3. Tolerance: Do not exceed the specified surface grade of the compacted Subbase Aggregate material more than $\pm 3/4$ in. (20 mm) over a 10 ft. (3 m) long straightedge laid in any direction.
4. Provide the Base Aggregate material in uniform lifts not exceeding 6 in. (150 mm) over the compacted Subbase Aggregate (or Subgrade) material and compact to at least 100 percent Standard Proctor Density as per ASTM D 698.
5. Compact the Base Aggregate material with at least two passes in the vibratory mode then at least two in the static mode with a minimum 10 ton vibratory roller until there is no visible movement. Do not crush aggregate with the roller.
6. Tolerance: Do not exceed the specified surface grade of the compacted Base Aggregate material more than $\pm 3/8$ in. (10 mm) over a 10 ft. (3 m) long straightedge laid in any direction.
7. Compact and grade the upper surface of the base sufficiently to prevent infiltration of the bedding sand into the base both during construction and throughout its service life. Blend segregated areas of the granular base by the application of crushed fines that have been watered and compacted into the surface.

C. Setting Bed Sand.

1. Provide and spread Setting Bed Sand evenly over the Base Aggregate course and screed to a nominal thickness of 1 in.
 - a. Do not disturb screened Setting Bed Sand.
 - b. Do not substantially exceed screed area which cannot be covered by pavers in one day.

- c. Do not use Setting Bed Sand material to fill depressions greater than 1/4 inch in the base surface.
 2. Keep moisture content constant and density loose and constant until Concrete Pavers are set and compacted.
 3. Screed the Setting Bed Sand using either an approved mechanical spreader (e.g.: an asphalt paver) or by the use of screed rails and boards.
 4. Carefully maintain spread Setting Bed Sand in a loose condition, and protected against incidental compaction, both prior to and following screening. Loosen any incidentally compacted sand or screened sand left overnight before further paving units are placed.
 5. Provide lightly screened Setting Bed Sand in a loose condition to the predetermined depth, only slightly ahead of the paving units.
 6. Fully protected screed Setting Bed Sand against incidental compaction, including compaction by rain. Remove any screened Setting Bed Sand that is incidentally compacted prior to laying of the paving units. Do not permit either pedestrian or vehicular traffic on the screened Setting Bed Sand.
 7. Inspect the Setting Bed Sand course prior to commencing the placement of the Concrete Pavers. Acceptance of the Setting Bed Sand occurs with the initiation of Concrete Paver placement.
- D. Concrete Pavers.
1. Do not use Concrete Pavers with chips, cracks, voids, discolorations, and other defects that might be visible in finished work.
 2. Mix Concrete Pavers from a minimum of three (3) bundles simultaneously drawing the paver vertically rather than horizontally, as they are placed, to produce uniform blend of colors and textures. (Color variation occurs with all concrete products. This phenomenon is influenced by a variety of factors, e.g. moisture content, curing conditions, different aggregates and, most commonly, from different production runs. By installing from a minimum of three (3) bundles simultaneously, variation in color is dispersed and blended throughout the project).
 3. Exercise care in handling face mix concrete pavers to prevent surfaces from contacting backs or edges of other units.
 4. Provide Concrete Pavers using laying pattern as indicated. Adjust laying pattern at pavement edges such that cutting of edge pavers is minimized. Cut all pavers exposed to vehicular tires no smaller than one-third of a whole paver.
 5. Use string lines or chalk lines on Setting Bed Sand to hold all pattern lines true.
 6. Place units hand tight against spacer bars. Adjust horizontal placement of laid pavers to align straight.
 - a. When installation is performed with mechanical equipment, use only unit pavers with spacer bars on sides of each unit.
 7. Provide space between paver units of 1/32 in. (1 mm) wide to achieve straight bond lines.
 8. Do not exceed joint (bond) lines more than $\pm 1/2$ in. (± 13 mm) over 50 ft. (15 m) from string lines.
 9. Fill gaps between units or at edges of the paved area that exceed 3/8 inch (10 mm) with pieces cut to fit from full-size unit pavers.
 10. Cut Concrete Pavers with motor-driven masonry saw equipment to provide clean, sharp, unchipped edges. Cut units to provide pattern indicated and to fit adjoining work neatly. Use full units without cutting where possible. Hammer cutting is not acceptable.

11. Do not allow traffic on installed Concrete Pavers until Joint Sand has been vibrated into joints. Keep skid steer and forklift equipment off newly laid Concrete Pavers that have not received initial compaction and Joint Sand material.
12. Vibrate Concrete Pavers into leveling course with a low-amplitude plate vibrator capable of a to 5000-lbf (22-kN) compaction force at 80 to 90 Hz. Perform at least three passes across paving with vibrator. Vibrate under the following conditions.
 - a. After edge pavers are installed and there is a completed surface or before surface is exposed to rain.
 - b. Compact installed Concrete Pavers to within 6 feet (2 meters) of the laying face before ending each day's work. Cover Concrete Pavers that have not been compacted and leveling course on which pavers have not been placed, with nonstaining plastic sheets to prevent Setting Bed Sand from becoming disturbed.
13. Protect face mix Concrete Paver surface from scuffing during compaction by utilizing a urethane pad.
14. Remove any cracked or structurally damaged Concrete Pavers and replace with new units prior to installing Joint Sand material.
15. Tolerances: Do not exceed 1/32-inch (0.8-mm) unit-to-unit offset from flush (lippage). Do not exceed 1/8 inch in 10 feet (3 mm in 3 m) from level, or indicated slope, for finished surface of paving.

3.4 FIELD QUALITY CONTROL

- A. Verify final elevations for conformance to the drawings after sweeping the surface clean.
 1. Do not deviate from final surface tolerance from grade elevations more than $\pm 3/8$ in. (± 10 mm) under a 10 ft (3 m) straightedge or indicated slope, for finished surface of paving.
- B. Set surface elevation of pavers 1/8 in. (3 mm) above adjacent drainage inlets, concrete collars or channels.
- C. Lippage: No greater than 1/8 in. (3 mm) difference in height between Concrete Pavers and adjacent paved surfaces.

3.5 REPAIRING, CLEANING AND SEALING

- A. Remove and replace unit pavers that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Provide new units to match adjoining units and install in same manner as original units, with same joint treatment and with no evidence of replacement.
- B. Cleaning: Remove excess dirt, debris, stains, grit, etc. from exposed paver surfaces; wash and scrub clean.
 1. Clean Concrete Pavers in accordance with the manufacturer's written recommendations.
- C. Seal as indicated.
 1. Apply Sealer for Concrete Pavers in accordance with the manufacturer's written recommendations.

3.6 PROTECTION

- A. Protect completed work from damage due to subsequent construction activity on the site.

END OF SECTION 02783

**NEW PASSENGER TERMINAL
DULUTH INTERNATIONAL AIRPORT
DULUTH, MINNESOTA**

**SECTION 02826 – STEEL
FENCING**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Steel fence.
- B. Related Sections:
 - 1. Division 2 Section 02930, "Plantings" for taconite screenings.

1.3 ACTION SUBMITTALS

- A. Product Data: For each product indicated. Provide manufacturers literature.
- B. Shop Drawings: Submit fencing layout and typical details.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each product indicated.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to project site in manufacturer's original packaging with labels intact and seals unbroken.
- B. Upon receipt at the job site, all materials shall be checked to ensure that no damage occurred during shipping or handling. Store to protect from weather, vandalism or theft.

PART 2 - PRODUCTS

2.1 FENCE

- A. Fence shall be as listed or approved equal.
 - 1. Montage II Welded Ornamental Steel Design, Majestic, 3-rail, flush top and bottom.
 - 2. Manufacturer: Ameristar Fence Products, Tulsa, OK.
 - 3. Color: Black.
 - 4. Adornments: Ball caps on post to match.
 - 5. Attached by concrete footing.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with landscape plans.
- C. Install fence components level and plumb and well anchored to foundations.

3.8 CLEANING AND PROTECTION

- A. Clean completely of dirt and grease.
- B. Protect from other construction operations as needed.

END OF SECTION 02826

**NEW PASSENGER TERMINAL
DULUTH INTERNATIONAL AIRPORT
DULUTH, MINNESOTA**

**SECTION 02920 – MEADOW
AND SOD**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Sodding
 - 2. Meadow
- B. Related Sections:
 - 1. Division 02, Section 02930 Plantings

1.3 DEFINITIONS

- A. Finish Grade: Elevation of finished surface of planting soil.
- B. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.
- C. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. It also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.
- D. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. These include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.
- E. Planting Soil: Standardized topsoil; existing, native surface topsoil; existing, in-place surface soil; imported topsoil; or manufactured topsoil that is modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.
- F. Sub grade: Surface or elevation of subsoil remaining after excavation is complete or top surface of a fill or backfill before planting soil is placed.
- G. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

- H. Forbs are herbaceous flowering plants that are not grasses, sedges or rushes found in nature in grasslands.
- I. Straight Glyphosate- Active ingredient in herbicide.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
 - 1. Pesticides and Herbicides: Include product label and manufacturer's application instructions specific to this Project.
- B. Sod: Certified Kentucky bluegrass type as specified below.
- C. Product Certificates: For soil amendments and fertilizers, from manufacturer.
- D. Material Test Reports: For existing native surface topsoil and imported or manufactured topsoil.
- E. Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of meadow during a calendar year. Submit before expiration of required initial maintenance periods.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified landscape Installer whose work has resulted in successful Meadow establishment.
 - 1. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
 - 2. Pesticide Applicator: State licensed, commercial.
- B. Soil-Testing Laboratory Qualifications: An independent laboratory or university laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.
- C. Soil Analysis: For each un-amended soil type, contractor shall furnish soil analysis and a written report by a qualified soil-testing laboratory stating percentages of organic matter, which must be above 3%; gradation of sand, silt, and clay content, clay content must be below 40%; cation exchange capacity; deleterious material; pH, which should be between 5.0 and 8.2; and mineral and plant-nutrient content of the soil.
 - 1. Report suitability of tested soil for meadow growth.
 - a. Based on the test results, state recommendations for soil treatments and soil amendments to be incorporated. State recommendations in weight per 1,000 sq. ft. or volume per cu. yd. for nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory planting soil suitable for healthy, viable plants.
 - b. Report presence of problem salts, minerals, or heavy metals, including aluminum, arsenic, barium, cadmium, chromium, cobalt,

lead, lithium, and vanadium. If such problem materials are present, provide additional recommendations for corrective action.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws, as applicable.
- B. All sod must be installed within 48 hours of delivery to site.
- C. Bulk Materials:
 - 1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
 - 2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
 - 3. Accompany each delivery of bulk fertilizers, lime, and soil amendments with appropriate certificates.

1.7 PROJECT CONDITIONS

- A. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with initial maintenance periods to provide required maintenance from date of Planting Completion.
 - 1. Meadow Fall Planting: Plant any time after October 15, taking into consideration weather limitations in March, April or May if site conditions prevent fall seeding. Fall planting is preferred.
- B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions.

1.8 MAINTENANCE SERVICE

- A. Initial Turf Maintenance Service: Provide full maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after each area is planted and continue until acceptable meadow is established but for not less than the following periods:
 - 1. Meadow: Two (2) years from date of Planting Completion. During the first growing season, mow all vegetation taller than 12-inches, mowed down to a 6-inch height.
 - 2. Second year mowing: When mowing to not leave chopped vegetation that can shade the indiagrass. This can be prevented using a frail type mower or mowing slowly with a rotary mower in small swaths. Be prepared to remove and vegetation that will shade the indiagrass.

3. In subsequent years (third and later growing seasons), annual removal of existing dead vegetation (duff) must be conducted each spring (not fall or winter), by one of two methods. Spring removal of existing duff may be done by mowing with a flail mower with removal of all vegetation or with a prescribed burn that is carried out by experienced individuals. They shall comply with all state and local fire and pollution laws and regulations. When possible prescribed burns are preferable and yield the best re-growth and control of weeds and brush.
4. Turf: One (1) year.

PART 2 - PRODUCTS

3.1 MEADOW SEED

- A. Seed Species: Plant area with Indiangrass, Sorghastrum nutans, at a rate of 15 lbs/acre, which is 1.5lbs/2000 sq ft.
2. Seed Species: Seed of the grass species shall be not less than 85 percent pure live seed, (PLS)

3.2 SOD

- A. Provide strongly rooted sod, not less than 2 years old and free of weeds and undesirable native grasses and machine cut to pad thickness of $\frac{3}{4}$ ", excluding top growth and thatch.
- B. Sod shall be a Sport turf mixture of at least 20% of these 4 varieties: Diva Kentucky Bluegrass, Ginney Kentucky Bluegrass, Mystere or Apollo Kentucky Bluegrass, and Princeton 105 Kentucky Bluegrass

3.3 FERTILIZER

- A. Slow-Release Fertilizer for sod area: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
 1. Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.
 2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

3.4 PLANTING SOILS

- A. Planting Soil: Existing, native surface topsoil formed under natural conditions with the duff layer retained during excavation process and stockpiled on-site. Verify suitability of native surface topsoil to produce viable planting soil. Clean soil of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful to plant growth.
 1. Additional Properties of Imported Topsoil or Manufactured Topsoil: Screened and free of stones 1 inch or larger in any dimension; free of

roots, plants, sod, clods, clay lumps, pockets of coarse sand, paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials harmful to plant growth; free of obnoxious weeds and invasive plants; not infested with nematodes, grubs, other pests, pest eggs, or other undesirable organisms and disease-causing plant pathogens; friable and with sufficient structure to give good tilth and aeration.

2. Mix imported topsoil or manufactured topsoil with soil amendments and fertilizers as necessary to produce planting soil:

3.5 MULCHES

- A. No mulching is necessary when seeding into killed vegetation.

3.6 PESTICIDES

- A. General: Pesticides, registered and approved by EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.
- B. Pre-Emergent Herbicide (Selective and Non-Selective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.
- C. Post-Emergent Herbicide (Selective and Non-Selective): Effective for controlling weed growth that has already germinated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to be planted for compliance with requirements and other conditions affecting performance.
 1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
 2. Do not mix or place soils and soil amendments in frozen, wet, or muddy conditions.
 3. Suspend soil spreading, grading, and tilling operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
 4. Uniformly moisten excessively dry soil that is not workable and which is too dusty.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations.

3.3 SOD AREA PREPARATION

- A. Limit turf sub grade preparation to areas to be planted.
- B. Newly Graded Sub grades: Loosen sub grade to a minimum depth of 4 inches. Remove stones larger than 1 inch in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
 - 1. Apply slow-release fertilizer directly to sub grade before loosening.
 - 2. Spread topsoil, apply soil amendments and fertilizer on surface, and thoroughly blend planting soil.
 - a. Delay mixing fertilizer with planting soil if planting will not proceed within a few days.
 - 3. Spread planting soil to a depth as shown on drawings to meet finish grades after light rolling and natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.
- C. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus ½ inch of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit finish grading to areas that can be planted in the immediate future.
- D. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.
- E. Before planting, obtain Engineer's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.4 SOD INSTALLATION

- A. Sod shall be placed between May 15th and June 30th or September 1st – November 15th, unless otherwise directed by landscape architect or engineer.
- B. Installation: Fit sod pieces tightly together so that no joint is visible, alternate courses staggered, and tamp firmly to eliminate all air pockets, provide a true and even surface and insure knitting without displacement of sod.
- C. Remove weeds before any sod installation. Where weeds are extensive, apply selective herbicides as required.
- D. Apply soil amendments and initial fertilizers required for establishing new turf and mix thoroughly into top 4 inches of existing soil. Install new planting soil to fill low spots and meet finish grades.
- E. Apply sod in location shown on drawings.
- F. Water newly planted areas and keep moist until sod is established.

3.5 MEADOW INSTALLATION

- A. Prepare site by killing all existing vegetation in delineated areas with application of glyphosate herbicide.
 - 1. Apply first application of glyphosate in designated areas beginning in early August. Repeat two weeks later and two weeks after that for a total of three (3) sprayings. Seed can be installed a minimum of two weeks after last spraying.
 - 2. Removal of existing vegetation: During the summer and fall before planting, kill any existing vegetation with applications of glyphosate-containing herbicide. Crucially, be prepared to spray such herbicide in September or October, following one or two summer sprays. No green vegetation shall be found on the site in October.
 - 3. DO NOT till areas to be seeded, LEAVE THE SOIL INTACT.
- B. Seeding shall be done only in favorable soil conditions.
 - 1. Seeding is to be done with a Truax, Tye, or equivalent prairie seed drill that is carefully set with proper depth bands, etc. to place grass NO DEEPER than .25 inches into the soil.

3.6 MEADOW MAINTENANCE

- A. Until time of final acceptance, all meadow seed areas shall be maintained by the contractor. This includes mowing, weeding and watering. If requested by designee, watering must be completed within 3 days of notification to the contractor.
 - 1. Second Growing Season,
 - a. a single low mowing is required before spring growth resumes. This mowing at 1- to 3-inches, should be done before May 1, before the prairie seedlings have begun to emerge. Remove all unchopped or smothering vegetation from site.
 - b. Beginning in July, conduct spot treatment with broadleaf herbicide of perennial weeds as needed.
 - 2. Subsequent Year Management: The only management measure typically required (except for invasion of weeds) will be an annual mowing or preferably a prescribed burn conducted annually in March or April by those experienced in prescribed fires in accordance with all fires control and pollution laws and regulations. mid spring. By the third year, the meadow will produce a massive amount of dead vegetation that must be removed before the previous year's growth can begin. A mowing before May with a flail mower is effective. Option: bail, then remove and sold if a local market is available as biomass. This bailing could be done late fall, winter or early spring.
 - a. Continued monitoring and spot treatments of perennial weeds is recommended 2 times a season.
 - b. Beginning late June the third growing season, the grasses will be mature enough for overspray applications of broadleaf-selective herbicides if needed.
- B. Watering:

1. SOD:
 - a. Install and maintain temporary hoses and turf-watering equipment to convey water from sources and to keep turf uniformly moist to a depth of 4 inches.
 - b. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
2. MEADOW:
 - a. Water meadow with fine sprays at a minimum rate of 1 inch per week unless rainfall precipitation is adequate May 15th thru August 31st.
 - b. No watering is needed unless in time of extreme drought, only during the first year.
- C. Invasive Weeds: With proper site preparation, planting, and subsequent management outlined above, undesirable weeds are unlikely to appear. But if they do, they should be dealt with when located. Species of concern, Canada thistle (*Cirsium arvense*), White and yellow sweet clover (*Melilotus* spp.) and teasels (*Dipsacus* spp.) If discovered growing in the still young prairie planting, any of these should be spot-sprayed with glyphosate, and if present, seed heads should be removed. Each year of maturity, invasion by alien weeds becomes less probable. Retain applicable subparagraphs below for mowing height. For seed mixtures, base selection on predominant species to be established.

3.7 SOD MAINTENANCE

- A. Maintain and establish sod by watering, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable lawn. Roll, regrade, and replant bare areas to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.
 1. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace materials and turf damaged or lost in areas of subsidence.
 2. Apply treatments as required to keep turf and soil free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards.
- B. Watering: Install and maintain temporary piping, hoses, and turf-watering equipment to convey water from sources and to keep turf uniformly moist to a depth of 4 inches.
 1. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
 2. Water turf with fine spray at a minimum rate of 1 inch per week unless rainfall precipitation is adequate.
- C. Mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than 1/3 of grass height. Remove no more than 1/3 of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when

grass is wet. Schedule initial and subsequent mowings to maintain the following grass height:

1. Mow grass to a height of 2 to 3 inches.

D. Turf Post fertilization: Apply fertilizer after initial mowing and when grass is dry.

1. Use fertilizer that will provide actual nitrogen of at least 1 lb/1000 sq. ft. to turf area.

3.8 SATISFACTORY MEADOW AND SOD

A. Turf installations shall meet the following criteria as determined by Engineer:

1. Satisfactory Seeded Turf: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. and bare spots not exceeding 5 by 5 inches.

B. Meadow will meet inspection by landscape architect or engineer for acceptance two years after installation to meet the following:

1. Meadow area will be relatively free from weeds, well established and in good healthy condition.
2. Upon written approval and acceptance of the Meadow the maintenance responsibility will be turned over to the city's maintenance department.
3. Contractor is responsible to provide a written report on condition of Meadow and maintenances requirements.

3.9 PESTICIDE APPLICATION

A. Apply pesticides and other chemical products and biological control agents in accordance with requirements of authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.

B. Post-Emergent Herbicides (Selective and Non-Selective): Apply only as necessary to treat already-germinated weeds and in accordance with manufacturer's written label recommendations.

3.10 CLEANUP AND PROTECTION

A. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after plantings are established.

END OF SECTION 02920

**NEW PASSENGER TERMINAL
DULUTH INTERNATIONAL AIRPORT
DULUTH, MINNESOTA**

SECTION 02930 – PLANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Plants.
 - 2. Planting soils.
 - 3. Tree stabilization.
 - 4. Planting bed Edging
 - 5. Taconite Screenings
- B. Related Sections:
 - 1. Division 02, Section 02920 "Meadow and Sod"

1.3 DEFINITIONS

- A. Backfill: The earth used to replace or the act of replacing earth in an excavation.
- B. Balled and Burlapped Stock: Plants dug with firm, natural balls of earth in which they were grown, with ball size not less than diameter and depth recommended by ANSI Z60.1 for type and size of plant required; wrapped with burlap, tied, rigidly supported, and drum laced with twine with the root flare visible at the surface of the ball as recommended by ANSI Z60.1.
- C. Container-Grown Stock: Healthy, vigorous, well-rooted plants grown in a container, with a well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for type and size of plant required.
- D. Duff Layer: The surface layer of native topsoil that is composed of mostly decayed leaves, twigs, and detritus.
- E. Finish Grade: Elevation of finished surface of planting soil.
- F. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.

- G. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. It also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.
- H. Pests: Living organisms that occur where they are not desired, or that cause damage to plants, animals, or people. These include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.
- I. Planting Soil: Standardized topsoil; existing, native surface topsoil; existing, in-place surface soil; imported topsoil; or manufactured topsoil that is modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.
- J. Plant; Plants; Plant Material: These terms refer to vegetation in general, including trees, shrubs, vines, ground covers, ornamental grasses, bulbs, corms, tubers, or herbaceous vegetation.
- K. Root Flare: Also called "trunk flare." The area at the base of the plant's stem or trunk where the stem or trunk broadens to form roots; the area of transition between the root system and the stem or trunk.

1.4 SUBMITTALS

- A. Shop Drawings: Submit shop drawings, for review and approval, showing tree and shrub planting details.
- B. First two paragraphs below are defined in Division 01 Section "Submittal Procedures" as "Action Submittals."
- C. Product Data: For each type of product indicated, including soils.
 - 1. Plant Materials: Include quantities, sizes, quality, and sources for plant materials.
 - 2. Pesticides and Herbicides: Include product label and manufacturer's application instructions specific to the Project.
- D. Qualification Data: For qualified landscape Installer. Include list of similar projects completed by Installer demonstrating Installer's capabilities and experience. Include project names, addresses, and year completed, and include names and addresses of owners' contact persons.
- E. Product Certificates: For each type of manufactured product, from manufacturer, and complying with the following:
 - 1. Manufacturer's certified analysis of standard products.
 - 2. Analysis of other materials by a recognized laboratory made according to methods established by the Association of Official Analytical Chemists, where applicable.
- F. Material Test Reports: For existing native surface topsoil and imported or manufactured topsoil.

- G. Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of plants during a calendar year. Submit before start of required maintenance periods.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified landscape Installer whose work has resulted in successful Meadow establishment.
 - 1. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
 - 2. Pesticide Applicator: State licensed, commercial.
- B. Soil-Testing Laboratory Qualifications: An independent laboratory or university laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.
- C. Soil Analysis: For each un-amended soil type, contractor shall furnish soil analysis and a written report by a qualified soil-testing laboratory stating percentages of organic matter, which must be above 3%; gradation of sand, silt, and clay content, clay content must be below 40%; cation exchange capacity; deleterious material; pH, which should be between 5.0 and 8.2; and mineral and plant-nutrient content of the soil.
 - 1. Report suitability of tested soil for meadow growth.
 - a. Based on the test results, state recommendations for soil treatments and soil amendments to be incorporated. State recommendations in weight per 1,000 sq. ft. or volume per cu. yd. for nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory planting soil suitable for healthy, viable plants.
 - b. Report presence of problem salts, minerals, or heavy metals, including aluminum, arsenic, barium, cadmium, chromium, cobalt, lead, lithium, and vanadium. If such problem materials are present, provide additional recommendations for corrective action.
- D. Provide quality, size, genus, species, and variety of plants indicated, complying with applicable requirements in ANSI Z60.1, "American Standard for Nursery Stock".
- E. Measurements: Measure according to ANSI Z60.1. Do not prune to obtain required sizes.
 - 1. Trees and Shrubs: Measure with branches and trunks in their normal position. Take height measurements from or near the top of the root flare for field-grown stock and container grown stock. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip to tip. Take caliper measurements 6 inches above the root flare for trees up to 4-inch caliper size.
 - 2. Other Plants: Measure with stems, petioles, and foliage in their normal position.

- F. Plant Material Observation: Engineer may observe plant material either at place of growth or at site before planting for compliance with requirements for genus, species, variety, cultivar, size, and quality. Engineer retains right to observe trees and shrubs further for size and condition of balls and root systems, pests, disease symptoms, injuries, and latent defects and to reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees shrubs or other plants immediately from Project site.
 - 1. Notify Landscape Architect of sources of planting materials 21 days in advance of delivery to site.
- G. The Contractor shall keep on the work site a copy of the drawings and specifications and shall at all time give the Landscape Architect or Owner's Representative access thereto. Any adjustment made by the Contractor without a determination issued by the Landscape Architect or Owner's Representative shall be at the Contractor's own risk and expense.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws if applicable.
- B. Bulk Materials:
 - 1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
 - 2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
 - 3. Accompany each delivery of bulk fertilizers, lime, and soil amendments with appropriate certificates.
- C. Deliver plants freshly dug.
- D. Do not prune trees and other plants before delivery. Protect bark, branches, and root systems from sun scald, drying, wind burn, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of plants during shipping and delivery. Do not drop plants during delivery and handling.
- E. Handle planting stock by root ball.
- F. Deliver plants after preparations for planting have been completed, and install immediately. If planting is delayed more than six hours after delivery, set plants and trees in the shade, protect from weather and mechanical damage, and keep roots moist.
 - 1. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.
 - 2. Do not remove container-grown stock from containers before time of planting.

3. Water root systems of plants stored on-site deeply and thoroughly. Water as often as necessary to maintain root systems in a moist, but not overly-wet condition.

1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify actual grade elevations, service and utility locations,, and dimensions of plantings and construction contiguous with new plantings by field measurements before proceeding with planting work.
- B. Interruption of Existing Services or Utilities: Do not interrupt services or utilities to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary services or utilities according to requirements indicated:
- C. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with maintenance periods to provide required maintenance from date of Planting Completion.
 1. Spring Planting: Any time March 15- June 15th
 2. Fall Planting: Any time after August 30th.
- D. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions and warranty requirements.
- E. Coordination with Turf Areas: Plant trees, shrubs, and other plants after finish grades are established and before planting turf areas, unless otherwise indicated.

1.8 WARRANTY

- A. Special Warranty: Installer agrees to repair or replace plantings and accessories that fail in materials, workmanship, or growth within specified warranty period.
 1. Failures include, but are not limited to, the following:
 - a. Death and unsatisfactory growth, except for defects resulting from abuse, lack of adequate maintenance, or neglect by Owner, or incidents that are beyond Contractor's control.
 - b. Structural failures including plantings falling or blowing over.
 - c. Faulty performance of tree stabilization.
 2. Warranty Periods from Date of Planting Completion and acceptance:
 - a. Trees, Shrubs, and Ornamental Grasses: 24 months.
 3. Include the following remedial actions as a minimum:
 - a. Immediately remove dead plants and replace unless required to plant in the succeeding planting season.
 - b. Replace plants that are more than 25 percent dead or in an unhealthy condition at end of warranty period.
 - c. A limit of one replacement of each plant will be required except for losses or replacements due to failure to comply with requirements.

- d. Provide extended warranty for period equal to original warranty period, for replaced plant material.

1.9 MAINTENANCE SERVICE

- A. Initial Maintenance Service for Trees, Shrubs and Ornamental Grasses: Provide maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established but for not less than maintenance period below.
 - 1. Maintenance Period: 24 months from date of Planting Completion including watering.

PART 2 - PRODUCTS

2.1 PLANT MATERIAL

- A. General: Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing, and other features indicated in the Plant List shown on Drawings and complying with ANSI Z60.1; and with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock, densely foliated when in leaf and free of disease, pests, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.
 - 1. Trees with damaged, crooked, or multiple leaders; tight vertical branches where bark is squeezed between two branches or between branch and trunk ("included bark"); crossing trunks; cut-off limbs more than $\frac{3}{4}$ inch in diameter; or with stem girdling roots will be rejected.
 - 2. Collected Stock: Do not use plants harvested from the wild, from native stands, from an established landscape planting, or not grown in a nursery unless otherwise indicated.
- B. Provide plants of sizes, grades, and ball or container sizes complying with ANSI Z60.1 for types and form of plants required. Plants of a larger size may be used if acceptable to Engineer, with a proportionate increase in size of roots or balls.
- C. Root-Ball Depth: Furnish trees and shrubs with root balls measured from top of root ball, which shall begin at root flare according to ANSI Z60.1. Root flare shall be visible before planting.

2.2 ORGANIC SOIL AMENDMENTS

- A. Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1-inch sieve; soluble salt content of 5 to 10 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:
 - 1. Organic Matter Content: 50 to 60 percent of dry weight.

2. Feedstock: Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source-separated or compostable mixed solid waste.

2.3 FERTILIZER

- A. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
 1. Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.
 2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

2.4 PLANTING SOILS

- A. Planting Soil: Existing, native surface topsoil formed under natural conditions with the duff layer retained during excavation process and stockpiled on-site. Verify suitability of native surface topsoil to produce viable planting soil. Clean soil of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful to plant growth.
 1. Mix existing, native surface topsoil with soil amendments and fertilizers to produce planting soil:
- B. Planting Soil: Imported topsoil or manufactured topsoil from off-site sources. Obtain topsoil displaced from naturally well-drained construction or mining sites where topsoil occurs at least 4 inches deep; do not obtain from bogs, or marshes.
 1. Additional Properties of Imported Topsoil or Manufactured Topsoil: Screened and free of stones 1 inch or larger in any dimension; free of roots, plants, sod, clods, clay lumps, pockets of coarse sand, paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials harmful to plant growth; free of obnoxious weeds and invasive plants; not infested with nematodes; grubs; or other pests, pest eggs, or other undesirable organisms and disease-causing plant pathogens; friable and with sufficient structure to give good tilth and aeration.
 2. Mix imported topsoil or manufactured topsoil with soil amendments and fertilizers to produce planting soil.
- C. Type 1 Soil: Area refer to drawings
 1. Mixture of 1/3 pulverized existing soil, 1/3 planting soil, 1/3 sandy loam,
- D. Type 2 Soil: Area refer to drawings
 1. Mixture of 1/3 planting soil, 1/3 compost, 1/3 sandy loam

2.5 MULCH

- A. Organic Mulch: Free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of one of the following:
 - 1. Type: Ground or shredded bark.
 - 2. Size Range: 3 inches maximum, ½ inch minimum.
 - 3. Color: Natural- To match Phase I plant installation.

2.6 ALUMINUM EDGING

- A. Taconite strip edging -Permaloc PermaStrip aluminum edging 16'-straight lines
 - 1. 12" Aluminum stakes, o.c. as per manufacturer
 - 2. Mill finish or approved equal
 - 3. Located at taconite edging strips -except near terminal building
- B. Planting bed edging- Permaloc PermaStrip aluminum edging 8', notched curves
 - 1. 12" Aluminum stakes, o.c. as per manufacturer
 - 2. Mill finish or approved equal
 - 3. Located at planting beds and sod areas- except near terminal building
- C. Terminal building planting- Permaloc Cleanline aluminum edging 16'
 - 1. 12" Aluminum stakes, 2' o.c., 8 per 16'
 - 2. Mill finish
 - 3. Located on areas near the terminal building

2.7 TACONITE SCREENINGS

- A. Submit sample for approval #2- 3/8" minus w/fines- power tamp in place
- B. Install where indicated on plan, see below for two types of application.
- C. See Drawings for subbase.

2.8 GEOTEXTILE FABRIC

- A. Heavy duty Weed barrier Fabric- type special, MNDOT 2575.604.
- B. Install under taconite screenings in all areas that do not have planting in the planting beds.
- C. Install in all areas that have taconite screenings only, No trees planted above.

2.9 PESTICIDES

- A. General: Pesticide registered and approved by EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.
- B. Pre-Emergent Herbicide (Selective and Non-Selective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.
- C. Post-Emergent Herbicide (Selective and Non-Selective): Effective for controlling weed growth that has already germinated.
- D. Water: The contractor shall provide sufficient water to maintain plant materials, seed granted. It is the contractors Contractor's responsibility to be in compliance with all local ordinances concerning water sources.

2.10 TREE STABILIZATION MATERIALS

- A. Stakes and Ties:
 - 1. Upright Stakes: Rough-sawn, sound, new hardwood or pressure-preservative softwood, free of knots, holes, cross grain, and other defects, 2-by-2-inch nominal by length indicated, pointed at one end.
 - 2. Tie Wires: ASTM A 641/A 641M, Class 1, galvanized-steel wire, two-strand, twisted, 0.106 inch in diameter.
 - 3. Hose Chafing Guard: Reinforced rubber or plastic hose at least ½ inch in diameter, black, and cut to lengths required to protect tree trunks from damage.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to be planted for compliance with requirements and other conditions affecting performance.
 - 1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
 - 2. Do not mix or place soils and soil amendments in frozen, wet, or muddy conditions.
 - 3. Suspend soil spreading, grading, and tilling operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
 - 4. Uniformly moisten excessively dry soil that is not workable and which is too dusty.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

- C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Engineer and replace with new planting soil

3.2 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities and turf areas and existing plants from damage caused by planting operations.
- B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
- C. Lay out individual tree and shrub locations and areas for multiple plantings. Stake locations, outline areas, adjust locations when requested, and obtain Landscape Architect's acceptance of layout before excavating or planting. Make minor adjustments as required.
- D. Lay out plants at locations directed by Landscape Architect. Stake locations of individual trees and shrubs and outline areas for multiple plantings.

3.3 PLANTING AREA ESTABLISHMENT

- A. Loosen sub grade of planting areas to a minimum depth of 4 inches. Remove stones larger than 1 inch in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
 - 1. Apply slow-release fertilizer directly to sub grade before loosening.
 - 2. Spread topsoil, apply soil amendments and fertilizer on surface, and thoroughly blend planting soil.
- B. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.
- C. Before planting, obtain Engineer's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.4 EXCAVATION FOR TREES AND SHRUBS

- A. Planting Pits and Trenches: Excavate circular planting pits with sides sloping inward. Excavations with vertical sides are not acceptable. Trim perimeter of bottom leaving center area of bottom raised slightly to support root ball and assist in drainage away from center. Do not further disturb base. Ensure that root ball will sit on undisturbed base soil to prevent settling. Scarify sides of planting pit smeared or smoothed during excavation.
 - 1. Excavate approximately three times as wide as ball diameter for balled and burlapped and container-grown stock.
 - 2. Do not excavate deeper than depth of the root ball, measured from the root flare to the bottom of the root ball.

3. If area under the plant was initially dug too deep, add soil to raise it to the correct level and thoroughly tamp the added soil to prevent settling.
 4. Maintain required angles of repose of adjacent materials. Do not excavate sub grades of adjacent paving, structures, hardscapes, or other new or existing improvements.
 5. Maintain supervision of excavations during working hours.
 6. Keep excavations covered or otherwise protected when unattended by Installer's personnel.
- B. Drainage: Notify Engineer if subsoil conditions evidence unexpected water seepage or retention in tree or shrub planting pits.
- C. Fill excavations with water and allow to percolate away before positioning trees and shrubs.

3.5 TREE AND SHRUB PLANTING

- A. Before planting, verify that root flare is visible at top of root ball according to ANSI Z60.1. If root flare is not visible, remove soil in a level manner from the root ball to where the top-most root emerges from the trunk. After soil removal to expose the root flare, verify that root ball still meets size requirements.
- B. Remove stem girdling roots and kinked roots. Remove injured roots by cutting cleanly; do not break.
- C. Set balled and burlapped stock plumb and in center of planting pit or trench with root flare 3 inches above adjacent finish grades.
1. Use planting soil, 50 percent subsoil and 50 percent topsoil for backfill.
 2. After placing some backfill around root ball to stabilize plant, carefully cut and remove burlap, rope, and wire baskets from tops of root balls and from sides, but do not remove from under root balls. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked or broken before or during planting operation.
 3. Backfill with planting soil around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
 4. Continue backfilling process. Water again after placing and tamping final layer of soil.
- D. Set container-grown stock plumb and in center of planting pit or trench with root flare 2 inches above adjacent finish grades.
1. Use planting soil, 50 percent subsoil and 50 percent topsoil for backfill.
 2. Carefully remove root ball from container without damaging root ball or plant.
 3. Backfill with planting soil around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
 4. Continue backfilling process. Water again after placing and tamping final layer of soil.

- E. When planting on slopes, set the plant so the root flare on the uphill side is flush with the surrounding soil on the slope; the edge of the root ball on the downhill side will be above the surrounding soil. Apply enough soil to cover the downhill side of the root ball.

3.6 TREE AND SHRUB PRUNING

- A. Remove only dead, dying, or broken branches. Do not prune for shape.
- B. Prune, thin, and shape trees and shrubs as directed by Landscape Architect.
- C. Prune, thin, and shape trees and shrubs according to standard professional horticultural and arboricultural practices. Unless otherwise indicated by Landscape Architect, do not cut tree leaders; remove only injured, dying, or dead branches from trees and shrubs; and prune to retain natural character.
- D. Do not apply pruning paint to wounds.

3.7 TREE STABILIZATION

- A. Install trunk stabilization as follows unless otherwise indicated:
 1. Upright Staking and Tying: Stake all trees of 2- through 5-inch caliper. Use three stakes, with of length that will penetrate at least 18 inches below bottom of backfilled excavation and to extend at least 72 inches above grade. Set vertical stakes and space to avoid penetrating root balls or root masses. All evergreens get 3 stakes.
 2. Use two stakes for trees up to 12 feet high and 2-1/2 inches or less in caliper.
 3. Support trees with bands of flexible ties at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree.
 4. Support trees with two strands of tie wire, encased in hose sections at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree.

3.8 ORNAMENTAL GRASSES AND PERENNIAL PLANTINGS

- A. Set out and space ornamental grasses as indicated in even rows with triangular spacing.
- B. Use planting soil for backfill.
- C. Dig holes large enough to allow spreading of roots.
- D. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water.
- E. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.
- F. Protect plants from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.

3.9 PLANTING AREA MULCHING

- A. Mulch backfilled surfaces of planting areas and other areas indicated.
 - 1. Trees and Shrubs in Turf Areas: Apply organic mulch ring of 3-inch average thickness, with 48-inch radius around trunks or stems. Do not place mulch within 3 inches of trunks or stems.
 - 2. Organic Mulch in Ornamental Grasses Planting Area: Apply 3-inch average thickness of organic mulch extending over the entire island where the ornamental grasses are located, and finish level with the top of the surrounding curb. Do not place mulch within 3 inches of stems.
 - 3. Submit two samples for approval of shredded hardbark mulch and pea gravel mulch for AREA B.

3.10 PLANT MAINTENANCE

- A. Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, mulching, restoring planting saucers, adjusting and repairing tree-stabilization devices, resetting to proper grades or vertical position, and performing other operations as required to establish healthy, viable plantings. Spray or treat as required to keep trees and shrubs free of insects and disease.
- B. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace mulch materials damaged or lost in areas of subsidence.
- C. Apply treatments as required to keep plant materials, planted areas, and soils free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards. Treatments include physical controls such as hosing off foliage, mechanical controls such as traps, and biological control agents.
- D. At the end of the 24 month maintenance period, remove all stakes and ties and re-mulch the beds and add to pea gravel mulch as needed.

3.11 PESTICIDE APPLICATION

- A. Apply pesticides and other chemical products and biological control agents in accordance with authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.
- B. Pre-Emergent Herbicides (Selective and Non-Selective): Apply to tree, shrub, and ornamental grasses areas in accordance with manufacturer's written recommendations. Do not apply to seeded areas.
- C. Post-Emergent Herbicides (Selective and Non-Selective): Apply only as necessary to treat already-germinated weeds and in accordance with manufacturer's written recommendations.

3.12 CLEANUP AND PROTECTION

- A. During planting, keep adjacent paving and construction clean and work area in an orderly condition.
- B. Protect plants from damage due to landscape operations and operations of other contractors and trades. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.
- C. After installation and before Substantial Completion, remove nursery tags, nursery stakes, tie tape, labels, wire, burlap, and other debris from plant material, planting areas, and Project site.

3.13 DISPOSAL

- A. Remove surplus soil and waste material including excess subsoil, unsuitable soil, trash, and debris and legally dispose of them off Owner's property.

END OF SECTION 02930

**NEW PASSENGER TERMINAL
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**SECTION 03100 - CONCRETE
FORMWORK**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section specifies formwork for cast-in-place concrete for the following:
 - 1. Footings.
 - 2. Foundation walls.
 - 3. Slabs-on-grade.
 - 4. Concrete toppings.
 - 5. Building walls.
- B. Related Sections include the following:
 - 1. Division 01 Section "Structural Testing and Special Inspections".
 - 2. Division 03 Section "Concrete Reinforcement".
 - 3. Division 03 Section "Cast-In-Place Concrete".
 - 4. Division 05 Section "Structural Steel" for embedded items.

1.3 REFERENCES

- A. ACI 117 – Specifications for Tolerance for Concrete Construction and Materials
- B. ACI 301 – Specification for Structural Concrete for Buildings.
- C. ACI 318 – Building Code Requirements for Structural Concrete.
- D. ACI 347 – Guide to Formwork for Concrete.
- E. PS1 – Construction and Industrial Plywood.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Formwork Shop Drawings: Prepared by or under the supervision of a Specialty Structural Engineer detailing fabrication, assembly, and support of formwork.
 - 1. Engineering Responsibility: Formwork, bracing, shoring, and reshoring design for construction loads are sole responsibility of Installer's Specialty Structural Engineer.
- C. Material Certificates: For each of the following, signed by manufacturers:

1. Form materials and form-release agents.

1.5 INFORMATIONAL SUBMITTALS

- A. Submittal Schedule for all action submittal items.
- B. Minutes of Pre-Installation conference.
- C. Sustainable Design Submittals:
 1. LEED Credit: Product Data for Credit EQ 4.1: For adhesives, including printed statement of VOC content.
 2. Product Data for Credit EQ 4.4: For composite-wood products, documentation indicating that product contains no urea formaldehyde.
 3. Certificates for Credit MR 7: Chain-of-custody certificates certifying that products specified to be made from certified wood comply with forest certification requirements. Include evidence that mill is certified for chain of custody by an FSC-accredited certification body.
 - a. Include statement indicating costs for each certified wood product.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed concrete work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Specialty Structural Engineer Qualifications: Employ professional Engineer, registered in the State of Minnesota, to perform design of formwork and shoring for construction loads. Sign and seal design Shop Drawings submitted to Owner for review.
- C. Mockups: See Specification Section 03300 "Cast in Place Concrete."
- D. Pre-Installation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."
 1. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, forms and form removal limitations.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
 2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
 - 1. Plywood, metal, or other approved panel materials.
 - 2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
 - a. High-density overlay, Class 1 or better.
 - b. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
 - c. Structural 1, B-B or better; mill oiled and edge sealed.
 - d. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that will produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.
- D. Void Forms: Biodegradable paper surface, treated for moisture resistance, structurally sufficient to support weight of plastic concrete and other superimposed loads.
- E. Soil Retainers: Material to be rigid and non-degradable.
- F. Chamfer Strips: Wood, metal, PVC, or rubber strips.
- G. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.
- H. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
 - 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- I. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
 - 1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
 - 2. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.
 - 3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

PART 3 - EXECUTION

3.1 FORMWORK

- A. Work shall conform to ACI 117 and ACI 301, except as modified by requirements of these Contract Documents.
- B. Design, erect, shore, brace, and maintain formwork, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- C. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated.
- D. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:
 - 1. Class B, 1/4 inch for smooth-formed finished surfaces exposed to view and as indicated by the Architect.
 - 2. Class C, 1/2 inch, for rough-formed finished surfaces unless noted otherwise.
- E. Construct forms tight enough to prevent loss of concrete mortar.
- F. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 - 1. Install keyways, reglets, recesses, and the like, for easy removal.
 - 2. Do not use rust-stained steel form-facing material.
- G. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- H. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- I. Chamfer exterior corners and edges of permanently exposed concrete. Size chamfer as indicated on drawings.
- J. Form openings, chases, offsets, sinkages, keyways, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- K. Fastening Devices for Other Work:
 - 1. Provide for installation of inserts, reglets, hangers, metal ties, anchor bolts and other fastening devices required for attachment of other work.
 - 2. Properly locate fastening devices in cooperation with other trades and secure position before concrete is placed.
 - 3. Where concrete surfaces are veneered with masonry, install masonry anchor slots.

- a. In concrete forms set vertically 2'-0" on center.
- b. Install two continuous slots per face at each column face wider than 1'-4".
- 4. Where masonry abuts concrete surface, install one continuous masonry anchor slot in concrete forms set vertically for each eight inches width of masonry, centered in masonry width.

- L. Install sleeves in concrete piers, columns, beams or joists only upon approval of the Architect.
- M. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- N. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- O. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 INSTALLATION OF VOID FORMS AND SOIL RETAINERS

- A. Placement:
 - 1. Place forms on smooth, level, firm, dry surface.
 - 2. Butt carton forms tightly end to end and side to side, seam side down.
 - 3. Place cover sheets on carton forms and staple.
- B. Moisture Protection:
 - 1. Do not let carton forms become wet.
 - 2. Remove and replace wet cartons.
- C. Place soil retainers at edge of grade beams.

3.3 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete, if concrete is hard enough to not be damaged by form-removal operations and curing and protection operations are maintained.
 - 1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 75 percent of its 28-day design compressive strength.
 - 2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage a qualified special inspector and independent testing agency to perform field tests and inspections and prepare test reports. Cooperate with testing agency to facilitate the execution of its duties.
- B. Inspect formwork prior to concrete placement to verify resulting element width, depth and length correspond to those indicated on formwork installation drawings and Contract Documents.
- C. Where special formed surface finish requirements are required, verify forming materials comply with requirements.
- D. Adequacy of formwork, shoring, and reshoring to support vertical and lateral loads during construction is sole responsibility of Contractor.

END OF SECTION 03100

**NEW PASSENGER TERMINAL
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**SECTION 03200 - CONCRETE
REINFORCEMENT**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes:
 - 1. Reinforcing bars for cast-in-place concrete.
 - 2. Smooth bar dowels and diamond dowels and dowel baskets for concrete slab joints.
 - 3. Deformed bar anchors and headed shear connectors.
 - 4. Stud rails.
 - 5. Couplers for reinforcing bars.
 - 6. Welded wire fabric.
 - 7. Ties and supports for reinforcement.
- B. Related Sections:
 - 1. Division 01 Section "Structural Testing and Special Inspections".
 - 2. Division 03 Section "Concrete Formwork".
 - 3. Division 03 Section "Cast-In-Place Concrete".
 - 4. Division 03 Section "Unbonded Post-Tensioned Concrete".

1.3 REFERENCES

- A. ACI 117 - Specification for Tolerances for Concrete Construction and Materials.
- B. ACI 301 – Specification for Structural Concrete.
- C. ACI 315 - Standards on Details and Detailing of Concrete Reinforcement.
- D. ACI 318 - Building Code Requirements for Structural Concrete.
- E. AWS D1.4 - Structural Welding Code Reinforcing Steel.
- F. CRSI - Manual of Standard Practice.
- G. CRSI - Placing Reinforcing Bars.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

- B. Shop Drawings: Submit in accordance with ACI 315, "Standards on Details and Detailing of Concrete Reinforcement"
 - 1. Provide necessary plan, elevation and section detail placing drawings that illustrate fabrication, bending, and placement of reinforcement.
 - 2. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.
- C. Welding certificates – signed by contractor certifying that welders comply with requirements of Article 1.5 – "Quality Assurance."

1.5 INFORMATIONAL SUBMITTALS

- A. Minutes of Pre-Installation conference.
- B. Sustainable Design Submittal:
 - 1. LEED Credit: Product Data for Credit MR 4.1 and Credit MR4.2 (if required): For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
 - a. Include statement indicating costs for each product having recycled content.

1.6 QUALITY ASSURANCE

- A. Fabricator Qualifications: A qualified fabricator utilizing experienced detailers who have successfully completed CRSI's Reinforcing Bar Detailer Program.
- B. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.
- C. Welding: Qualify procedures and personnel according to AWS D1.4, "Structural Welding Code--Reinforcing Steel."
- D. Pre-Installation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."
 - 1. Review special inspection and testing and inspecting agency procedures for field quality control, steel reinforcement installation, and protection during concrete placement.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage. Avoid damaging coatings on steel reinforcement.

1.8 EXTRA MATERIALS

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
 - 2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.
- B. Low-Alloy-Steel Reinforcing Bars: ASTM A 706, deformed.
- C. Deformed Bar Anchors (DBA): Standard fluxed ASTM A496 deformed bars prepared for stud welding.
 - 1. Available Manufacturers:
 - a. Erico Fastening.
 - b. Nelson Stud Welding.
- D. Headed Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1, Type B.
 - 1. Available Manufacturers:
 - a. Erico Fastening.
 - b. Nelson Stud Welding.
- E. Epoxy-Coated Reinforcing Bars: ASTM A 615, Grade 60, deformed bars, ASTM A 775, epoxy coated.
- F. Plain-Steel Wire: ASTM A 82, galvanized.
- G. Deformed-Steel Wire: ASTM A 496.
- H. Plain-Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from as-drawn steel wire into flat sheets.

2.3 JOINT DOWELS

- A. Dowel Caps: Plastic material of size recommended for rod diameter.
- B. Smooth Dowel Bars: ASTM A 615, Grade 60, plain-steel bars, cut bars true to length with ends square and free of burr. Provide dowel ends that are sawn with round ends, not sheared with crimped ends.

- C. Smooth Dowel Support Baskets:
 - 1. Available Manufactures:
 - a. American Highway Technology.
- D. Smooth Dowel Coating: Grease or bituminous coating.
- E. Diamond Plate Dowels: Saw cut from ASTM A 36 hot rolled plate.
 - 1. Available Products:
 - a. Diamond Dowel™ by PNA, Inc.
- F. Smooth Plate Dowels and Baskets:
 - 1. Approved Manufacturers:
 - a. PNA, Inc.
- G. Epoxy-Coated Joint Dowel Bars: ASTM A 615, Grade 60, plain-steel bars, ASTM A 775 epoxy coated.

2.4 REINFORCEMENT ACCESSORIES

- A. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating; compatible with epoxy coating on reinforcement and complying with ASTM A 775.
 - 1. Available Products:
 - a. 3M Scotchkote 213PC or liquid, two-part, epoxy repair coating or approved equal.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, or plastic according to CRSI's "Manual of Standard Practice," and as follows:
 - 1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.
 - 2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.
- C. Rebar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Chairs are to be stable and resist tipping.
 - 1. Dayton Richmond: Aztec E-Z Chair – PEZ and Tower Chair PTC.
 - 2. General Technologies, Inc.: Composite Chairs and Composite Slab-Beam Bolsters.
- D. Supports for slabs-on-grade with steel reinforcement: Use supports with sand plates or horizontal runners.
 - 1. Dayton Richmond: Aztec E-Z Chair – PEZ with E-Z Chair Sand Plate PSP.
 - 2. General Technologies, Inc.: Composite Chairs on Sand Plates.
- E. Compression Couplers: Use only where explicitly referenced on Drawings.
 - 1. Speed sleeve by Erico.
 - 2. G-Loc by Gateway Erectors.

- F. Tension Couplers: Use only where explicitly referenced on Drawings.
 - 1. Lenton Couplers by Erico.
 - 2. MRC 150 by Dayton Superior.
 - 3. No-Slip Coupler by Fox-Howlet.

2.5 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice" and accepted shop drawings.
- B. Do not re-bend or straighten steel reinforcement except where specifically accepted.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Comply with CRSI's "Manual of Standard Practice" and accepted shop drawings for placing reinforcement. Adjust reinforcing to avoid sleeves, blockouts and other voids in concrete.
- B. Underfloor Vapor Retarders: When chairing reinforcement on top of underfloor vapor retarders, use only supports with integral sand plates.
 - 1. Do not cut or puncture vapor retarder.
 - 2. Repair damage and reseal cuts or punctures in vapor retarder before placing concrete.
- C. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.
- D. Accurately position, support, and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
 - 1. Weld reinforcing bars according to AWS D1.4, where indicated.
- E. Provide bar supports in sufficient number and heavy enough to carry steel they support. Place no bar more than 2 inches beyond last leg of continuous bar support. Do not use bar supports to support runways for concrete buggies, or similar loads.
 - 1. Maximum support bar spacing shall not exceed 48 inches.
 - 2. Maximum bolster spacing shall not exceed 36 inches for #4 support bar or 48 inches for #5 support bar.
- F. Bar supports on ground may be concrete block for slab depth of 7 inches or less and if positioned in staggered pattern. Provide bar chairs with sand feet where slab thickness exceeds 7 inches.
- G. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- H. Steel reinforcement partially embedded in concrete shall not be field bent, except as indicated or permitted by Structural Engineer.

- I. For walls reinforced on both faces, provide spreader bars and chairs to surfaces of forms on each side at spacings not to exceed 8 feet in either direction. For walls with single layer of reinforcing, provide chairs each side at spacings not to exceed 8 feet in either direction.
- J. Install epoxy coated reinforcing bars using either epoxy or plastic coated tie wires. Place epoxy coated steel on epoxy coated bar supports. Patch cut ends and areas of damage.
- K. Install welded wire reinforcement in longest practicable lengths. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.
- L. Center smooth dowel bars on joints, position dowels at center of slab depth and align perpendicular to face of joints both vertically and horizontally. Within 30 minutes before placement of adjacent concrete along doweled joints, apply dowel coating on free ends of dowels.
- M. Install diamond plate dowels in concrete slab-on-grade joints where shown. Install diamond plate dowels per manufacturer's written instructions.

3.2 PROTECTION AND REPAIR

- A. Install additional bar supports at locations where reinforcement position is not maintained due to collapsed chairs or construction activity from time of original placement.
- B. Epoxy-Coated Reinforcement: Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D 3963. Use epoxy-coated steel wire ties to fasten epoxy-coated steel reinforcement.

3.3 FIELD QUALITY CONTROL

- A. Assign individual to monitor reinforcement position during concrete placement and reposition bars that are displaced due to construction activity.
- B. Testing and Inspecting: Owner will engage a qualified special inspector and material testing agency to perform field quality control inspections and testing in accordance with Division 01 Section "Structural Tests and Inspections" and as specified herein.
- C. Submit reports of inspections and material testing as soon as practical after they are made.
- D. Inspect reinforcement in all cast-in-place concrete footings, foundation frost walls, basement walls, retaining walls, and columns, slabs on grade, and topping slabs.
- E. Verify reinforcing bar grade.
- F. Verify reinforcing bars are free of dirt, excessive rust and damage.

- G. Verify reinforcing bars are adequately tied, chaired and supported to prevent displacement during concrete placement.
- H. Verify proper clear distances between bars and to surfaces of concrete.
- I. Verify reinforcing bar size and placement.
- J. Verify bar laps for proper length and stagger and bar bends for minimum diameter, slope and length.
- K. Verify mechanical splices are placed in accordance with Contract Documents and reviewed shop drawings.
- L. Verify epoxy coating is present at locations noted on the Contract Documents; include tie wires, chairs, bolsters, etc. Verify coating damage is repaired in accordance with the Contract Documents.
- M. Verify installation of anchor rods, embedded plates and angles are placed in accordance with the Contract Documents.
- N. Correct work that does not comply with specified requirements prior to scheduling concrete placement.
- O. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

END OF SECTION 03200

**NEW PASSENGER TERMINAL
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**SECTION 03300 – CAST-IN-PLACE
CONCRETE**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section specifies cast-in place concrete, vapor retarder, concrete materials, mixture design, placement procedures, finishes and all related accessories, for the following:
 - 1. Footings.
 - 2. Foundation walls and piers.
 - 3. Slabs-on-grade.
 - 4. Columns.
 - 5. Concrete toppings.
 - 6. Base slabs.
 - 7. Miscellaneous concrete items.
 - 8. Placement of embedded items provided by other trades
- B. Related Requirements:
 - 1. Division 01 Section "Structural Tests and Special Inspections".
 - 2. Division 03 Section "Concrete Formwork".
 - 3. Division 03 Section "Concrete Reinforcement".
 - 4. Division 03 Section "Concrete Topping".
 - 5. Division 04 Section "Unit Masonry" for wedge type inserts and dovetail slots.
 - 6. Division 05 Sections for items cast into concrete.
 - 7. Division 31 Section "Earth Moving".

1.3 REFERENCES

- A. ACI 117 – Specifications for Tolerances for Concrete Construction and Materials.
- B. ACI 214 - Recommended Practice for Evaluation of Strength Test Results of Concrete.
- C. ACI 223 – Standard Practice for the Use of Shrinkage Compensation Concrete.
- D. ACI 301 - Specifications for Structural Concrete for Buildings.
- E. ACI 302 – Guide for Concrete Floor and Slab Construction.
- F. ACI 304 - Guide for Measuring, Mixing, Transporting and Placing Concrete.
- G. ACI 305 - Hot Weather Concreting.

- H. ACI 306 - Cold Weather Concreting.
- I. ACI 308 – Standard Practice for Curing Concrete.
- J. ACI 309 - Guide for Consolidation of Concrete.
- K. ACI 318 - Building Code Requirements for Structural Concrete.
- L. ASTM E 1155 – Standard Test Method for Determining F_F Floor Flatness and F_L Floor Levelness Numbers.

1.4 DEFINITIONS

- A. Floor Flatness Number, F_F , measures floor curvature or flatness per ASTM E 1155.
- B. Floor Levelness Number, F_L , measures floor inclination from a horizontal plane per ASTM E 1155.
 - 1. Floor Levelness, (F_L), tolerances only apply to nonsloping slabs-on-grade and suspended slabs shored at time of testing. Floor Levelness tolerances shall not apply to slabs placed on unshored form surfaces, shored surfaces after removal of shores, or pitched slab surfaces per ACI 302.
- C. Overall F_F/F_L numbers represent minimum values acceptable for all combined local floor test sections representing the specified floor finish area per ACI 302.
- D. Local F_F/F_L test areas shall be defined as follows per ACI 302.
 - 1. Areas bounded by construction or control joints for slabs-on-grade.
 - 2. Areas bounded by columns and/or wall lines for elevated structural slabs. No less than one-half bay size.
- E. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
 - 1. Form-release agents
 - 2. Concrete Admixtures.
 - 3. Curing Materials.
 - 4. Joint Fillers.
 - 5. Waterstops.
 - 6. Floor and Slab Treatments.
 - 7. Bonding Agents.
 - 8. Adhesives.
 - 9. Repair Materials
- B. Concrete Mix Designs: Each concrete mix design submittal shall contain the following information:
 - 1. Mix Number (which will correspond to mix ticket on trucks delivered to site).

2. Application for which concrete is designed (i.e. – footings, slabs, etc...)
3. Applicable mix performance criteria including:
 - a. Final Design strength at 28 days.
 - b. Unit Weight.
 - c. Air Content.
 - d. Slump (with water only and after addition of WRA and/or HRWRA).
 - e. For shrinkage compensating concrete, provide results of restrained prism expansion tests, ASTM C878, with mix design.
4. Applicable mix ingredients including quantities, ASTM designations, and sources for:
 - a. Cementitious materials.
 - b. Aggregate source, geological type, size, and shape.
 - 1) Include total gradation for combined coarse and fine aggregates for mixes specified to contain Well Graded Aggregate.
 - 2) Included calculated Coarseness Factor and Workability Factor for mixes specifying limits on these values.
 - c. Water.
 - 1) Indicate amount of mixing water to be withheld for later addition at Project site.
 - d. Water cementitious materials ratio, w/cm.
 - e. Admixtures.
 - f. Fibers, color pigments, and other additions.
5. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

C. Proposed construction joint and saw-cut contraction joint locations for slabs-on-grade.

1.6 INFORMATIONAL SUBMITTALS

- A. Submittal Schedule for all action submittal items.
- B. Manufacturer's Instructions for each type of product indicated:
 1. Curing and Sealing Compounds.
 2. Joint Fillers.
 3. Waterstops.
 4. Floor and Slab Treatments.
 5. Bonding Agents.
 6. Adhesives.
 7. Repair Materials.
- C. Preconstruction Material Test Reports:
 1. Cementitious Materials.
 2. Compressive strength results of trial batches or historical test data, in accordance with ACI 318 Chapter 5, indicating following:
 - a. Specified compressive strength, f'_c .
 - b. Average compressive strength, f'_{cr} .
 - c. Number of consecutive tests.
 - d. Overall standard deviation.
 - e. Overall coefficient of variation.
 - f. Minimum moving average of three consecutive strength tests.
 3. Aggregate gradation, specific gravity, and absorption.

4. Aggregate potential alkali-silica reactivity (ASR) for concrete in exterior, corrosive, or wet environments in accordance with ASTM C 289.

D. Minutes of Pre-Installation conference.

E. Sustainable Design Submittals:

1. LEED Credit: Product Data for Credit MR 4.1 and Credit MR 4.2 if required: For products having recycled content, documentation indicating weights, costs, and percentages by weight of postconsumer and preconsumer recycled content.
 - a. Include statement indicating material weights and costs for each product having recycled content.
 - b. Design Mixtures for Credit ID 1.1: For each concrete mixture containing recycled pozzolanic or cementitious materials as a replacement for portland cement and for equivalent concrete mixtures that do not contain portland cement replacements.
2. LEED Credit: Product Data for Credit MR 5.1 and Credit MR 5.2 if required: For products having Regional content (Extracted, and processed or manufactured within 500 miles of site), documentation indicating total weights, costs and percentages by weight of regional content.
 - a. Include statement indicating material weights, and costs for each product having regional content.

F. Construction Test Reports:

1. Concrete tests.
2. Floor tolerance measurement.
3. Industrial floor joint filler inspection.

1.7 CLOSEOUT SUBMITTALS

- A. Floor Correction Agreement: Submit written floor slab extended correction period agreement in duplicate within ten days after date of Substantial Completion.
- B. Maintenance Contracts:
 1. Curing and Sealing Compounds.
 2. Floor and Slab Treatments.
- C. Operation and Maintenance Data:
 1. Curing and Sealing Compounds.
 2. Floor and Slab Treatments.
- D. Bonds.
- E. Warranty Documentation.
- F. Record Documentation.
- G. Sustainable Design Closeout Documentation.

1.8 QUALITY ASSURANCE

- A. **Installer Qualifications:** An experienced installer who has completed concrete work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. **Manufacturer Qualifications:** A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94 requirements for production facilities and equipment.
 - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- C. **Testing Agency Qualifications:** An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.
- D. **Source Limitations:** Obtain materials from same source throughout Work.
- E. **Mockups:** Construct mockups as directed by the Architect to demonstrate aesthetic effects and qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for the completed Work:
 - 1. **Exposed Concrete Panel Samples:** Cast concrete formed-surface panels to demonstrate typical joints, surface finish, texture, tolerances, and standard of workmanship for review and acceptance by Architect and Owner.
 - a. Build panel to size and in the location as directed by the Architect.
 - b. Approved mockups may become part of the completed Work and shall remain exposed to view for duration of work as basis for quality of final construction.
 - c. Sample mockups not selected for incorporation shall be demolished and removed from site.
- F. Contractor shall assign a qualified staff member to perform quality control on their own work in the field on a daily basis, for each day work is performed. The Contractor's quality control staff shall review their own work for compliance with contract documents before the Contractor notifies the design team of readiness for required inspections, tests and observations to be provided by the Owner's Representatives.
- G. **Pre-Installation Conference:** Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination" and Division 01 Section "Structural Tests and Special Inspections".
 - 1. Review installer qualifications, methods, scheduling and testing procedures before work is started.
 - 2. Review special inspection and testing and inspecting agency procedures for field quality control, steel reinforcement installation, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, semirigid joint fillers, vapor-retarder installation, anchor rod and anchorage device installation tolerances, floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.

3. Authorized representatives of concrete supplier, industrial floor supplier and installer, floor finisher, testing and inspection agency, admixture supplier, steel fiber reinforcement supplier, Engineer, Owner and Construction Manager.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.
- B. Joint Filler, Joint Sealers and Curing Materials: Deliver in original factory packaging and unopened containers and protect from damage and contamination.

1.10 SITE CONDITIONS

- A. Provide total building enclosure including weather tight roof and walls before placing interior concrete slabs.
- B. During installation of interior slabs on grade, close openings in exterior walls and roofs enclosing areas.
- C. Provide minimum interior temperature 50 degrees F during installation and curing.
- D. Vent heaters or combustion equipment to outside.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
 2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 CONCRETE MATERIALS

- A. Cementitious and Pozzolanic Materials: Use the following materials, of the same type, brand, and source for each required type of concrete and on which selection of concrete proportions was based:
 1. Portland Cement: ASTM C 150, Type 1 or Type I/II.
 2. Fly Ash: ASTM C 618, Class C or F, and as specified herein.
 - a. Available Alkalis, as Na₂O equivalent: 1.5% maximum
 - b. Loss On Ignition (LOI): 1% maximum
 - c. Calcium Oxide Limit (CaO): 20% maximum
 3. Microsilica: ASTM C 1240, amorphous silica.
 4. Replacement Ratio: Portland cement shall be replaced on an equal mass (not weight) basis. Material replacements shall be expressed as a percent, by mass, of the total cementitious materials content, with proportions selected for 28 day compressive strengths equal to those specified. The change in volume resulting

from the substitutions shall be determined and an adjustment in both coarse and fine aggregate proportions shall be determined in order to ensure a unit volume.

- a. Fly Ash replacement shall not exceed 30% for Class C, 20% for Class F, or as specified for a particular mix design.
- b. Microsilica replacement shall not exceed 10%.
- c. Maximum cement replacement of concrete mixes containing pozzolan shall not exceed 40% unless specified otherwise.

B. Normal-Weight Aggregates: ASTM C 33. Do not use aggregates containing soluble salts or other substances which can cause stains on exposed surfaces. Use aggregates from one source of supply corresponding to that on which selection of concrete proportions was based.

1. Coarse Aggregate: Minimum Class Designation:
 - a. Class 3S Typical
 - b. Class 4S Exterior horizontal concrete
 - 1) Maximum absorption 1.7%
 - c. Class 5S Exterior exposed architectural concrete
 - 1) Maximum absorption 1.7%
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
3. Aggregate Gradation: Conform to ASTM C 33 and as specified herein.
 - a. Well Graded Aggregate: Provide in concrete mixes indicated with the combined coarse and fine aggregates meeting the following criteria:

Sieve Size	Top Size Aggregate		
	1 1/2"	1"	3/4"
% Retained on Sieve			
1 1/2"	0% - 8%		
1"	8% - 18%	0% - 8%	
3/4"	8% - 18%	8% - 22%	0% - 6%
1/2"	8% - 18%	8% - 22%	6% - 22%
3/8"	8% - 18%	8% - 22%	6% - 22%
No. 4	8% - 18%	8% - 22%	6% - 22%
No. 8	8% - 18%	8% - 22%	6% - 22%
No. 16	8% - 18%	8% - 22%	6% - 22%
No. 30	8% - 18%	8% - 22%	6% - 22%
No. 50	3% - 12%	3% - 12%	3% - 12%
No. 100	0% - 8%	0% - 8%	0% - 8%
No. 200	0% - 5%	0% - 5%	0% - 5%

- 1) At least 55% by weight shall be retained on or above the #4 sieve.
 - 2) A maximum of two non-adjacent sieves between 1 inch and No. 50 may fall outside the prescribed limits above with a minimum of 5% retained and a maximum of 22% retained on these nonconforming sieves.
4. Aggregates for Exposed Architectural Finish Concrete: Aggregates shall be specially selected for color and size as selected by Architect.

C. Water: ASTM C 94 and potable.

2.3 ADMIXTURES

- A. General: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use admixtures containing calcium chloride or thiocyanates.
- B. Air-Entraining Admixture (AEA): ASTM C 260.
 - 1. Available Products:
 - a. BASF: MB AE 90 or Micro Air.
 - b. Euclid Chemical Company: Air-Mix.
 - c. General Resource Technology: Polychem AE.
 - d. Grace Construction Products: Daravair series or Darex series.
 - e. Protex Industries: Protex AES.
- C. Water-Reducing Admixture (WRA): ASTM C 494, Type A.
 - 1. Available Products:
 - a. BASF: Pozzolith 210 or Pozzolith 322 N
 - b. Euclid Chemical Company: Eucon WR-75.
 - c. General Resource Technology: Polychem 1000.
 - d. Grace Construction Products: WRDA.
- D. Mid-Range Water-Reducing Admixture (MRWRA): ASTM C 494, Type A.
 - 1. Available Products:
 - a. BASF: Polyheed 997 or Polyheed FC100.
 - b. Euclid Chemical Company: Eucon A+.
 - c. General Resource Technology: KB-1000.
 - d. Grace Construction Products: Daracem-65.
- E. Polycarboxylate High-Range Water-Reducing Admixture (HRWRA): ASTM C 494, Type F.
 - 1. Available Products:
 - a. BASF: Glenium 3000 NS, 3030 NS, or 3200 HES.
 - b. Euclid Chemical Company: Plastol 5000.
 - c. Grace Construction Products: ADVA.
- F. Whelan Gum or Methylcellulose Viscosity Modifying Admixture (VMA):
 - 1. Available Products:
 - a. BASF: Rheomac VMA 358, 362, or 450.
 - b. Euclid Chemical Company: Viscrol.
- G. Water-Reducing and Retarding Admixture: ASTM C 494, Type B and D.
 - 1. Available Products:
 - a. BASF: Pozzolith 80 or Pozzolith 200 N.
 - b. Euclid Chemical Company: Eucon Retarder-75.
 - c. General Resource Technology: Polychem R.
 - d. Grace Construction Products: Daratard 17.
- H. Non-Corrosive, Non-Chloride Accelerator: ASTM C494, Type C or E.
 - 1. Available Products:
 - a. BASF: Pozzolith NC 534.

- b. Euclid Chemical Company: Accelguard 80.
- c. General Resource Technology: Polychem Super Set.
- d. Grace Construction Products: Polarset.

I. Integral Water Repellant Admixtures:

- 1. Available Products:
 - a. Grace Construction Products: Darapel
 - b. Xypex Chemical Corporation: Admix C-1000 or C-2000.

J. Prohibited Admixtures: Calcium chloride, thiocyanates or admixtures effectively containing chloride ions (more than 0.05 percent) are not permitted.

2.4 WATERSTOPS

A. Self-Expanding Butyl Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete, 3/4 by 1 inch.

- 1. Available Products:
 - a. Colloid Environmental Technologies Company; Volclay Waterstop-RX.
 - b. Concrete Sealants Inc.; Conseal CS-231.
 - c. Greenstreak; Swellstop.
 - d. Henry Company, Sealants Division; Hydro-Flex.
 - e. JP Specialties, Inc.; Earthshield Type 20.
 - f. Progress Unlimited, Inc.; Superstop.
 - g. TCMiraDRI; Mirastop.

2.5 MISCELLANEOUS EMBEDDED ITEMS

A. Headed Anchor Rods: ASTM F 1554, Grade 36, straight.

- 1. Nuts: ASTM A 563 heavy hex carbon steel.
- 2. Plate Washers: ASTM A 36 carbon steel.
- 3. Washers: ASTM F 436 hardened carbon steel.

B. Miscellaneous angles, channels, and plates: ASTM A 36.

C. Reglets: Fabricate reglets of not less than 0.0217-inch- thick (26-ga.), galvanized steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.

- 1. Available Manufacturers:
 - a. Gateway Building Products.
 - b. Heckman Building Products.
 - c. Hohmann-Bernard.

D. Stair Nosings:

- 1. Available Products:
 - a. Wooster Products: Spectra Type WP4C.

2.6 CURING, CLEANING, AND SEALING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
 - 1. Available Products:
 - a. BASF: Confilm
 - b. Burke by Edoco; BurkeFilm.
 - c. ChemMasters; Spray-Film.
 - d. Conspec; Aquafilm.
 - e. Dayton Superior Corporation; Sure Film.
 - f. Euclid Chemical Company; Eucobar.
 - g. Kaufman Products, Inc.; Vapor Aid.
- B. Water Cure:
 - 1. Waterproof paper.
 - 2. Reef Industries: Transguard Economy Grade. (ASTM C 171, 20-mils thick, polypropylene sheet with nonperforated white coating.)
 - 3. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
 - 4. Dayton Bag and Burlap: Burlene.
 - 5. Reef Industries: Transguard 4000; 42-mil thick, fiber mat with polyethylene sheet backing.
- C. Water: ASTM C 94 and potable.
- D. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.
 - 1. Available Products:
 - a. Burke by Edoco; Aqua Resin Cure.
 - b. ChemMasters; Safe-Cure Clear.
 - c. Dayton Superior Corporation; Day Chem Rez Cure (J-11-W).
 - d. Euclid Chemical Company; Kurez DR VOX.
 - e. L&M Construction Chemicals, Inc.; L&M Cure R.
 - f. Meadows, W. R., Inc.; 1100 Clear.
- E. Concrete Floor Cleaner and Stripper:
 - 1. Available Products:
 - a. Burke by Edoco; Burke Klean.
 - b. Dayton Superior Corporation; Citrus Peel (J-48).
 - c. Euclid Chemical Company; Euco Clean & Strip.
 - d. Kaufman Products, Inc.; K Pro CD.
 - e. L&M Construction Chemicals, Inc.; Citrex.
- F. Penetrating Liquid Densifier and Sealer: Clear, chemically reactive, waterborne solution of inorganic silicate or silicate materials and proprietary components; odorless; colorless; that penetrates, hardens, and densifies concrete surfaces.
 - 1. Available Products:
 - a. Burke by Edoco; Titan Hard.
 - b. ChemMasters; Chemisil Plus.
 - c. Curecrete Distribution Inc.; Ashford Formula.
 - d. Dayton Superior Corporation; Day-Chem Sure Hard.
 - e. Euclid Chemical Company; Euco Diamond Hard.

- f. Kaufman Products, Inc.; SureHard.
- g. L&M Construction Chemicals, Inc.; Seal Hard.

2.7 JOINT MATERIALS

- A. Equipment Control joint saw:
 - 1. Available Products:
 - a. Soff-Cut International; "Soff-Cut System," early-entry dry-cut saw with Skid Plate.
- B. Expansion Joint Material: ASTM D 1751, asphalt-saturated cellulosic fiber.
 - 1. Available Manufacturers:
 - a. W.R. Meadows.
 - b. BASF.
- C. Joint Backer Rod: Flexible, compressible, closed-cell polyethylene foam, not less than 10 psi compression deflection.
- D. Joint Filler-Industrial Slabs: Two-component, semirigid, 100 percent solids, per ASTM D 2240.
 - 1. Metzger/McGuire, MM80.
 - 2. Metzger/McGuire, SPAL-PRO RSF at freezers.
- E. Interior Joint Sealer: Mameco, Vulkem 45.
- F. Interior Bond Breaker Joint: 30 pound asphalt felt, unperforated.

2.8 RELATED MATERIALS

- A. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- B. Under Slab Vapor Retarder: ASTM E1745, Class A. Permeance of less than 0.01 perms after mandatory conditioning tests per ASTM E 1745 (7.1.1 – 7.1.5). Not less than 15 mils thick.
 - 1. Manufacturers and Products:
 - a. Barrier Bac, Inc..
 - b. Raven Industries.
 - c. Reef Industries, Inc..
 - d. Stego Industries.
 - e. Monaflex
 - f. Flatiron Films
 - 2. Accessories:
 - a. Seam tape: High density polyethylene tape with pressure sensitive adhesive, minimum 4 inches wide.
 - b. Pipe boots: Constructed from vapor barrier membrane and seam tape.

2.9 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
 - 1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 - 2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
 - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
 - 4. Compressive Strength: Not less than 4000 psi at 28 days when tested according to ASTM C 109.
- B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
 - 1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 - 2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
 - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
 - 4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109/C 109M.

2.10 CONCRETE MIXING

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
- B. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94, with exceptions specified herein, and ASTM C 1116 where fibers are used, and furnish batch ticket information.
 - 1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.
- C. Admixtures: Use approved admixtures according to manufacturer's written instructions.
 - 1. Use chemical admixtures in concrete, as required, for placement, workability, durability, and controlled set time.
- D. Air Content: Do not allow air content of hard-troweled finished floors to exceed 3 percent.
- E. Concrete Slump Limits: Measured according to ASTM C 143 at point of placement.
 - 1. 4 inches without water reducing admixtures
 - 2. 5 inches after addition of WRA or MWRA.
 - 3. 7 inches after addition of HRWRA.

4. A tolerance of up to one inch above indicated maximum will be allowed for one batch in any five consecutive batches tested.
5. If the maximum water-cement ratio is not exceeded, concrete arriving at the jobsite within 60 minutes of the initial batching that has a slump less than the maximum allowed may have water added when accepted by the project inspector.
6. Water reducing admixtures will not be incorporated in combination with shrinkage compensating concrete unless approved by the Engineer.
7. Water reducing admixtures may be added to increase the slump when water can not be added and additional slump is necessary for workability when accepted by the project inspector.
8. Water shall not be added to the mix after any supplemental water reducing admixtures have been dosed into the mixer.

2.11 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Footings: Proportion normal-weight concrete mixture as follows:

Item	Requirements
Compressive Strength at 56 days (min), f'_c	4000 psi
Maximum Cementitious Content	520 lb/cy
Maximum water/cementitious materials ratio, w/cm	0.50
Cementitious Materials Portland Cement, Type I or Type I/II Supplementary Cementitious Materials	50%-100% 0%-50%
Top Size Aggregate	1-1/2 inch

- B. Foundation Walls and Piers: Proportion normal-weight concrete mixture as follows:

Item	Requirements
Compressive Strength at 28 days (min), f'_c	4000 psi
Maximum Cementitious Content	520 lb/cy
Maximum water/cementitious materials ratio, w/cm	0.45
Cementitious Materials Portland Cement, Type I or Type I/II Supplementary Cementitious Materials	60%-100% 0%-40%
Top Size Aggregate	1-1/2 inch
Air Content (at point of placement) at un-insulated exterior foundation walls	5.5% ($\pm 1.5\%$)

- C. Slabs-on-Grade: Proportion normal-weight concrete mixture as follows:

Item	Requirements
Compressive Strength at 28 days (min), f'_c	4000 psi
Maximum Cementitious Content	520 lbs/yd ³
Maximum water/cementitious materials ratio, w/cm	0.44

Cementitious Materials Portland Cement, Type I or Type I/II Fly Ash, Class C or F	70%-100% 0% - 30%
Maximum Top Size Aggregate	1-1/2 inch
Aggregate Gradation	Well Graded
Coarseness Factor	52 - 70
Workability Factor	32 - 40
Air Content (at point of placement) for slabs exposed to freezing and thawing	5.5% (\pm 1.5%)

- D. Suspended Slabs-On-Metal Deck: Proportion normal-weight concrete mixture as follows:

Item	Requirements
Compressive Strength at 28 days (min), f'_c	4000 psi
Equilibrium Unit Weight	150 lbs/ft ³ (\pm 3 lbs/ft ³)
Cementitious Materials Content	520 lbs/yd ³
Maximum water/cementitious materials ratio, w/cm	0.44
Cementitious Materials Portland Cement, Type I or Type I/II Fly Ash, Class C or F	70%-80% 20% - 30%
Top Size Aggregate	1.5 inch
Coarseness Factor	52-70
Workability Factor	32-40
Aggregate Gradation	Well Graded
Air Content (at point of placement)	3% maximum
Strux 90/40 Synthetic Fiber Reinforcement	As indicated on drawings

- E. Concrete Topping Slabs: Proportion normal-weight concrete mixture as follows:

Item	Requirements
Compressive Strength at 28 days (min), f'_c	3000 psi
Maximum Cementitious Content	564 lbs/yd ³
Maximum water/cementitious materials ratio, w/cm	0.42
Cementitious Materials Portland Cement, Type I or Type I/II Fly Ash, Class C or F	70%-100% 0% - 30%
Minimum Top Size Aggregate	1/2 inch
Aggregate Gradation	Well Graded

- F. Miscellaneous Concrete Items: Concrete stair pan fill, curbs, housekeeping pads, etc. Proportion normal-weight concrete mixture as follows:

Item	Requirements
Compressive Strength at 28 days (min), f'_c	3000 psi

Maximum water/cementitious materials ratio, w/cm	0.45
Cementitious Materials Portland Cement, Type I or Type I/II	60%-100%
Supplementary Cementitious Materials	0%-40%
Minimum Top Size Aggregate	1/2 inch

- G. Drilled Piers—See specification section 31 63 29.

PART 3 - EXECUTION

3.1 GENERAL

- A. Work shall conform to ACI 117 and ACI 301, except as modified by requirements of these Contract Documents.

3.2 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
 2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
 3. Install wedge inserts for masonry shelf angle supports and sleeves for pipe and conduit.

3.3 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect and Engineer.
1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated.
 2. Form joints with keyways and/or dowels as detailed. Embed keys at least 1-1/2 inches into concrete.
 3. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 4. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
 5. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth

equal to at least one-fourth of concrete thickness as follows where not specifically shown on Drawings:

1. Exterior Slabs:
 - a. Spacing shall not exceed 24 times slab thickness; 10 feet on center, maximum.
 - b. Short: long side ratio shall not be less than 3:4.
2. Interior Slabs:
 - a. As indicated on drawings.
3. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
4. Sawed Joints: Form contraction joints with early-entry dry-cut power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
 - a. Install cuts 0 to 2 hours after final finishing and prior to final set.
 - b. Install joint protector at saw-cut intersections prior to cross cut.
5. Provide cleanly cut, straight joints in toppings over joints in base slab.
6. Do not saw cut slabs on metal deck.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install expansion joint material at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend expansion joint material full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.
2. Terminate full-width expansion joint material not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Division 07 Section "Joint Sealants," are indicated.
3. Install expansion joint material in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

3.4 WATERSTOPS

A. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions, adhesive bonding, mechanically fastening, and firmly pressing into place. Install in longest lengths practicable.

3.5 INSTALLING UNDER SLAB VAPOR RETARDER

- A. Install according to membrane manufacturer's current published instructions and ASTM E1643.
- B. Install over level granular base and under reinforcing and slabs on grade.
- C. Lap over footings and seal to foundation walls.
- D. Overlap membrane joints minimum 6 inches and seal continuously with seam tape.

- E. Seal penetrations and pipes with pipe boot fashioned from membrane and sealed with seam tape.
- F. Repair damaged membrane with patches of membrane overlapping damage minimum 6 inches and sealing completely with seam tape.

3.6 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
 - 1. Do not add water to concrete after adding water-reducing admixtures to mixture.
- C. Clean forms, reinforcing and accessories and lubricate forms prior to placing concrete.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
 - 1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
 - 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
 - 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
 - 4. Do not insert vibrators to bottom of slabs-on-grade with underfloor vapor retarders to avoid damaging this membrane.
 - 5. Do not allow concrete to drop freely more than 4 feet.
 - 6. Use approved chutes equipped with suitable hoppers for placing where required.
 - 7. Place at rate that concrete is always plastic and flows readily into every space.
 - 8. Place beams, girders and haunches monolithically with floor system.
 - 9. Wait until concrete in columns and walls is no longer plastic before casting beams, girders or slabs supported by them.
- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
 - 1. Before concrete slabs on grade are placed, verify that granular base is level and compacted.
 - 2. Sprinkle base to eliminate suction of water from concrete.
 - 3. Allow no freestanding water.
 - 4. Place interior slabs only after permanent walls and roof enclose slab area.
 - 5. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 - 6. Maintain reinforcement in position on chairs during concrete placement.

7. Do not insert vibrators to bottom of slabs-on-grade with underfloor vapor retarders to avoid damaging this membrane.
8. Screed slab surfaces with a straightedge and strike off to correct elevations.
9. Slope surfaces uniformly to drains where required.
10. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

F. Concrete Finish Topping:

1. Prior to placing topping, remove laitance and loose particles of sand and dirt.
2. Remove oil and grease spots by washing with 10 percent solution of muriatic acid or strong washing soda.
3. After cleaning, hose down with pressure hose and keep base slab wet for at least 12 hours.

G. Do not use concrete that has partially hardened or been contaminated by foreign materials, nor concrete that has been retempered or remixed after initial set.

H. Before depositing new concrete on or against concrete that has set at construction joints, clean, wet and apply bonding agent to existing surfaces. Tighten forms prior to resuming pouring.

I. Exercise care to prevent splashing of forms or reinforcing with concrete above level of concrete being placed.

J. Clean reinforcement projecting above or out of concrete immediately after completion of particular unit of pour.

K. Do not place concrete under adverse weather conditions unless adequate protection is provided. Refer to ACI 301, for weather restrictions and placing temperatures.

3.7 COLD WEATHER CONCRETING

A. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When average high and low temperature is expected to fall below 40 deg F, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
4. Ensure minimum temperatures are maintained for the duration of the curing period in accordance with ACI 306.1.
5. Concrete shall be allowed to dry for at least 12 hours before removing temperature protection for water cured or moisture retention cured concrete.

3.8 HOT WEATHER CONCRETING

- A. Hot-Weather Placement: Comply with ACI 301 and as follows:
 - 1. When high temperature, measured on jobsite at concrete placement area, is expected to rise above 90 deg F, maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 - 2. When temperature of steel reinforcement, embeds, subgrade, or forms, is greater than 120 degrees F, fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.
 - 3. Protect concrete from wind and direct sunlight to avoid rapid drying.
 - 4. Apply evaporation retarder to unformed concrete surfaces if the air temperature exceeds 80 degrees F, the wind speed exceeds 10 mph, or the relative humidity is less than 40%. Apply according to manufacturer's written instructions immediately after placing and screeding.
 - 5. Apply moisture retaining covers or wet cure in accordance with concrete curing and protection methods as specified.

3.9 FINISHING FLOORS AND SLABS

- A. Finish bare concrete floors (adjacent to floors with other surfacing) so concrete surface is level with other finishes, unless otherwise noted.
- B. At areas to receive floor covering, grind smooth joints between slabs on grade and structural slabs and between existing and new surfaces to eliminate unevenness and to provide smooth, level surface across joints.
- C. Wetting the concrete surface during finishing operations is prohibited.
- D. Power floating with troweling machines equipped with normal trowel blades is prohibited.
- E. Use caution when finishing lightweight concrete slabs to maintain trowel blades at shallow angle as possible during final finishing operations.
 - 1. Do not provide a tight steel trowel finish to lightweight concrete slabs.
- F. Protect finished surfaces from damage. Keep free of abrasive materials.
- G. In areas where water will be present (interior and exterior) place and finish slabs so areas will drain and water will not stand in puddles. Conform to slopes shown. At structural slabs, verify elevations of drains to insure drains will be at low points. Where elevations and slopes are not indicated, generally slope floors 1/8 inch per foot uniformly to drains, unless otherwise directed by Architect.
- H. Finish and measure surface so gap at any point between concrete surface and an unlevelled, freestanding, 10-foot-long straightedge resting on 2 high spots and placed anywhere on the surface does not exceed 1/4-inch.

- I. Apply slab finish to Floor Profile Number tolerances listed unless specifically noted otherwise on Drawings, according to ASTM E 1155 "Standard Test Method for Determining F_F Floor Flatness and F_L Floor Levelness Numbers" for randomly trafficked floor surfaces.
 - 1. Refer to ACI 302, Chapter 8 and Table 8.15.3, for recommended typical procedures to attain specified Floor Profile Numbers.
- J. General Finishing Requirements: Comply with ACI 302.1R recommendations for screeding, restraighening, and finishing operations for concrete surfaces as appropriate to attain slab finish specified.
 - 1. Utilize wet-screed guides, dry-screed guides, and/or edge forms for initial strikeoff set with optical or laser instruments as appropriate to attain specified Floor Profile Number. Check elevation after initial strikeoff and repeat as necessary.
 - 2. Smooth and restraighen surface using 8 to 10 foot wide bull float, darby, or modified highway straightedge.
 - a. Apply in two directions at 45 degree angle to strip for Overall Floor Flatness, F_F 30 or greater.
 - 3. Wait until bleed water sheen has disappeared and concrete can sustain finishing operations employed without digging in or disrupting the levelness of the surface.
 - 4. Float surface with one or more passes using a power float (float shoe blades or pans) or by hand floating if area is small or inaccessible to power driven floats. Restraighen, cut down high spots, and fill low spots. Repeat float passes and restraighening until surface is left with a uniform, smooth, granular texture.
- K. CONC FIN-1: Light Trowel Finish.
 - 1. Follow General Finishing Requirements for initial procedures.
 - 2. Restraighen surface if required following paste-generating float passes using 10-foot wide highway straightedge.
 - 3. Consolidate concrete surface, uniform in texture and appearance, with one to two passes using power trowel. Hand trowel areas inaccessible by power trowel.
- L. CONC FIN-2: Medium Trowel Finish.
 - 1. Follow General Finishing Requirements for initial procedures.
 - 2. Restraighen surface if required following paste-generating float passes using 10-foot wide highway straightedge. Apply in two directions at 45 degree angle to strip. Use supplementary material to fill low spots.
 - 3. Consolidate concrete surface, uniform in texture and appearance, with two to three passes using power trowel. Hand trowel areas inaccessible by power trowel.
- M. CONC FIN-3: Trowel and Fine Broom Finish.
 - 1. Follow General Finishing Requirements for initial procedures.
 - 2. Consolidate concrete surface, with one pass using a power trowel.
 - 3. Slightly scarify surface with soft bristled broom while concrete is still plastic.
- N. CONC FIN-4: Broom Finish.
 - 1. Surfaces of concrete mixes with silica fume and/or calcium nitrite must be kept moist (not wet) during finishing operations to promote proper texturing. Pressure foggers with a reach capable of covering the entire surface can aid finishing operations.

2. Follow General Finishing Requirements, steps 1 through 3, for initial procedures.
 3. Scarify surface with a transverse scored texture using a medium bristled broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.
 4. Finish Tolerance: Surface shall not vary by more than $\pm 1/2$ inch anywhere from elevation noted on Drawings.
 5. Finish all concrete slabs to proper elevations to insure that all surface moisture will drain freely, and that no puddles exist. Contractor must bear cost of any corrections to provide positive drainage and repairing poorly finished surface areas.
- O. CONC FIN-5: Slip-Resistive Aggregate Finish.
1. Apply at rates recommended by the manufacturer, but not less than 25 pounds per 100 square feet.
 2. Verify all procedures noted below are in compliance with manufacturer's written instructions. Notify Architect of any discrepancies requiring resolution.
 3. Follow General Finishing Requirements, steps 1 through 3, for initial procedures.
 4. Break the surface using a power trowel with float shoes or attached pan.
 5. Evenly distribute approximately two-thirds of the specified amount of non-slip aggregate with mechanical spreader.
 6. After applied material has absorbed moisture, float surface using hand wooden floats. Take care not to tear through into the underlying concrete.
 7. Apply remaining one-third of dry-shake hardener. Tamp aggregate flush with surface, but do not force below surface. Float surface in a like manner.
 8. If needed, trowel until the desired surface finish is achieved.
 9. After curing, lightly work surface with a steel wire brush or an abrasive stone and water to expose slip-resistive aggregate.
- P. Coordinate final slab texture requirements with Division 9 flooring installer for proper adhesion of final flooring materials.
- Q. Summary Slab Finish Schedule:

SLAB USE	SLAB FINISH	OVERALL F _F /F _L	LOCAL F _F /F _L
Carpet; raised access floor; or base slabs below acoustic concrete topping slabs	CONC FIN-1 Light Trowel Finish	F _F 25/F _L 20	F _F 17/F _L 15
Thin set resilient flooring; paint; or other thin film-finish coating system	CONC FIN-2 Medium Trowel Finish	F _F 30/F _L 25	F _F 24/F _L 15
Thin set ceramic or quarry tile; stone flooring; epoxy terrazzo	CONC FIN-3 Trowel and Fine Broom Finish	F _F 18/F _L 15	F _F 15/F _L 10
Parking ramps; exterior concrete pavement (Ramp > 7%)	CONC FIN-4 Broom Finish (Rake Finish)	F _F 18/F _L 15	F _F 15/F _L 10
Egress stair exposed concrete treads and landings; where shown on	CONC FIN-5 Slip-Resistive Aggregate Fin-	F _F 25/F _L 20	F _F 17/F _L 15

SLAB USE	SLAB FINISH	OVERALL F _F /F _L	LOCAL F _F /F _L
Drawings	ish		

R. Measurement of Floor Tolerance:

1. Frequency: For industrial slabs, conduct floor tolerance measurements for each day's slab placement.
 - a. Report deficient areas to Architect to determine repair procedures appropriate for final required finish.
 - b. Make appropriate adjustments to construction procedures prior to next slab placement when previous slab placement is deficient.
2. Frequency: Conduct floor tolerance or measurements within 72 hours of final finishing operations and prior to removal of forms on elevated slabs for each slab placement.
3. Frequency: Conduct floor tolerance or measurements only if slab appears to be out of tolerance.
4. Floor slab tolerances provided for localized areas shall apply to sections maximum one bay in length and minimum one-half bay.
5. Conduct measurement of floor tolerance for F_F100/F_L75 areas by floor consultant utilizing Face Floor Profileograph, or other system approved by Architect.
6. Conduct measurement of floor tolerance for other slab areas utilizing Dip Stick Floor Profiler.

3.10 FINISHING FORMED SURFACES

- A. CONC FIN-20: Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 1. Apply to concrete surfaces exposed to public view, to receive a rubbed finish, or to be covered with a coating or covering material applied directly to concrete.
- B. CONC FIN-21: Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
 1. Apply to Smooth-Formed Finish as-cast concrete where indicated.
- C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.11 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.
- D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel-finish concrete surfaces. Before final troweling of exposed treads and landings, apply dampened non-slip shake at a minimum rate of ¼ pound over square foot of surface.

3.12 CONCRETE PROTECTING AND CURING

- A. General: Concrete shall be maintained above 50-degrees F and in a moist condition for at least the first seven days after placement. Provide curing and protection immediately after placement in accordance with ACI 301 using materials as specified herein.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if the air temperature exceeds 80 degrees F, the wind speed exceeds 10 mph, or the relative humidity is less than 40% before and during finishing operations as measured at the Project site. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
 - 1. Wet Curing: Keep surfaces continuously wet for not less than three days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
 - d. Protect surface from rapid loss of moisture upon termination of wet curing by covering with moisture-retaining covers for the remainder of the curing period.
 - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive.

Immediately repair any holes or tears during curing period using cover material and waterproof tape.

3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - a. After curing period has elapsed, completely remove curing compound without damaging concrete surfaces using concrete floor cleaner and stripper recommended by curing compound manufacturer.

- F. Wet cure or use moisture-retaining covers on all concrete surfaces for first 24 hours, minimum.
 1. Continue curing in this manner for as long as Hot Weather Concreting conditions persist.
 2. Industrial slabs shall be water cured for entire curing period.
- G. Curing Compounds shall not be used on concrete surfaces to receive adhered coverings or Penetrating Liquid Densifier and Sealer without prior manufacturer certification that it will not interfere with bonding of floor covering and warranties of flooring installer are validated.
- H. Moisture Condition of Slabs – Following placement of concrete and climatization of building, check to see that any specified tests for moisture emission have been made and a written report submitted prior to floor covering or coating installation.

3.13 PENETRATING LIQUID DENSIFIER AND SEALER

- A. Penetrating Liquid Densifier and Sealer: Prepare, apply, and finish Penetrating Liquid Densifier and Sealer according to manufacturer's written instructions at concrete floors to remain exposed to view.
 1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
 2. Do not apply to concrete that is less than 28 days old unless treatment also functions as a curing aid.
 3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.
- B. Protect finish surface during remainder of construction. Repair immediately any staining of finish concrete surfaces by methods recommended by manufacturer.
- C. Dry buff finish floor surfaces per manufacturer's written instructions to achieve final gloss appearance of liquid densifier and sealer just prior to substantial completion after majority of heavy construction and wet work activities have been completed

3.14 JOINT FILLING

- A. Arrange for on-site supervision by manufacturer's personnel.

- B. Coordinate with Owner that adequate protection or spatial separation is provided to ensure there is not contamination of Owner's stored product during joint filling.
- C. Prepare, clean, and install joint filler according to manufacturer's written instructions.
 - 1. Defer joint filling until concrete has cured for 30 to 90 days and space has assumed its normal operating temperature. Do not fill joints until construction traffic has permanently ceased.
- D. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry. Clean inside wall of joints to bare concrete.
- E. Mix filler thoroughly with power equipment according to manufacturer's published instructions.
- F. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.
- G. Protect joint completely from traffic for 8 hours and from vehicular traffic for 24 hours.
- H. Touch Up:
 - 1. Within one year after Substantial Completion, touch up joints with additional material and correct for normal joint movement according to manufacturer's published directions.
 - 2. Coordinate schedule for joint touch up with Owner.
 - 3. Touch up joints during Owner's non-working hours as required by Owner.
 - 4. Coordinate with Owner and Architect to ensure there is no contamination of Owner's stored product.

3.15 JOINT SEALING

- A. When concrete has cured 30 to 90 days, and space has assumed its normal operating temperature, rake out loose debris and clean joint with compressed air.
- B. Install backer rod and sealant according to manufacturer's published recommendations.
- C. Protect joint completely from traffic for 24 hours.

3.16 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval and in accordance with ACI 301. Repair methods for defects affecting the concrete's structural performance shall be closely coordinated between Contractor and Engineer.
- B. Patching Mortar: Submit proposed patching materials for Architect's review and approval.

- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension in solid concrete, but not less than 1 inch in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
 2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 2. After concrete has cured at least 14 days, correct high areas by grinding.
 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
 5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
 6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.17 FIELD QUALITY CONTROL

- A. The Owner will engage a qualified testing and inspection agency to provide special inspection and testing services and prepare reports in accordance with Division 01Section Structural Tests and Special Inspections", and with IBC 2006 Chapter 17 as adopted by the 2007 MSBC, and the CASE/Mn Guideline for Special Structural Inspection and Testing, and other items which in the professional judgement of the Structural Engineer of Record, are critical to the integrity of the building structure.
- B. Contractor will cooperate with and assist testing agency in obtaining representative concrete samples as concrete is placed for determining slump and air entrainment and casting test cylinders.
 1. Provide suitable space on site for storage for field condition test cylinders.
 2. If testing agency is not available, cast compression test cylinders as concrete is placed, determine and record slump of concrete, determine and record air content of concrete and submit cylinders and information to the testing agency.
- C. Inspections:
 1. Verification of use of required design mixture.
 2. Concrete placement, including conveying and depositing.
 3. Curing procedures and maintenance of curing temperature.
 4. Verification of concrete strength before removal of shores and forms from beams and slabs.
- D. Concrete Tests (Technical 1): Testing of composite samples of fresh concrete obtained according to ASTM C 172 - Practice for Sampling Freshly Mixed Concrete, ASTM C 31 - Practice for Making and Curing Concrete Test Specimens in the Field, and ASTM C 39 - Test Method for Compressive Strength of Cylindrical Concrete Specimens. Evaluation and acceptance of concrete shall be in accordance with ACI 318 and according to the following requirements:
 1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture where less than 50 yd³ is placed, plus one additional set for each additional 100 yd³ or fraction thereof.
 - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

2. Slump: ASTM C 143; one test at point of discharge for each composite sample.
 - a. Perform additional tests when concrete consistency appears to change.
 - b. For industrial slabs, slump each truck until slump stabilization is reached then decrease slump frequency to one test per 25 cubic yards.
 3. Air Content: When air content is specified, perform test in accordance with ASTM C 231, pressure method, for normal-weight concrete and ASTM C 173, volumetric method, for structural lightweight concrete.
 - a. Where placement is by pump, air content shall be measured at location of placement.
 - b. For concrete exposed to freezing and thawing, concrete from each truck shall be tested and concrete not meeting specified percentages shall not be placed.
 - c. For interior concrete not exposed to freezing and thawing, such as lightweight concrete on metal decking, perform one test for each set of test cylinders.
 - d. Concrete used in performing air content test shall not be used in fabricating test specimens
 4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
 5. Unit Weight: ASTM C 567, equilibrium unit weight of structural lightweight concrete; one test for each composite sample.
 6. Compression Test Specimens: ASTM C 31.
 - a. Cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
 - b. Cast and field cure one cylinder specimen for each composite sample.
 - 1) Store field-cured cylinders as near as possible to location of concrete represented by sample and give cylinder, insofar as practicable, same protection and curing as adjacent concrete.
 - c. If additional specimens are required to verify early strength of concrete, contractor must pay for additional testing.
 7. Compressive-Strength Tests: ASTM C 39.
 - a. Test one cylinder specimen at 7 days for information, and remaining two cylinder specimens at 28 days for acceptance, plus one cylinder to be held until 90 days in the event that the 28 day compressive strengths are not met.
 - b. Deliver field-cured specimens to laboratory at 28 days and test to verify adequacy of curing and protection in field.
 - c. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
- E. Measure floor and slab flatness and levelness according to ASTM E 1155 within 48 hours of finishing when requested by the Owner's Representative(Technical 1):
1. Measurements shall be made prior to removal of forms and shores at elevated structural slabs.
 2. The Contractor shall be notified immediately after the measurements of any section are complete and a written report of the results shall be submitted within 72 hours after finishing operations are complete.
 3. Report deficient areas to Architect to determine repair procedures appropriate for final required finish.

3.18 EVALUATION OF TEST RESULTS

- A. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
- B. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
- C. Test results shall be reported in writing to Architect, concrete supplier, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
- D. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
- E. Additional Tests: Testing and inspecting agency shall make additional tests of concrete at the expense of the Contractor when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42 or by other methods as directed by Architect.
- F. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- G. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.
- H. Fill core holes with concrete specified for location.

END OF SECTION 03300

**NEW PASSENGER TERMINAL
DULUTH INTERNATIONAL AIRPORT
DULUTH, MINNESOTA**

**SECTION 05120 – STRUCTURAL STEEL
FRAMING**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Structural steel framing members and all related accessories such as structural embeds, connections, bolts, welds, fasteners, threaded rods, headed studs, including fabrication, erection and all related work and accessories.
 - 2. Grouting for base plates, seats, and bearing areas.
 - 3. Connections and other performance specified items, including related design by contractor's Qualified Professional Engineer.
 - 4. Temporary bracing and shoring, including related design by contractor's specialty structural engineer.
 - 5. Shop applied finishes and coatings, including preparation, primers, special paint systems or galvanizing on steel exposed to exterior or aggressive environments, and bitumastic coating on steel below grade in soil.
 - 6. The work covered by this Section shall include all labor, material, equipment, permits, engineering and other services necessary for the fabrication and installation of structural steel and related work, complete, in accordance with the drawings and as specified herein.
- B. Related Requirements:
 - 1. Division 01 – Structural Testing and Special Inspections.
 - 2. Division 01 – Submittal Procedures
 - 3. Division 03 – Cast-In-Place Concrete.
 - 4. Division 05 – Steel Decking.
 - 5. Division 05 – Metal Fabrications
 - 6. Division 05 – Metal Stairs and Ladders
 - 7. Division 07 – Applied Fireproofing.
 - 8. Section 09 – Painting and High Performance Coatings

1.3 REFERENCES

- A. AISC Specification for Design, Fabrication, and Erection of Structural Steel for Buildings.
- B. AISC Code of Standard Practice for Steel Buildings and Bridges.
- C. AISC Specification for the Design of Steel Hollow Structural Sections.
- D. AWS D1.1 – Structural Welding Code.
- E. RCSC Specification for Structural Joints Using ASTM A 325 or A 490 Bolts.
- F. ASTM Standards in Building Codes.

G. Steel Structures Painting Council (SSPC) – PS7.01.

1.4 DEFINITIONS

- A. Structural Steel: Elements of structural-steel frame, as classified by AISC's "Code of Standard Practice for Steel Buildings and Bridges," that support design loads.
- B. The terms "for record" and "submit for record" in this specification are defined as Contractor submittals that do not require a response.

1.5 CONNECTION DESIGN PERFORMANCE REQUIREMENTS

- A. Connections: Provide details of simple shear connections, moment connections, axial connections, splice connections, and brace frame tension/compression connections required by the Contract Documents to be selected or completed by structural-steel fabricator to withstand service loads indicated and comply with other information and restrictions indicated.
 - 1. Select and complete connections using schematic details indicated and AISC's "Manual of Steel Construction, Thirteenth Edition Allowable Strength Design." Connection concepts for non-fully detailed connections show only the minimum requirements to convey design intent.
 - 2. Engineering Responsibility: Fabricator's responsibilities include using a Qualified Professional Engineer to prepare structural analysis data for all structural-steel connections that are not completely detailed on the Contract Documents.
 - a. The contractor shall design and provide any stiffener plates, doubler plates, reinforcing plates, etc. and their connections that may be required to develop and/or transfer the forces and/or connection design criteria called for in the Contract Documents.
 - b. Design connections to withstand the combined effects of shears, axial forces, moments and torques and as required by applicable code(s) and the Contract Documents.
 - c. All non-shear forces shown on the drawings are to be assumed reversible unless noted otherwise, and must be checked for both directions. If no transfer/pass-through forces are shown on the Contract Documents, then the most critical combinations of member forces and directions shall be assumed for the connection design.
 - d. All welded connections must utilize pre-qualified joints or joints that have been qualified by AWS D1.1, Section 2.
 - e. Comply with all connection notes on drawings in conjunction with these specifications.
 - f. The connection design calculation submittals shall meet the following criteria:
 - 1. Use a logical numbering system for connections without repeating labels. Cloud all changes to resubmitted calculations.
 - 2. Provide sketches for the results of each calculation, with all the pertinent dimensions to the calculation shown.
 - 3. For repetitive connections a spreadsheet summary may be used, but provide all pertinent input and resulting values plus an example long-hand calculation.
 - 4. Provide drawings/sketches showing the overall locations of the connections that are keyed/referenced to each connection calculation.
 - 5. Provide calculation checks for all forces shown on the drawings. All AISC code requirements apply. "OK by inspection" is not permitted.

1.6 SUBMITTALS – PART A (FOR REVIEW)

- A. Product Data: For each type of product indicated.
- B. Typical Connection Design Submittal: For each classification of connections (shear, axial, moment, truss and braced frame), submit a proposed typical connection and the supporting calculations for review prior to commencing substantial connection design.
- C. Provide placement plan and details for shear studs on all composite steel framing.
- D. Shop Drawings and related submittals: Show complete information for fabrication and erection of structural steel components.
 - 1. Submit shop drawings under provisions of Division 1 Section “Submittal Procedures.” Phase submittals to match sequence of actual construction to avoid delay of work.
 - 2. Include overall floor plans with piece marks labeled and erection detail cuts.
 - 3. Include full height elevations where appropriate for elements such as brace frames.
 - 4. Include details of cuts, connections, splices, camber, holes, and other pertinent erection data.
 - 5. Include embedment, anchor bolt and erection drawings.
 - 6. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.
 - 7. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.
 - 8. List paint manufacturer’s name and paint number where painting is required.
 - 9. Indicate items to be galvanized or coated where required.
 - 10. Connection design calculations: Submit connection design calculations and location references indicators at the same time that the shop drawings for the related connections are submitted. These shop drawings will be rejected without the following:
 - a. Complete connection calculations.
 - b. References of connection label and required loads on the shop drawings.
 - c. Signed letter from the Connection Engineer that they have already reviewed and incorporated their comments into the submitted shop drawings. This review shall be for all connections that are required to be designed by the Contractor’s Engineer.
 - 11. Submittal Process and Review:
 - a. Submittal of shop and erection drawings and other submittals by the General Contractor shall constitute General Contractor’s representation that the General Contractor has verified all quantities, dimensions, materials, catalog numbers and similar data with respect thereto and reviewed or coordinated each drawing with other drawings and other trades. The General Contractor shall place their shop drawing stamp on all submittals confirming the above.
 - b. The Contractor shall submit to the Design Team two (2) black-line prints and one (1) electronic copy (pdf) for shop drawing review.
 - c. The Contractor shall allow at least ten (10) working days between receipt and release by the Design Team for the review of shop and erection drawings, other than connection design calculations, which shall be allowed fifteen (15) working days. The size of the submittals is limited to that which is agreed upon during the submittal schedule required below.

- d. Resubmittals: Completely address previous comments prior to resubmitting a drawing. Resubmit only those drawings that require resubmittal. All modifications or revisions to submittals, shop drawings, connection design calculations and erection drawings must be clouded, with an appropriate revision number clearly indicated.
 - e. The Contractor shall deliver to the Design Team at the completion of the job two (2) electronic versions of the final as-built shop drawings on a CD-ROM or other media acceptable to the Design Team.
 - f. The review of connection design and the review and approval of shop and erection drawings shall be for general conformance with the design intent of the work and with the information given in the Contract Documents only and will not in any way relieve the Contractor or the Contractor's Engineer from their responsibilities stated herein.
12. Substitution Request:
- a. Requests for any departure from Contract Documents must be submitted in writing by the Contractor and accepted in writing by the Design Team, prior to receipt of submittals.
 - b. Such substitutions or modifications, if acceptable to the Design Team, shall be coordinated and incorporated in the work at the sole expense of the Contractor.
 - c. Compensation for Additional Services: Should additional work by the Design Team, such as design, drafting, meetings and/or visits be required, which are necessitated for the review and/or incorporation of the Contractor-requested substitution, including indirect effects on other portions of the work, the Contractor is responsible for paying for additional work at the standard billing rates plus out-of-pocket expenses incurred at cost + 10%.
 - d. Contractor is responsible for means and methods and any impacts on other portions of the work that may arise from this substitution.

1.7 SUBMITTALS – PART B (FOR RECORD)

- A. Submittal Schedule for all Part A submittal items.
- B. Welding certificates for all welders that will perform work for this project..
- C. Welding Procedures: Submit for record written welding procedures for all joints not prequalified by Section 2 of AWS D1.1. Submit all welding and qualification procedures to the Testing Agency for Approval before submitting to Design Team.
- D. Qualification Data for the Fabricator, Erector and Connection Engineer
- E. Submittal Letter: The Contractor shall submit for record a letter from the Contractor's Engineer supervising the preparation of connection designs on shop and erection drawings. A letter shall be submitted along with the first submission of Connection design calculations. It shall be signed and sealed by the Contractor's Engineer, and shall include the following:

"All connection design calculations for this project will be designed by me, or by qualified personnel under my direct supervision, to resist the loads and reactions indicated on the Contract Documents, except those connections which are completely designed on the Contract Documents."

- F. Preconstruction Survey: Submit for record. For all steel construction, before steel erection commences, perform and submit a complete survey for position and alignment at all points where construction by other trades will support steel elements, including but not limited to pockets, embedded plates, anchor rods and base plates.
- G. Source quality-control test reports.
- H. Minutes of Pre-Installation conference.
- I. Mill Test Reports: Signed by manufacturers certifying that the following products comply with requirements:
 - 1. Structural steel including chemical and physical properties.
 - 2. Bolts, nuts, and washers including mechanical properties and chemical analysis.
 - 3. Direct-tension indicators.
 - 4. Tension-control, high-strength bolt-nut-washer assemblies.
- J. Sustainable Design Submittals:
 - 1. LEED Credit: Product Data for Credit MR 4.1 and Credit MR 4.2: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
 - a. Include statement indicating costs for each product having recycled content.

1.8 CLOSEOUT SUBMITTALS

- A. Record Documentation.
- B. Sustainable Design Closeout Documentation.

1.9 QUALITY ASSURANCE

- a. Fabricator Qualifications; A qualified fabricator who participates in the AISC Quality Certification Program and is designated an AISC Certified Plant, Category STD. Fabricator shall be experienced in the preparation of shop drawings using intergrated three-dimensional modeling software parametrically linking all major structural piece marks and overall building framing model.
- b. Installer (erector) Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category CSE (minimum).
- c. Fabricator's/Contractor's Qualified Professional Engineer/Specialty Structural Engineer Qualifications: Qualified Professional Engineer(s), licensed in the State of Minnesota, with 10 years of experience being in responsible charge to work of this nature. The proposed engineer(s) shall be subject to approval of the Design Team.
- d. Comply with applicable provisions of the following specifications and documents:
 - 1. AISC's "Code of Standard Practice for Steel Buildings and Bridges."
 - 2. AISC's "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design" or "Load and Resistance Factor Design Specification for Structural Steel Buildings."
 - 3. AISC's "Specification for the Design of Steel Hollow Structural Sections."
 - 4. AISC's "Specification for Allowable Stress Design of Single-Angle Members" or "Specification for Load and Resistance Factor Design of Single-Angle Members."
 - 5. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

- e. Contractor shall assign a qualified staff member to perform quality control on their own work in the field on a daily basis, for each day work is performed. The Contractor's quality control staff shall review their own work for compliance with contract documents before the Contractor notifies the design team or others, of readiness for required inspections, tests and observations to be provided by the Owner's Representatives.
- f. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel."
- g. Pre-Design/Detailing Meeting: Prior to starting connection design and detailing, the Fabricator shall hold a meeting to verify all connection design assumptions and procedures and shop drawing preparation and submittal procedures. The Contractor shall prepare an agenda and require responsible representatives of every party who is concerned with the connection design and detailing to attend this meeting. The Contractor shall distribute meeting minutes to all parties within 5 working days of the meeting.
- h. Pre-Installation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination" and Division 01 – "Structural Tests and Special Inspections".

1.10 TEMPORARY SUPPORT OF STRUCTURAL STEEL FRAME

- A. The structure as shown on the Contract Documents is designed to withstand the design loads only when all structural elements are installed and fully connected. The Contractor shall be responsible for the analysis of all components and assemblies for stresses and displacements that may be imposed by fabrication, shipping, handling, erection, temporary conditions, construction loads, etc. The analysis of such shall be performed by the Contractor's Engineer.

1.11 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from erosion and deterioration.
- B. Store fasteners in a protected place. Bolts and nuts that become dry or rusty before use shall not be allowed.
- C. Store welding electrodes in hermetically sealed containers. Electrodes exposed to atmosphere for periods greater than those permitted shall be redried in accordance with AWS D1.1.
- D. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

1.12 OBSERVATIONS BY DESIGN TEAM

- A. Review: The Design Team will observe the construction for general compliance with the provisions of the Contract Documents during various phases of construction.

- B. Compensation for Additional Services: Should additional work by the design team such as design, drafting, meetings and/or visits be required which are necessitated by failure of the Contractor to perform the work in accordance with the Contract Documents, the Contractor is responsible for paying for additional work performed at standard billing rates plus out-of-pocket expenses incurred at cost + 10%. Additional costs for testing and inspection by the Owner shall also be compensated by the Contractor.

1.13 COORDINATION

- A. Furnish anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.
- B. Provide structural steel substrate to receive sprayed fire-resistive materials free of paint, lubricants, oils, dirt, or other contaminants which would significantly impair adhesion of sprayed materials.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified. Contractor may submit alternative product for review and approval by the design team.

2.2 STRUCTURAL-STEEL MATERIALS

- A. W-Shapes: ASTM A 992, Grade 50
- B. Channels, Angles: ASTM A 36
- C. Plate and Bar: ASTM A 36 or ASTM A 572 (Fy = 50 ksi) where indicated on drawings
- D. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B, structural tubing
- E. Steel Pipe: ASTM A53, Type E or S, Grade B.
- F. Welding Electrodes: E 70 XX, minimum. Comply with AWS requirements.

2.3 BOLTS, CONNECTORS, AND ANCHORS

- A. High-Strength Bolts, Nuts, and Washers: ASTM A325 or A490, heavy hex steel structural bolts; All bolts shall be new, not re-used.
 - 1. Finish: Plain – Typical. Mechanically deposited zinc coating, ASTM B 695, Class 50 - exposed to weather.
- B. Direct-Tension Indicators: ASTM F 959, Type 325 compressible-washer type.
 - 1. Finish: Plain – Typical. Mechanically deposited zinc coating, ASTM B 695, Class 50 - exposed to weather.

- C. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, round head steel structural bolts with splined ends; ASTM A 563 heavy hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers.
 - 1. Finish: Plain – Typical. Mechanically deposited zinc coating, ASTM B 695, Class 50 – exposed to weather
 - 2. Available Products:
 - a. LeJeune Tension Control Bolts.
 - b. Bethlehem Load Indicator Bolts.
- D. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1, Type B.
- E. Anchor Rods: ASTM F 1554, Grade as indicated on General Structural Notes and Contract Drawings, straight.
 - 1. Nuts: ASTM A 563 heavy hex carbon steel.
 - 2. Plate Washers: ASTM A 36 carbon steel.
 - 3. Washers: ASTM F 436 hardened carbon steel.
 - 4. Finish: Plain, unless noted otherwise on Contract Drawings.
- F. Threaded Rods: ASTM A 36, unless noted otherwise on Contract Drawings.
 - 1. Nuts: ASTM A 563 heavy hex carbon steel.
 - 2. Washers: ASTM A 36 carbon steel.
 - 3. Finish: Plain.
- G. Clevises and Turnbuckles: ASTM A108, Grde 1035, cold-finished carbon steel.

2.4 SHOP COATINGS

- A. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer. Color to be fabricator's standard.
- B. Galvanizing Repair Paint: ASTM A780.
- C. Bituminous Protection Coating: Carboline, Bitumastic 50

2.5 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time. $F'c = 4000$ psi minimum at 24 hours.
 - 1. Available Products:
 - a. Five Star Products:
 - 1. Five Star Grout
 - b. Master Builders: Embeco.
 - c. Sonneborn Chemrex Inc.: Sonogrout 10K.

2.6 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC's "Specification for Structural Steel Buildings."
 - 1. Camber structural-steel members where indicated.
 - 2. Identify high-strength structural steel according to ASTM A 6 and maintain markings until structural steel has been erected.

3. Mark and match-mark materials for field assembly.
 4. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.
- B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
 1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1.
 - C. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.
 - D. Cleaning: Clean and prepare steel surfaces that are to remain unpainted and/or not exposed to view or exterior conditions according to SSPC-SP 2 - "Hand Tool Cleaning". For interior steel exposed to view, clean and prepare per SSPC-SP 6 - "Commercial Blast Cleaning". For Exterior steel that is not galvanized, prepare to SSPC-SP-6. For members to be hot Dipped Galvanized, prepare to SSPC-SP-3, "Power Tool Cleaning."
 - E. Holes: Provide holes required for securing other work to structural steel and for passage of other work through steel framing members.
 1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
 2. Base-Plate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
 3. Weld threaded nuts to framing and other specialty items indicated to receive other work.
 - F. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1 and manufacturer's written instructions.

2.7 SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
 1. Joint Type:
 - a. Typical shear connections: Snug Tightened.
 - b. Moment connections: Slip Critical.
 - c. Tension/Compression Connections: Slip Critical.
- B. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.
 1. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
 2. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.

2.8 SHOP PRIMING

- A. Structural steel to be unpainted unless noted otherwise on the architectural drawings.

- B. For all steel noted as painted on the architectural drawings, shop prime steel surfaces except the following:
 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
 2. Surfaces to be field welded.
 3. Surfaces to be high-strength bolted with slip-critical connections.
 4. Surfaces to receive sprayed fire-resistive materials.
 5. Galvanized surfaces.
 6. Surfaces supporting concrete slabs, composite metal deck or shear connectors.
- C. Surface Preparation: Clean surfaces per the requirements in Section 2.6
- D. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a dry film thickness of not less than 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
 1. Apply two coats of shop paint to inaccessible surfaces after assembly or erection.

2.9 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123.
 1. Galvanize items indicated in Contract Documents.
 2. Fill vent holes and grind smooth after galvanizing.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify elevations of concrete bearing surfaces and locations of anchor rods, bearing plates, and other embedments, with steel erector present, for compliance with requirements.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place, unless otherwise indicated. See Section 1.10.

3.3 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC's "Code of Standard Practice for Steel Buildings and Bridges".
- B. Base Plates: Clean concrete bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting base plates. Clean bottom surface of base plates.
 1. Set base plates for structural members on wedges, shims, or setting nuts as required.
 2. Weld plate washers to top of base plate.

3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of base plate before packing with grout.
 4. Promptly pack grout solidly between bearing surfaces and base plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- C. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."
 - D. Align and adjust various members forming part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
 1. Level and plumb individual members of structure.
 2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.
 - E. Splice members only where indicated.
 - F. Do not use thermal cutting during erection.
 - G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.
 - H. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1 and manufacturer's written instructions. The top flanges of the beams receiving stud shear connectors shall be free of any substances that might interfere with the welding operations. During welding the steel decking panels shall be free of detrimental substances and rest tightly upon the top flange of the beam.
 - I. No trades may field cut or alter structural members without specific approval of the Structural Engineer. Submit dimensioned plan and detail sketch of proposed modification under cover of a "Request for Information" (RFI) or cloud proposed changes on shop drawings.

3.4 FIELD CONNECTIONS

- A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
 1. Joint Type:
 - a. Typical shear connections: Snug Tightened.
 - b. Moment connections: Slip Critical or fully pretensioned.
 - c. Tension/Compression Connections: Slip Critical or fully pretensioned.
- B. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.
 1. Comply with AISC's "Code of Standard Practice for Steel Buildings and Bridges" for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
 2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.

3. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.
 4. Verify that weld sizes, fabrication sequence, and equipment used for AESS will limit distortions to allowable tolerances.
 - a. Grind butt welds flush.
 - b. Grind or fill exposed fillet welds to smooth profile. Dress exposed welds.
- C. Tension Control Devices:
1. Install using electric power wrench as recommended by bolt manufacturer.
 2. Tighten until splined end of bolt is sheared off.
- D. Shear Connectors:
1. Do not weld when the temperature is below 0 degrees F.
 2. Remove standing water in deck ribs so that water is not trapped between beams and deck during welding.
 3. Ensure that surfaces of steel beams to which studs are to be welded are dry and free of paint, dirt and debris and that deck bottom is in firm contact with beam.
 4. Install studs after steel framing and metal decking are in place.
 5. Use automatic welding equipment powered to weld studs satisfactorily under site conditions.
 6. Prior to starting each day's operations, weld at least two shear studs to determine proper generator control unit and stud welder settings.
 7. Test that studs are capable of being bent 45 degrees from vertical without weld failure.
 8. Weld additional trial shear studs at request of Independent Testing Lab.

3.5 FIELD QUALITY CONTROL

- A. The Owner will engage a qualified testing and inspection agency to provide special inspection and testing services and prepare reports in accordance with Division 1, Section "Structural Tests and Special Inspections", and IBC Chapter 17 as adopted by the current Minnesota State Building Code, and the CASE/Mn Guideline for Special Structural Inspection and Testing, and other items which in the professional judgment of the Structural Engineer of Record, are critical to the integrity of the building structure.
- B. Special Inspection and Testing Criteria. Refer to Division 1, Section "Structural Tests and Special Inspections" for standard requirements and definitions.
1. Special Testing and Inspection Requirements
 - a. High Strength Bolting (Field Installed).
 - 1) General (Technical II)
 - a) Visually inspect mating surfaces and bolt type for all slip-critical bolted connections for general conformance with the contract documents prior to bolting.
 - b) Determine the requirements for bolts, nuts, washers, paint and installation/tightening standards are met.
 - c) Observe calibration procedures when such procedures are required in the contract documents and verify that selected procedure is used to tighten bolts.
 - 2) Slip Critical Bolts and Tension Bolts (Technical II)
 - a) Test bolt tightening in 10% of all bolts. Test a minimum of two bolts in each connection. Verify that all plies of connected elements have been brought into contact, at 100% of connection. Verify all tips are removed from "twist-off" bolts.

- 3) Bearing Bolts (Technical II)
 - a) Visually inspect to conform all plies of connected elements have been brought into contact, at 100% of connections. (Applies only to bolts designed for values not requiring exclusion of threads from failure plane, all other bolts require testing as for tension bolts.)
- 4) Standard
 - a) Test High Strength bolted connections per R.C.S.C. Specifications for Structural Joints Using ASTM A325 or A490 Bolts.
- b. Welding (Field)
 - 1) Fillet Welds (Technical II)
 - a) Visually inspect 100% of all fillet welds for size, length and quality per AWS D1.1.
 - 2) Partial Penetration Welds (Technical II)
 - a) Test 100% of all partial penetration welds exceeding 5/16 inch, using Ultrasonic Tester per AWS D1.1. Test 25% of all partial penetration welds less than 5/16 inch, using Magnetic Particle Testing per ASTM E109, performed on root pass on finished weld.
 - 3) Full Penetration Welds (Technical II)
 - a) Test 100% of all full penetration welds exceeding 5/16 inch, using Ultrasonic Tester per AWS D1.1. Test 25% of all full penetration welds less than 5/16 inch, using Magnetic Particle Testing per ASTM E109, performed on root pass on finished weld.
 - 4) Stud Shear Connector Welds (Technical I)
 - a) Visually inspect 100% of installed studs for full 360 degree flash. Test all questionable studs, not showing full 360 degree flash by bending studs 15 degrees from vertical, away from weld discontinuity, per AWS D1.1. All ceramic welding ferrules shall be removed by contractor. Randomly test all other studs by bending to 15 degrees from vertical as noted:
 - Studs welded through deck: 15%
 - Studs welded to bare steel: 5%
 Alternatively, sound 100% of installed studs, for full penetration weld, using an 8 lb. Maul. Test questionable studs as noted above. Welding ferrules need not be removed.
 - 5) Deck Welds and Fasteners (Technical I)
 - a) Visually inspect size, location, length and burn through for 100% of puddle welds on metal deck designed as a structural element, per AWS D1.3.
 - b) Visually inspect sidelap fasteners to meet spacing and size specified.
 - 6) Welding of Reinforcing Bars (Technical II)
 - a) Be continuously present during welding and visually inspect 100% of all reinforcing bar welds as the welding is performed, per AWS D1.4. Verify proper joint preparation is provided and proper electrodes are used and properly store and dried.
- c. Mechanical Fasteners (Misc.)
 - 1) Fasteners (Technical I)
 - a) Visually inspect specified size, spacing, embedment, and location of expansion bolts and adhesive bonded bolts in connections shown on the structural drawings.

d. Structural Configuration

- 1) Submittals (Structural I)
 - a) Verify mill test reports and other submitted documentation for compliance with contract documents.
- 2) Materials (Technical I)
 - a) Verify materials delivered to site comply with contract documents and approved shop drawings. Materials include bolts, electrodes, mechanical fasteners and deck gauge.
- 3) Detail Compatibility (Structural I) On a periodic basis:
 - a) Review project documents affecting integrity of the structure, including contract documents and pertinent submittals (approved shop drawings)
 - b) Visit site, at intervals appropriate to the stage of construction, to perform review of the structure and visually confirm general compliance with the project documents.
 - c) Inspect the following to verify member orientation, configuration, type and size comply with details indicated on the contract documents and approved shop drawings:
 - Bracing and stiffening members.
 - Proper applications of joint details at connections for structural members.
 - Other work critical to the integrity of the building structure.

e. General (Technical I)

- 1) Verify that all mill certificates and welder certifications comply with the requirements set forth in this specification.

2. Conventional Testing and Inspection Requirements

a. High Strength Bolting

- 1) Bolt Material Test (Technical II)
 - a) Test a minimum of two bolts of each ASTM class specified, for bolt hardness and tensile properties.
- 2) Fabrication and Erection Tolerances (Owner's Construction Manager)
 - a) Verify in-place structure satisfies specified tolerances.

- C. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

3.6 REPAIRS AND PROTECTION

- A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Touchup Painting: After installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists and accessories, and abutting structural steel.
1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
 2. Apply a compatible primer of same type as shop primer used on adjacent surfaces.
- C. Touchup Painting: Cleaning and touchup painting are specified in Division 09 painting Sections.

END OF SECTION 05120

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**SECTION 05310 – STEEL ROOF
DECK**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Roof deck.
- B. Related Requirements:
 - 1. Division 01 Section "Structural Testing and Special Inspections".
 - 2. Division 05 Section "Structural Steel".
 - 3. Division 07 Sections for thermal and moisture protection, and applied fireproofing.
 - 4. Division 09 Sections for painting and coating of exposed deck.

1.3 SUBMITTALS FOR REVIEW

- A. Product Data: For each type of deck, accessory, and product indicated.
 - 1. Include name of deck manufacturer as well as type, depth, gauge and finish of deck.
- B. Shop Drawings:
 - 1. Show layout and types of deck panels, anchorage details, attachment patterns, field welding requirements, side lap fastenings, pans, cut deck openings, special jointing, accessories, and attachments to other construction required for complete installation of decking.
 - 2. Describe types and locations of acoustical materials and closures.
 - 3. Include deck manufacturer's ICBO Approval Number.
- C. Certificates:
 - 1. Product Certificates: For each type of steel deck, signed by product manufacturer.
 - 2. Welding certificates signed by contractor certifying that welders comply with requirements of Article 1.5 – "Quality Assurance."
- D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that each of the following complies with requirements:
 - 1. Powder-actuated mechanical fasteners.
 - a. Substitute for deck welds at contractor's option. Product data and test reports shall demonstrate fasteners have equal or greater capacity than welds indicated and are suitable for attachment to base material.

- E. FMG Listings for description of roofing products evaluated to meet minimum requirements for Factory Mutual Research Approval recognition.
- F. Sustainable Design Submittals:
 - 1. LEED Credit: Product Data for Credit MR 4.1 and Credit MR4.2 (if required):
For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
 - a. Include statement indicating costs for each product having recycled content.

1.4 CLOSEOUT SUBMITTALS

- A. Sustainable Design Closeout Documentation.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Fabricate panels to comply with dimensional parameters as defined in "Design Manual for Composite Decks, Form Decks, and Roof Decks" in SDI Publication No. 31. Section properties shall be based in accordance with the AISI Specification for the Design of Cold-Formed Steel Structural Members.
- B. Installer Qualifications: An experienced installer who has completed steel deck similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1 and D1.3 Structural Welding Codes.
- D. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 for testing indicated.
- E. FMG Listing: Provide steel roof deck evaluated by FMG and listed in its "Approval Guide, Building Materials" for Class 1 fire rating and Class1-90 windstorm ratings.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.
- B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.
 - 1. Protect and ventilate acoustical cellular roof deck with factory-installed insulation to maintain insulation free of moisture.
- C. Keep construction loads and stored materials, including other decking, off steel deck until it is permanently fastened and inspected.
- D. Do not overload deck beyond 75% rated capacity with stored materials or equipment.

1.7 COORDINATION

- A. Coordinate installation of sound-absorbing insulation strips in topside ribs of acoustical deck with roofing installation specified in Division 07 Sections for thermal and moisture protection to ensure protection of insulation strips against damage from effects of weather and other causes.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. Canam Steel Corp.
 2. Epic Metals Corporation.
 3. Nucor Corp.; Vulcraft Division.
 4. United Steel Deck, Inc.
 5. Verco Manufacturing Co.
 6. Wheeling Corrugating Company.

2.2 ROOF DECK

- A. Steel Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:
 1. Prime-Painted Steel Sheet: ASTM A 1008, Grade 40 minimum, shop primed with manufacturer's standard baked-on, rust-inhibitive primer.
 - a. Color: Manufacturer's standard.
 2. Galvanized Steel Sheet: ASTM A 653, Grade 40 zinc coating.
 3. Galvanized and Shop-Primed Steel Sheet: ASTM A 653, Grade 40, G60 zinc coating; cleaned, pretreated, and primed with manufacturer's standard baked-on, rust-inhibitive primer.
 - a. Color: Manufacturer's Standard.
 4. Aluminum-Zinc-Alloy-Coated Steel Sheet: ASTM A 792/A 792M, Structural Steel (SS), Grade 33 minimum, AZ50 aluminum-zinc-alloy coating (Galvalume).
 5. Deck Profile: As indicated on Drawings.
 6. Profile Depth: As indicated on Drawings.
 7. Design Uncoated-Steel Thickness: As indicated on Drawings.
 8. Design Uncoated-Steel Thicknesses; Deck Unit/Bottom Plate: As indicated on Drawings.
 9. Span Condition: Three span minimum, unless noted otherwise on drawings.
 10. Side Laps: As indicated on drawings.

2.3 ACCESSORIES

- A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.
- B. Mechanical Fasteners: Corrosion-resistant, austempered, powder-actuated or pneumatically driven carbon-steel fasteners with knurled shank.

- C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.
- D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.
- E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 40,000 psi, of same thickness, material and finish as deck; of profile indicated or required for application.
- F. Flat Sump Plate: Single-piece steel sheet, 0.0747 inch thick (14-ga), of same material and finish as deck. For drains, cut holes in the field.
- G. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035, with dry film containing a minimum of 94 percent zinc dust by weight.
- H. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.

3.2 INSTALLATION, GENERAL

- A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 31, manufacturer's written instructions, and requirements in this Section.
- B. Install temporary shoring before placing deck panels, if required to meet deflection limitations.
- C. Locate deck bundles to prevent overloading of supporting members.
- D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.
 - 1. Align cellular deck panels over full length of cell runs and align cells at ends of abutting panels.
- E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.
- F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.
- G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.

- H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.
- I. Mechanical fasteners may be used in lieu of welding to fasten deck at contractor's option. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

3.3 ROOF-DECK INSTALLATION

- A. Fasten roof-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter that is not less than 1-1/2 inches long, and as follows:
 - 1. Weld Diameter: 5/8 inch, nominal.
 - 2. Weld Spacing: Space welds as indicated on Drawings.
 - 3. Cover weld burn holes with metallic tape.
- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals as indicated on Drawings, and as follows:
 - 1. Mechanically fasten with self-drilling, No. 10 diameter or larger, carbon-steel screws.
 - 2. If deck is 0.0474 inches thick (18-ga) or more, fastenings may be welded with a minimum of 1-1/2-inch- long welds.
- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:
 - 1. End Joints: Lapped 2 inches minimum.
- D. Roof Sump Pans and Sump Plates: Install over openings provided in roof deck and weld flanges to top of deck. Space welds not more than 8 inches apart with at least one weld at each corner.
 - 1. Install reinforcing channels or zees in ribs to span between supports and weld.
- E. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld to substrate to provide a complete deck installation.
 - 1. Weld cover plates at changes in direction of roof-deck panels, unless otherwise indicated.
- F. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer's written instructions to ensure complete closure.
- G. Rubber Gaskets: At all roof areas where no roofing materials or insulation is provided over the steel roof decking, such as the canopy area, provide rubber gaskets for all tek screws capable of preventing water leakage through the decking.

3.4 PROTECTION AND REPAIR

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Repair Painting: Wire brush and clean rust spots, welds, and abraded areas on both surfaces of prime-painted deck immediately after installation, and apply repair paint.
 - 1. Apply repair paint, of same color as adjacent shop-primed deck, to bottom surfaces of deck exposed to view.
- C. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.
- D. No hangers, fasteners or loads shall be hung from the underside of the deck unless specifically indicated thus on the structural drawings. Such items as mechanical/electrical equipment, utility lines, architectural bulkheads, ceilings, signage, etc, shall have their own sub-framing designed, supplied and installed by their related trade, as required span to adjacent beams, joists or walls for any support needed.

3.5 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports in accordance with Division 01 Section "Structural Testing and Special Inspections".
- B. Inspections:
 - 1. Visually inspect size, location, length and burn-through for 100% of puddle welds on metal deck, per AWS D1.3, Section 6. (Technical I).
 - 2. Visually inspect size, location, and seating for 100% of powder-actuated or pneumatically driven fasteners on metal deck, per AWS D1.3, Section 6. (Technical I).
 - 3. Report inspection results promptly and in writing to Contractor and Architect.
- C. Inspection Procedure:
 - 1. After five to ten squares of roof deck have been erected, arrange for inspection agency to visually inspect fastening system for size, quality and spacing at interior supporting members, perimeter supports and side laps.
 - 2. Demonstrate corrective procedures for deficiencies found by inspection agency to satisfaction of the Architect and inspection agency before erection of roof deck is resumed.
 - 3. Use approved fastening system, including corrective procedures, as standard for comparison for remaining deck fastening.
 - 4. When erection of roof deck is completed, but before placing roofing materials, arrange for inspection agency to make inspection of complete deck installation and submit written report to Architect.
- D. Deck panels shall be clean, dry, and in firm contact with substrate prior to welding.
- E. Remove and replace work that does not comply with specified requirements.

- F. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

END OF SECTION 05310

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**SECTION 05400 – COLD-FORMED
METAL FRAMING**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Exterior and interior load-bearing wall framing.
 - 2. Exterior and interior non-load-bearing wall framing.
 - 3. Engineered design by Contractor's Specialty Structural Engineer.
- B. Related Requirements:
 - 1. Division 01 – Structural Testing and Special Inspections.
 - 2. Division 03 – Cast-In-Place Concrete.
 - 3. Division 05 – Structural Steel Framing.
 - 4. Division 05 – Metal Fabrications.
 - 5. Division 09 Section "Non-Structural Metal Framing" for interior non-load-bearing, metal-stud framing and ceiling-suspension assemblies.
 - 6. Division 09 Section "Gypsum Board Shaft Wall Assemblies" for interior non-load-bearing, metal-stud-framed, shaft-wall assemblies.

1.3 REFERENCES

- A. AISI – North American Specification for the Design of Cold-Formed Steel Structural Members.
- B. AWS D1.1 – Structural Welding Code.
- C. AWS D1.3
- D. LGSEA's Technical Note 551e, "Design Guide for Permanent Bracing of Cold-Formed Steel Trusses."

1.4 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated.
 - 1. Design Loads: As indicated on drawings
 - 2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than indicated on the drawings.

3. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.
 4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:
 - a. Upward and downward movement of $L/360$ where L is the span in inches.
- B. Cold-Formed Steel Framing, General: Design according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions."
1. Headers: Design according to AISI's "Standard for Cold-Formed Steel Framing - Header Design."
 2. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of cold-formed metal framing product and accessory indicated.
- B. Shop Drawings: Show layout, spacings, sizes, thicknesses, and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.
- C. Calculations: For cold-formed metal framing indicated to comply with design loads, include structural analysis data signed and sealed by Qualified Professional Engineer licensed in the State of Minnesota. Submit calculations at the same time as shop drawings.

1.6 INFORMATIONAL SUBMITTALS

- A. Submittal Schedule for all action submittal items.
- B. Welding certificates.
- C. Product Test Reports: From a qualified testing agency, unless otherwise stated, indicating that each of the following complies with requirements, based on evaluation of comprehensive tests for current products:
 1. Steel sheet.
 2. Expansion anchors.
 3. Power-actuated anchors.
 4. Mechanical fasteners.
 5. Vertical deflection clips.
 6. Horizontal drift deflection clips
 7. Miscellaneous structural clips and accessories.
- D. Research/Evaluation Reports: For cold-formed metal framing.

- E. Sustainable Design Submittals:
 1. LEED Credit: Product Data for Credit MR 4.1 and Credit MR 4.2 if required: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
 2. Include statement indicating costs for each product having recycled content.

1.7 CLOSEOUT SUBMITTALS

- A. Sustainable Design Closeout Documentation.

1.8 QUALITY ASSURANCE

- A. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer.
- B. Professional Engineer Qualifications: A professional engineer who is licensed in the State of Minnesota and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of cold-formed metal framing that are similar to those indicated for this Project in material, design, and extent.
- C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct the testing indicated.
- D. Product Tests: Mill certificates or data from a qualified independent testing agency, indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.
- E. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."
- F. Fire-Test-Response Characteristics: Where indicated, provide cold-formed metal framing identical to that of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
- G. AISI Specifications and Standards: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and its "Standard for Cold-Formed Steel Framing - General Provisions."
 1. Comply with AISI's "Standard for Cold-Formed Steel Framing - Truss Design."
 2. Comply with AISI's "Standard for Cold-Formed Steel Framing - Header Design."
- H. Comply with AISI's "Standard for Cold-Formed Steel Framing - Prescriptive Method for One and Two Family Dwellings."
- I. Pre-Installation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling.
- B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering cold-formed metal framing that may be incorporated into the Work include, but are not limited to, the following:
 - 1. AllSteel Products, Inc.
 - 2. Clark Steel Framing.
 - 3. Dale/Incor.
 - 4. Dietrich Metal Framing; a Worthington Industries Company.
 - 5. MarinoWare, a division of Ware Industries.
 - 6. SCAFCO Corporation
 - 7. The Steel Network.
 - 8. Super Stud Building Products, Inc.
 - 9. United Metal Products, Inc.

2.2 MATERIALS

- A. Steel Sheet: ASTM A 1003, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
 - 1. Grade: ST33H minimum or as required by structural performance.
 - 2. Coating: G60 or equivalent.
- B. Steel Sheet for Vertical Deflection or Drift Clips: ASTM A 653, structural steel, zinc coated, of grade and coating as follows:
 - 1. Grade: As required by structural performance.
 - 2. Coating: G60.

2.3 LOAD-BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: 18 gage (0.0428 inch).
 - 2. Flange Width: Minimum 1-5/8 inches with ½ inch returns.
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: 18 gage (0.0428 inch).
 - 2. Flange Width: 1-1/4 inches.

- C. Steel Box or Back-to-Back Headers: Manufacturer's standard C-shapes used to form header beams, of web depths indicated, punched, with stiffened flanges, and as follows:
 1. Minimum Base-Metal Thickness: 18 gage (0.0428 inch).
 2. Flange Width: Minimum 1-5/8 inches with ½ inch returns.

2.4 NON-LOAD-BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
 1. Minimum Base-Metal Thickness: 18 gage (0.0428 inch).
 2. Flange Width: Minimum 1-5/8 inches with ½ inch returns.
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
 1. Minimum Base-Metal Thickness: 18 gage (0.0428 inch).
 2. Flange Width: 1-1/4 inches.
- C. Vertical Deflection Clips: Manufacturer's standard bypass clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.
 1. Available Manufacturers: As per Section 2.1.
- D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal and lateral loads and transfer them to the primary structure, and as follows:
 1. Available Manufacturers: As per Section 2.1.
 2. Minimum Base-Metal Thickness: 18 gage or (0.0428 inch).
 3. Flange Width: 1 inch plus twice the design gap.
- E. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure.

2.5 FRAMING ACCESSORIES

- A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.
- B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
 1. Supplementary framing.
 2. Bracing, bridging, and solid blocking.
 3. Web stiffeners.
 4. Anchor clips.
 5. End clips.
 6. Foundation clips.
 7. Gusset plates.
 8. Stud kickers, knee braces, and girts.
 9. Joist hangers and end closures.

- 10. Hole reinforcing plates.
- 11. Backer plates.

2.6 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A 36, zinc coated by hot-dip process according to ASTM A 123.
- B. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.
- C. Powder-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.
- D. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.
 - 1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.
- E. Welding Electrodes: Comply with AWS standards.

2.7 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: ASTM A 780.
- B. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.
- C. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C 1107, with fluid consistency and 30-minute working time.
- D. Shims: Load bearing, high-density multimonomer plastic, nonleaching.
- E. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

2.8 FABRICATION

- A. Fabricate cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.
 - 1. Fabricate framing assemblies using jigs or templates.
 - 2. Cut framing members by sawing or shearing; do not torch cut.

3. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.
 4. Fasten other materials to cold-formed metal framing by welding, bolting, or screw fastening, according to Shop Drawings.
- B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.
- C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
 2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.
1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.
- B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that are required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.
- C. Install load bearing shims or grout between the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations to ensure a uniform bearing surface on supporting concrete or masonry construction.
- D. Install sealer gaskets to isolate the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations.

3.3 INSTALLATION, GENERAL

- A. Cold-formed metal framing may be shop or field fabricated for installation, or it may be field assembled.
- B. Install cold-formed metal framing according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions" and to manufacturer's written instructions unless more stringent requirements are indicated.
- C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.
 - 1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.
- D. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened.
 - 1. Cut framing members by sawing or shearing; do not torch cut.
 - 2. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.
- E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.
- F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.
- G. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.
- H. Install insulation, specified in Division 07 Section "Thermal Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.
- I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.
- J. At openings in all exterior or bearing walls, provide additional studs as indicated on drawings.

- K. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
 - 1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 LOAD-BEARING WALL INSTALLATION

- A. Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor at corners and ends, and at spacings as follows:
 - 1. Anchor Spacing: As shown on drawings.
- B. Squarely seat studs against top and bottom tracks with gap not exceeding of 1/8 inch between the end of wall framing member and the web of track. Fasten both flanges of studs to top and bottom tracks. Space studs as follows:
 - 1. Stud Spacing: 16 inches on center max spacing. Tighten spacing if required for loads.
- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar configurations.
- D. Align studs vertically where floor framing interrupts wall-framing continuity. Where studs cannot be aligned, continuously reinforce track to transfer loads.
- E. Align floor and roof framing over studs. Where framing cannot be aligned, continuously reinforce track to transfer loads.
- F. Anchor studs abutting structural columns or walls, including masonry walls, to supporting structure as indicated.
- G. Install headers over wall openings wider than stud spacing. Locate headers above openings as indicated. Fabricate headers of compound shapes indicated or required to transfer load to supporting studs, complete with clip-angle connectors, web stiffeners, or gusset plates.
 - 1. Frame wall openings with not less than a double stud at each jamb of frame as indicated on Shop Drawings. Fasten jamb members together to uniformly distribute loads.
 - 2. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with clip angles or by welding, and space jack studs same as full-height wall studs.
- H. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing.
 - 1. If type of supplementary support is not indicated, comply with stud manufacturer's written recommendations and industry standards in each case, considering weight or load resulting from item supported.

- I. Install horizontal bridging in stud system, spaced as indicated on Shop Drawings. Fasten at each stud intersection.
 - 1. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs with a minimum of 2 screws into each flange of the clip angle for framing members up to 6 inches deep.
- J. Install steel sheet diagonal bracing straps to both stud flanges, terminate at and fasten to reinforced top and bottom tracks. Fasten clip-angle connectors to multiple studs at ends of bracing and anchor to structure.
- K. Install miscellaneous framing and connections, including supplementary framing, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.5 NON-LOAD-BEARING WALL INSTALLATION

- A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.
- B. Fasten both flanges of studs to top and bottom track, unless otherwise indicated. Space studs as follows:
 - 1. Stud Spacing: As indicated on drawings to support architectural wall finish.
- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.
- D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
 - 1. Install single-leg deflection tracks and anchor to building structure
OR
 - 2. Connect vertical deflection clips to bypassing studs and anchor to building structure.
- E. Install horizontal bridging in wall studs, spaced in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.
 - 1. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches of single deflection track. Install a combination of flat, taut, steel sheet straps of width and thickness indicated and stud or stud-track solid blocking of width and thickness matching studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
 - a. Install solid blocking at centers indicated on Shop Drawings.
 - 2. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
- F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable wall-framing system.

3.6 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage a qualified special inspector and independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Field and shop welds will be subject to testing and inspecting.
- C. Testing agency will report test results promptly and in writing to Contractor and Architect.
- D. Remove and replace work where test results indicate that it does not comply with specified requirements.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.7 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure that cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05400

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**SECTION 05500 – METAL
FABRICATIONS**

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Steel framing and supports for applications where framing and supports are not specified in other Sections.
- B. Related Sections:
 - 1. Division 05 Section 05700, "Ornamental Metal."
 - 2. Division 08 Section 08460, "Automatic Entrance Doors."
 - 3. Division 08 Section 08385, "High-Speed Overhead Doors."
 - 4. Division 08 Section 08801, "Interior Glazing."
 - 5. Division 10 Section 10435, "Roadway Signage."
 - 6. Division 11 Section 11400, "Food Service Equipment."
 - 7. Division 12 Section 12494, "Motorized Roller Shades."

1.3 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Paint products.
 - 2. Grout
- B. LEED Submittals:
 - 1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
- C. Shop Drawings: Show fabrication and installation details for metal fabrications.
 - 1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

1.4 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

1.5 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code – Steel."

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrication exposed to view in the complete Work, provide materials without seam marks, roller marks, rolled trade names or blemishes

2.2 FERROUS METALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Steel Tubing: ASTM A 500, cold-formed steel tubing.
- C. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40) unless otherwise indicated.
- D. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.
 - 1. Size of Channels: 1-5/8 by 1-5/8 inches (41 by 41 mm).
 - 2. Material: Cold-rolled steel, ASTM A 1008/A 1008M, commercial steel, Type B; 0.0677 inch (1.7 mm) minimum thickness; coated with rust-inhibitive, baked-on, acrylic enamel.
- E. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/1 47M, unless otherwise indicated.

2.3 FASTENERS

- A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade and class required.
- B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with hex nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.
- C. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicates; with nuts, ASTM A 563; and, where indicated, flat washers.
 - 1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.
- D. Eyebolts: ASTM A 489.
- E. Machine Screws: ASME B18.6.3 (ASME B18.6.7M).

- F. Lag Screws: ASME B18.2.1 (ASME B18.2.3.8M).
- G. Wood Screws: Flat head, ASME B18.6.1.
- H. Plain Washers: Round, ASME B18.22.1 (ASME B18.22M).
- I. Lock Washers: Helical, spring type, ASME B17.21.1 (ASME B18.21.2M).
- J. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six (6) times the load imposed when installed in unit masonry and four (4) times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
- K. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.
 - 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941 (ASTM F 194M), Class Fe/Zn 5, unless otherwise indicated.
 - 2. Material for Exterior Locations and Where Stainless Steel is Indicated: Alloy Group 1 (A1) stainless-steel bolts, ASTM F 593 (ASTM F 738M), and nuts, ASTM F 594 (ASTM F 836M).
- L. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8 by 7/8 inches (41 by 22mm) by length indicated with anchor straps or studs not less than 3 inches (75 mm) long at not more than 8 inches (200mm) o.c. Provide with temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B 633, Class Fe/Zn 5, as needed for fastening to inserts.

2.4 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Shop Primers: Provide primers that comply with Division 09 painting Sections and Division 09 Section "High-Performance Coatings."
- C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.
- D. Non-shrink, Non-metallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- E. Concrete: Comply with requirements in Division 03 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum twenty-eight (28) day compressive strength of 3000 psi (20 MPa).

2.5 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to the greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work with accurate angles and surfaces with straight edges.
- E. Weld corners and seams continuously to comply with the following:
 - 1. Use materials and method that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.
- F. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- G. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- H. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
 - 1. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches (3.2 by 38 mm), with a minimum 6 inch (150 mm) embedment and 2 inch (50 mm) hook, not less than 8 inches (200 mm) from ends and corners of units and 24 inches (600 mm) o.c., unless otherwise indicated.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
- B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
 - 1. Fabricate units from slotted channel framing where indicated.
 - 2. Furnish inserts for units installed after concrete is placed.
- A. Galvanize miscellaneous framing and supports where indicated.
- B. Prime miscellaneous framing and supports with primer specified in Division 09 Section "Painting."

2.9 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish metal fabrications after assembly.
- C. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.10 STEEL AND IRON FINISHES

- A. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
 - 2. Shop prime with primers specified in Division 09 Section, "Painting."
- B. Preparation for Shop Priming: Prepare surfaces to comply with requirements indicated below:
 - 1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3 "Commercial Blast Cleaning."
 - 3. Items Indicated to Receive Primers Specified in Division 09 Section "High-Performance Coatings:" SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 4. Other Items: SSPC-SP 3, "Power Tool Cleaning."
- C. Shop Priming: Apply shop primer to comply with SSOPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
 - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Cutting, Fitting and Placement: Perform cutting, drilling and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment and elevation; with edges and surfaces level, plumb, true and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitation. Do not weld, cut or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.

4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws and other connectors.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

3.3 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erections, clean field welds, bolted connections and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting and to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 1. Apply by brush or spray to provide a minimum 2.0 mil (0.05 mm) dry film thickness.
- B. Galvanized Surfaces: Clean field welds, bolted connections and abraded areas and repair galvanizing to comply with ASTM A 780. Apply Galvanizing Repair Compound in accordance with manufacturer's recommendations.
 1. Apply by brush or spray to provide a minimum 1.5 mil (0.04 mm) dry film thickness.

END OF SECTION 05500

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**SECTION 05521
PIPE AND TUBE RAILINGS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Steel pipe and tube railings.
 - 2. Wire mesh balustrade infills.
- B. Related Sections:
 - 1. Division 10 Section "Walkway Covers" for pedestrian ramp canopies and supporting metal structures attached to railings.

1.3 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design railings, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. General: In engineering railings to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:
 - 1. Steel: 72 percent of minimum yield strength.
- C. Structural Performance: Railings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Handrails and Top Rails of Guards:
 - a. Uniform load of 50 lbf/ ft. applied in any direction.
 - b. Concentrated load of 200 lbf applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 - 2. Infill of Guards:
 - a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft.
 - b. Infill load and other loads need not be assumed to act concurrently.
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing

buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

- E. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.4 ACTION SUBMITTALS

- A. Product Data: For the following:
1. Manufacturer's product lines of mechanically connected railings.
 2. Railing brackets.
 3. Grout, anchoring cement, and paint products.
- B. LEED Submittals:
1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
- C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
- D. Samples for Verification: For each type of exposed finish required.
1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters.
 2. Fittings and brackets.
- E. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified professional engineer.
- B. Mill Certificates: Signed by manufacturers of stainless-steel products certifying that products furnished comply with requirements.
- C. Welding certificates.
- D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.
- E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, according to ASTM E 894 and ASTM E 935.

1.6 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of railing from single source from single manufacturer.
- B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

1.8 COORDINATION AND SCHEDULING

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- C. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Steel Pipe and Tube Railings:
 - a. Pisor Industries, Inc.
 - b. Wagner, R & B, Inc.; a division of the Wagner Companies.

2.2 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.

2.3 STEEL AND IRON

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Tubing: ASTM A 500 (cold formed) or ASTM A 513.
- C. Pipe: ASTM A 53/A 53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.
 - 1. Provide galvanized finish for exterior installations and where indicated.
- D. Plates, Shapes, and Bars: ASTM A 36/A 36M.
- E. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.
- F. Woven-Wire Mesh: Intermediate-crimp, square pattern, 2-inch woven-wire mesh, made from 0.135-inch nominal diameter wire complying with ASTM A 510.

2.4 FASTENERS

- A. General: Provide the following:
 - 1. Hot-Dip Galvanized Railings: Type 304 stainless-steel or hot-dip zinc-coated steel fasteners complying with ASTM A 153/A 153M or ASTM F 2329 for zinc coating.
- B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.
- C. Fasteners for Interconnecting Railing Components:
 - 1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless exposed fasteners are unavoidable or are the standard fastening method for railings indicated.
- D. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
 - 1. Material for Exterior Locations and Where Stainless Steel is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

2.5 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
 - 1. Provide type and alloy as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.

- B. Etching Cleaner for Galvanized Metal: Complying with MPI#25.
- C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.
- D. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- E. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.
 - 1. Water-Resistant Product: Provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

2.6 FABRICATION

- A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.
- B. Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- D. Form work true to line and level with accurate angles and surfaces.
- E. Fabricate connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- G. Connections: Fabricate railings with welded connections unless otherwise indicated.
- H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove flux immediately.
 - 4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.

- I. Nonwelded Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
 - 1. Fabricate splice joints for field connection using an epoxy structural adhesive if this is manufacturer's standard splicing method.
- J. Form changes in direction as follows:
 - 1. As detailed or by bending or inserting prefabricated elbow fittings.
- K. Bend members in jigs to produce uniform curvature for each configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- L. Close exposed ends of railing members with prefabricated end fittings.
- M. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.
- N. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.
- O. For railing posts set in concrete, provide sleeves not less than 6 inches long with inside dimensions not less than 1/2 inch greater than outside dimensions of post, with metal plate forming bottom closure.
- P. For removable railing posts, fabricate slip-fit sockets from tube or pipe whose ID is sized for a close fit with posts; limit movement of post without lateral load, measured at top, to not more than one-fortieth of post height. Provide socket covers designed and fabricated to resist being dislodged.
- Q. Woven-Wire Mesh Infill Panels: Fabricate infill panels from woven-wire mesh crimped into 1-by-1/2-by-1/8-inch metal channel frames. Make wire mesh and frames from same metal as railings in which they are installed.
 - 1. Orient wire mesh with wires horizontal and vertical.
- R. Toe Boards: Where indicated, provide toe boards at railings around openings and at edge of open-sided floors and platforms. Fabricate to dimensions and details indicated.
- S. End Caps: Where railing posts are shown as open sleeves for acceptance of walkway cover support structure, provide removable fitted end caps of same material and finish as pipe railings.

2.7 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

2.8 STEEL AND IRON FINISHES

- A. Galvanized Railings:
 1. Hot-dip galvanize exterior steel and iron railings, including hardware, after fabrication.
 2. Comply with ASTM A 123/A 123M for hot-dip galvanized railings.
 3. Comply with ASTM A 153/A 153M for hot-dip galvanized hardware.
 4. Fill vent and drain holes that will be exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.
- B. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Fit exposed connections together to form tight, hairline joints.
- B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
 1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
 2. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
 3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.
- C. Adjust railings before anchoring to ensure matching alignment at abutting joints.
- D. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.2 RAILING CONNECTIONS

- A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.

3.3 ANCHORING POSTS

- A. Use metal sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions.
- B. Form or core-drill holes not less than 5 inches deep and 3/4 inch larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions.
- C. Cover anchorage joint with flange of same metal as post, attached to post with set screws.
- D. Leave anchorage joint filler sloped away from post.
- E. Anchor posts to metal surfaces with oval flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:
 - 1. For steel pipe railings, weld flanges to post and bolt to metal supporting surfaces.
- F. Install removable railing sections, where indicated, in slip-fit metal sockets cast in concrete.

3.4 ATTACHING RAILINGS

- A. Secure wall brackets and railing end flanges to building construction as follows:
 - 1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
 - 2. For hollow masonry anchorage, use toggle bolts.
 - 3. For steel-framed partitions, use self-tapping screws fastened to steel framing or to concealed steel reinforcements.

3.5 ADJUSTING AND CLEANING

- A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

3.6 PROTECTION

- A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

END OF SECTION 05521

**NEW PASSENGER TERMINAL
DULUTH INTERNATIONAL AIRPORT
DULUTH, MINNESOTA**

**SECTION 05530 - METAL
GRATINGS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Metal bar gratings.
- B. Related Sections include the following:
 - 1. Division 05 Section 05500, "Metal Fabrications" for support components.

1.3 PERFORMANCE REQUIREMENTS

- A. Structural Performance of Gratings: Provide gratings capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Walkways Used as Exits: Uniform load of 100 psf or concentrated load of 300 lbf, whichever produces the greater stress.
 - 2. Limit deflection to L/240 or 1/4 inch, whichever is less.

1.4 ACTION SUBMITTALS

- A. LEED Submittals:
 - 1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. Provide templates for anchors and bolts specified for installation under other Sections.

2. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

- A. Mill Certificates: Signed by manufacturers of stainless-steel sheet certifying that products furnished comply with requirements.
- B. Welding certificates.
- C. Qualification Data: For professional engineer.

1.6 QUALITY ASSURANCE

- A. Metal Bar Grating Standards: Comply with NAAMM MBG 531, "Metal Bar Grating Manual" and NAAMM MBG 532, "Heavy-Duty Metal Bar Grating Manual."
- B. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel."

1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with gratings by field measurements before fabrication and indicate measurements on Shop Drawings.
 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating gratings without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.
 2. Provide allowance for trimming and fitting at site.

1.8 COORDINATION

- A. Coordinate installation of anchorages for gratings, grating frames, and supports. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Metal Bar Gratings:
 - a. Alabama Metal Industries Corporation.
 - b. All American Grating, Inc.
 - c. Barnett/Bates Corp.
 - d. Fisher & Ludlow.
 - e. IKG Industries; a Harsco Company.
 - f. Marwas Steel Co.; Laurel Steel Products Division.
 - g. McNichols Company
 - h. Ohio Gratings, Inc.
 - i. Seidelhuber Metal Products, Inc.
 - j. Tru-Weld.

2.2 FERROUS METALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Wire Rod for Grating Crossbars: ASTM A 510.

2.3 FASTENERS

- A. General: Unless otherwise indicated, provide Type 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, at exterior walls. Provide stainless-steel fasteners for fastening aluminum. Select fasteners for type, grade, and class required.
- B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.
- C. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, nuts, and, where indicated, flat washers; ASTM F 593 for bolts and ASTM F 594 for nuts, Alloy Group 1.
- D. Plain Washers: Round, ASME B18.22.1.
- E. Lock Washers: Helical, spring type, ASME B18.21.1.

2.4 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy that is welded.

- B. Shop Primers: Provide primers that comply with Division 09 painting Sections.
- C. Select paragraph above or one of two paragraphs and associated subparagraphs below if gratings are to be painted. Because paint wears off easily under foot traffic, it should generally not be relied on to provide protection from corrosion.
- D. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.
- E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.5 FABRICATION

- A. Shop Assembly: Fabricate grating sections in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch material cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form from materials of size, thickness, and shapes indicated, but not less than that needed to support indicated loads.
- D. Fit exposed connections accurately together to form hairline joints.
- E. Welding: Comply with AWS recommendations and the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
- F. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space the anchoring devices to secure gratings, frames, and supports rigidly in place and to support indicated loads.
 - 1. Toeplate Height: 4 inches, unless otherwise indicated.

2.6 METAL BAR GRATINGS

- A. Welded Steel Grating:
 - 1. Bearing Bar Spacing: As indicated on drawings.
 - 2. Bearing Bar Depth: As indicated on drawings.

3. Bearing Bar Thickness: As required to comply with structural performance requirements.
4. Crossbar Spacing: As required to comply with structural performance requirements.
5. Grating Mark: As indicated.
6. Traffic Surface: Serrated.
7. Steel Finish: Hot-dip galvanized with a coating weight of not less than 1.8 oz./sq. ft. of coated surface.

2.7 STEEL FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish gratings, frames, and supports after assembly.
- C. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing gratings. Set units accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
- B. Fit exposed connections accurately together to form hairline joints.
 1. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade the surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections. Delete paragraph below if no toeplates or if they are attached in shop. Delete paragraph and subparagraphs below if no gratings are installed by welding and no grating frames require field welding.

3.2 INSTALLING METAL BAR GRATINGS

- A. General: Install gratings to comply with recommendations of referenced metal bar grating standards that apply to grating types and bar sizes indicated, including installation clearances and standard anchoring details.

- B. Attach removable units to supporting members with type and size of clips and fasteners indicated or, if not indicated, as recommended by grating manufacturer for type of installation conditions shown.
- C. Attach nonremovable units to supporting members by welding where both materials are same; otherwise, fasten by bolting as indicated above.

3.3 ADJUSTING AND CLEANING

- A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 05530

**NEW PASSENGER TERMINAL
DULUTH INTERNATIONAL AIRPORT
DULUTH, MINNESOTA**

**SECTION 05700 - ORNAMENTAL
METAL**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Metal ceiling surround at commercial kitchen hood.
 - 2. Metal foot rail at Bar.
 - 3. Metal trim base at Bar.
- B. Related Sections:
 - 1. Section 05500 "Metal Fabrications" for non-decorative metal fabrications.
 - 2. Section 06402 "Interior Architectural Woodwork" for casework incorporating metal components.
 - 3. Section 06422 "Flush Wood Paneling" for wall panel systems trimmed with metal.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. LEED Submittals:
 - 1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
- C. Shop Drawings: Show fabrication and installation details for decorative metal.
 - 1. Include plans, elevations, component details, and attachments to other work.
 - 2. Indicate materials and profiles of each decorative metal member, fittings, joinery, finishes, fasteners, anchorages, and accessory items.
 - 3. Include details of support-framing systems.
 - 4. Indicate relative locations of adjacent materials
- D. Samples for Verification: For each type of exposed finish required.

1. Stainless steel sheet: 12" x 12"
2. Stainless steel bar or extrusion: 12" length.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified fabricator.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: A firm experienced in producing decorative metal similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store decorative metal in a well-ventilated area, away from uncured concrete and masonry, and protected from weather, moisture, soiling, abrasion, extreme temperatures, and humidity.
- B. Deliver and store cast-metal products in wooden crates surrounded by sufficient packing material to ensure that products will not be cracked or otherwise damaged.

1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with decorative metal by field measurements before fabrication and indicate measurements on Shop Drawings.

1.8 COORDINATION

- A. Coordinate installation of anchorages for decorative metal items. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. Provide materials without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

2.2 STAINLESS STEEL

- A. Tubing: ASTM A 554, Grade MT 304.
- B. Pipe: ASTM A 312, Grade TP 304.
- C. Castings: ASTM A 743, Grade CF 8 or CF 20.
- D. Sheet: ASTM A 666, Type 304, thickness as recommended by manufacturer, but not less than 0.050" unless otherwise indicated.
- E. Plate: ASTM A 240, Type 304, mechanically leveled.
- F. Bars and Shapes: ASTM A 276, Type 304.

2.3 STEEL AND IRON

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Tubing: ASTM A 500 (cold formed) or ASTM A 513, Type 5 (mandrel drawn).
- C. Bars: Hot-rolled, carbon steel complying with ASTM A 29, Grade 1010.
- D. Plates, Shapes, and Bars: ASTM A 36.
- E. Cast Iron: Either gray iron, ASTM A 48, or malleable iron, ASTM A 47 unless otherwise indicated.
- F. Steel Sheet, Cold Rolled: ASTM A 1008, either commercial steel or structural steel, exposed.

2.4 ALUMINUM

- A. Pipe and Tube: ASTM B 429, material of alloy and temper as recommended by the aluminum producer.
- B. Plate and Sheet: ASTM B 209, alloy 3003-H16.
- C. Extrusions: ASTM B 221 or ASTM B 308, material of alloy and temper as recommended by the aluminum producer.

2.5 FASTENERS

- A. Fastener Materials: Unless otherwise indicated, provide the following:
 - 1. Stainless-Steel Items: Type 304 stainless-steel fasteners.
 - 2. Dissimilar Metals: Type 304 stainless-steel fasteners.

- B. Fasteners for Anchoring to Other Construction: Unless otherwise indicated, select fasteners of type, grade, and class required to produce connections suitable for anchoring indicated items to other types of construction indicated.
- C. Provide concealed fasteners for interconnecting components and for attaching decorative metal items to other work unless otherwise indicated.
 - 1. Provide hex socket flat-head machine screws for exposed fasteners unless otherwise indicated.

2.6 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.7 FABRICATION, GENERAL

- A. Assemble items in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- B. Form decorative metal to required shapes and sizes, true to line and level with true curves and accurate angles and surfaces. Finish exposed surfaces to smooth, sharp, well-defined lines and arris.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing the Work.
- D. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- E. Mill joints to a tight, hairline fit. Cope or miter corner joints. Fabricate connections that will be exposed to weather in a manner to exclude water.
- F. Carefully match exposed work to produce continuity of line and design.
- G. Provide framing, braces, and supports required for anchoring the assemblies.
- H. Except where otherwise indicated, the method of assembly shall be the fabricator's option provided the results are acceptable to the Authority
 - 1. Fabricate and fasten metal Work so that the Work will not be distorted or fasteners overstressed from expansion and contraction of the metal.
 - 2. Conceal fasteners unless otherwise detailed on the Drawings. Where exposed in finished surfaces, finish shall match adjacent metal

- I. Comply with AWS for recommended practices in shop welding. Weld behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded joints of flux, and dress exposed and contact surfaces.
 - 1. Where welding cannot be concealed behind finished surfaces, finish joints to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 1 Welds: no evidence of a welded joint.
- J. Wherever dissimilar metals are in contact, paint contact surfaces with a heavy brush coat of bituminous paint or separate contact surfaces by use of preformed tape.
 - 1. Paint contact surfaces of metals, except stainless steel, which will be in contact with concrete, mortar, plaster, or other masonry, with a heavy brush coat of bituminous paint

2.8 METAL TRIM AND PERFORATED METAL BASE AT BAR BASE

- A. Manufacturers: Subject to compliance with requirements, available manufacturer/fabricators qualified to produce the Work include, but are not limited to, the following:
 - 1. Binzel Industries, Inc.
 - 2. Environmental Interiors, Inc.
 - 3. Harrington & King Perforating Company, Inc.
 - 4. Metalworks, a WSM Enterprise Co.
 - 5. Schluter Systems, L.P.
 - 6. Tesko Enterprises.
- B. Fabricate metal corner trim for paneled walls from stainless-steel sheet, plate, bars or extruded sections to produce the profile indicated. Trim must be capable of withstanding a concentrated load of 200 lbf at any point without permanent deformation or noticeable damage.
- C. Fabricate metal base from 16 ga. stainless steel sheet to produce profile and pattern indicated.

2.9 MISCELLANEOUS

- A. Provide other metal work of ornamental nature shown or noted on the Drawings and not specified elsewhere.
 - 1. Items shall be fabricated as detailed of indicated metals.
 - 2. Provide anchors and fasteners necessary to complete the Work.

2.10 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Ferrous metal Work for reinforcing shall be thoroughly cleaned and given a heavy shop coat of bituminous paint, well worked into joints and open spaces. Do not prime surfaces to be field welded. After installation, touch up as required.
- D. Provide protection against galvanic action wherever dissimilar metals are in contact. Paint contact surfaces with a heavy brush coat of bituminous or zinc chromate paint (complete coverage) or separate with preformed tape.

2.11 STAINLESS-STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - 1. Run grain of directional finishes with long dimension of each piece.
- C. Refer to Materials schedule for finish.
- D. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of decorative metal.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Provide anchorage devices and fasteners where needed to secure decorative metal to in-place construction.
- B. Perform cutting, drilling, and fitting required to install decorative metal. Set products accurately in location, alignment, and elevation, measured from established lines and levels. Provide temporary bracing or anchors in formwork for items to be built into concrete, masonry, or similar construction.

- C. Fit exposed connections accurately together to form tight, hairline joints or, where indicated, uniform reveals and spaces for sealants and joint fillers. Where cutting, welding, and grinding are required for proper shop fitting and jointing of decorative metal, restore finishes to eliminate evidence of such corrective work.
- D. Do not cut or abrade finishes that cannot be completely restored in the field. Return items with such finishes to the shop for required alterations, followed by complete refinishing, or provide new units as required.
- E. Install concealed gaskets, joint fillers, insulation, and flashings as work progresses.
- F. Restore protective coverings that have been damaged during shipment or installation. Remove protective coverings only when there is no possibility of damage from other work yet to be performed at same location.
 - 1. Retain protective coverings intact; remove coverings simultaneously from similarly finished items to preclude nonuniform oxidation and discoloration.
- G. Field Welding: Comply with applicable AWS specification for procedures of manual shielded metal arc welding and requirements for welding and for finishing welded connections in "Fabrication, General" Article. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations.
- H. Field Brazing: Comply with requirements for brazing and for finishing brazed connections in "Fabrication, General" Article. Braze connections that are not to be left as exposed joints but cannot be shop brazed because of shipping size limitations.

3.3 CLEANING AND PROTECTION

- A. Unless otherwise indicated, clean metals by washing thoroughly with clean water and soap, rinsing with clean water, and drying with soft cloths.
- B. Clean stainless steel according to metal finisher's written instructions in a manner that leaves an undamaged and uniform finish matching approved Sample.
- C. Protect finishes of decorative metal from damage during construction period with temporary protective coverings approved by decorative metal fabricator. Remove protective covering at time of Substantial Completion.
- D. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION 05700

**NEW PASSENGER TERMINAL
DULUTH INTERNATIONAL AIRPORT
DULUTH, MINNESOTA**

**SECTION 06100 - ROUGH
CARPENTRY**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.

1.2 SUMMARY

- A. This section includes the following:
 - 1. Wood blocking, cants and nailers.

1.3 DEFINITIONS

- A. Rough Carpentry: Carpentry work not specified in other sections and generally not exposed, unless otherwise specified.
- B. Dimension Lumber: Lumber of 2 inches nominal (38 mm actual) or greater but less than 5 inches nominal (114 mm actual) in least dimension.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
 - 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
 - 2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
 - 3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
 - 4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
 - 5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.
- B. LEED Submittals:
 - 1. Certificates for Credit MR 7: Chain-of-custody certificates indicating that products specified to be made from certified wood comply with forest

certification requirements. Include documentation that manufacturer is certified for chain of custody by an FSC-accredited certification body. Include statement indicating cost for each certified wood product.

2. Product Data for Credit IEQ 4.1: For adhesives, documentation including printed statement of VOC content.

1.5 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the American Lumber Standards Committee's (ALSC) Board of Review.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Keep materials under cover and dry. Protect from weather and contact with damp or wet surfaces. Stack lumber, plywood, and other panels. Provide for air circulation within and around stacks and under temporary coverings including polyethylene and similar materials.
 1. For lumber and plywood pressure treated with waterborne chemicals, place spacers between each bundle to provide air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Wood-Preservative-Treated Materials:
 - A. Baxter: J. H. Baxter Co.
 - B. Chemical Specialties, Inc.
 - C. Continental Wood Preservers, Inc.
 - D. Hickson Corp.
 - E. Hoover Treated Wood Products, Inc.
 - F. Osmose Wood Preserving, Inc.

2.2 LUMBER, GENERAL

- A. Certified Wood: Materials shall be produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."
- B. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
 1. Factory mark each piece of lumber with grade stamp of grading agency.

- B. Inspection Agencies: Inspection agencies, and the abbreviations used to reference them, include the following:
 - 1. SPIB - Southern Pine Inspection Bureau.
 - 2. WWPA - Western Wood Products Association.
 - 3. NELMA - Northeastern Lumber Manufacturers Association.
- C. Grade Stamps: Provide lumber with each piece factory marked with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at time of surfacing, and mill.
- D. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
 - 1. Provide dressed lumber, S4S, unless otherwise indicated.
 - 2. Provide dry lumber with 19 percent maximum moisture content at time of dressing for 2-inch nominal thickness or less, unless otherwise indicated.

2.3 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. General: Where lumber or plywood is indicated as preservative treated or is specified to be treated, comply with applicable requirements of AWPAC C2 (lumber) and AWPAC C9 (plywood). Mark each treated item with the Quality Mark Requirements of an inspection agency approved by ALSC's Board of Review.
 - 1. Do not use chemicals containing chromium or arsenic.
- B. Pressure treat aboveground items with waterborne preservatives to a minimum retention of 0.25 lb/cu. ft. After treatment, kiln-dry lumber and plywood to a maximum moisture content of 19 and 15 percent, respectively. Treat indicated items and the following:
 - 1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 - 2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
- C. Complete fabrication of treated items before treatment, where possible. If cut after treatment, apply field treatment complying with AWPAC M4 to cut surfaces. Inspect each piece of lumber or plywood after drying and discard damaged or defective pieces.
- D. Do not use oil borne pentachlorophenol for surfaces that are to be painted and surfaces in contact with roofing.

2.4 MISCELLANEOUS LUMBER

- A. General: Provide lumber for support or attachment of other construction, including rooftop equipment curbs and support bases, cant strips, bucks, nailers, blocking, furring, grounds, stripping, and similar members.
- B. Fabricate miscellaneous lumber from dimension lumber of sizes indicated and into shapes shown.

- C. Moisture Content: 19 percent maximum for lumber items not specified to receive wood preservative treatment.
- D. Grade: For dimension lumber sizes, provide No. 3 or Standard grade lumber per ALSC's NGRs of Southern pine-SPIB or Douglas fir south-WWPA, unless otherwise indicated.

2.5 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
 - 1. Where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with a hot-dip zinc coating per ASTM A153 or of Type 304 stainless steel.
- B. Nails, Brads, and Staples: ASTM F 1667
- C. Power-Driven Fasteners: NES NER-272.
- D. Wood Screws: ASME B18.6.1.
- E. Lag Bolts: ASME B18.2.1.
- F. Bolts: Steel bolts complying with ASTM A307, Grade A; with ASTM A563 hex nuts and, where indicated, flat washers.

2.6 MISCELLANEOUS MATERIALS

- A. Water-Repellent Preservative: NWWDA-tested and -accepted formulation containing 3-iodo-2-propynyl butyl carbamate, combined with an insecticide containing chloropyrifos as its active ingredient.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
 - 1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches (406 mm) o.c.
- B. Discard units of material with defects that impair quality of rough carpentry construction and that are too small to use in fabricating rough carpentry with minimum number of joints or optimum joint arrangement.
- C. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted.

- D. Fit rough carpentry to other construction; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds, and similar supports to allow attachment of other construction.
- E. Comply with AWPAC M4 for applying field treatment to cut surfaces of preservative-treated lumber.
 - 1. Use inorganic boron for items that are continuously protected from liquid water.
 - 2. Use copper naphthenate for items not continuously protected from liquid water.
- F. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. NES NER-272 for power-driven fasteners.
 - 2. "Recommended Nailing Schedule" of referenced framing standard and with AFPA's "National Design Specifications for Wood Construction." Comply with requirements of applicable codes and of authorities having jurisdiction.
- G. Use hot-dip galvanized nails, unless otherwise indicated. Use finishing nails for finish work. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; predrill as required.

3.2 WOOD BLOCKING AND NAILERS

- A. Install wood blocking and nailers where shown and where required for screeding or attaching other work. Form to shapes shown and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated.
- C. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

END OF SECTION 06100

**NEW PASSENGER TERMINAL
DULUTH INTERNATIONAL AIRPORT
DULUTH, MINNESOTA**

**SECTION 06402 – INTERIOR
ARCHITECTURAL
WOODWORK**

PART 1. - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Plastic laminate-faced cabinets and casework including:
 - a. Coffee Bar/ Bar Façade
 - b. Back Bar Upper Wall Cabinets
 - 2. Wood furring, blocking, shims, and hanging strips for installing cabinets and shelving unless concealed within other construction before cabinet installation.
- B. Related Sections include the following:
 - 1. Section 05700 - ORNAMENTAL METALS for metal trim, sheet, etc., associated with architectural woodwork.
 - 2. Section 06100 - ROUGH CARPENTRY for wood furring, blocking, shims, and hanging strips required for installing woodwork and concealed within other construction before woodwork installation.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product, including panel products, high-pressure decorative laminate.
- B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
 - 1. Show details full size.
 - 2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
 - 3. Show locations and sizes of cutouts and holes for items installed in architectural woodwork.
- C. Samples for Verification: For the following:
 - 1 Plastic-laminate, 8 by 10 inches, for each type, color, pattern, and surface finish.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Fabricator(s) and Installer(s). . Provide lists of successfully completed projects of similar size and scope including project names and addresses, names of architects and owners, and other information specified.

- B. Product Certificates: For each type of product.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: A firm experienced in producing architectural woodwork similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- B. Quality Standard: Unless otherwise indicated, comply with AWI's "Architectural Woodwork Quality Standards" for grades of interior architectural woodwork, construction, finishes, and other requirements.
 - 1. Provide AWI Quality Certification Program labels indicating that woodwork complies with requirements of grades specified.
- C. Mockups: Before fabricating and installing interior architectural woodwork, build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and qualities of materials and execution. Build mockups using materials indicated for the completed Work:
 - 1. Build mockups of:
 - a. Coffee Bar/ Bar Façade
 - 2. Notify Architect seven days in advance of dates and times when mockups will be fabricated and installed.
 - 3. Demonstrate the proposed range of aesthetic effects and workmanship.
 - 4. Obtain Architect's approval of mockups before starting interior architectural woodwork fabrication.
 - 5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 - 6. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1, Section 01200 - PROJECT MEETINGS.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed and indicate measurements on Shop Drawings.
- C. Established Dimensions: Where cabinets are indicated to fit to other construction, establish dimensions for areas where cabinets are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions

1.7 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.

PART 2. - PRODUCTS

2.1 MATERIALS

- A. General: Provide materials that comply with requirements of the AWI quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.
- B. Wood Products: Comply with the following:
 - 1. Hardboard: AHA A135.4.
 - 2. Medium-Density Fiberboard: ANSI A208.2, Grade MD.
 - 3. Particleboard: ANSI A208.1, Grade M-2.
 - 4. Softwood Plywood: DOC PS 1, Medium Density Overlay.
 - 5. Hardwood Plywood and Face Veneers: HPVA HP-1.
- C. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated, or if not indicated, as required by woodwork quality standard.
 - 1. Manufacturer: Subject to compliance with requirements, provide high-pressure decorative laminates by one of the following:
 - a. Chemetal/ TreeFrog
 - b. Formica Corporation.
 - c. Laminart.
- D. Adhesive for Bonding Plastic Laminate: Unpigmented contact cement.
 - 1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.
- F. Stainless Steel: Comply with following:
 - 1. Tubing: ASTM A 554, Grade MT 304
 - 2. Sheet, Strip, Plate, and Flat Bar: ASTM A 666, Type 304.
 - 3. Bars and Shapes: ASTM A 276, Type 304.

2.2 CABINET HARDWARE AND ACCESSORIES

- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets, except for items specified in Division 8, Section 08710 - FINISH HARDWARE.
- B. Hardware Standard: Comply with BHMA A156.9 for items indicated by referencing BHMA numbers or items referenced to this standard.
- C. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in ASTM A240 No. 4, satin brush finish, Type 304.

2.3 INSTALLATION MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Refer to Division 6, Section 06100 - ROUGH CARPENTRY.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

2.4 FABRICATION, GENERAL

- A. Interior Woodwork Grade: Provide Premium grade interior woodwork complying with the referenced quality standard for public areas, Custom grade for non-public areas.
- B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.
- C. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:
 - 1. Corners of Cabinets and Edges of Solid-Wood (Lumber) Members and Rails: 1/16 inch.
- D. Complete fabrication, including assembly, finishing, and hardware application, to maximum extent possible, before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
 - 1. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements indicated on Shop Drawings before disassembling for shipment.
- E. Shop cut openings, to maximum extent possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
 - 1. Seal edges of openings in countertops with a coat of varnish.
- F. Laminate fabrications to be completed in accordance with decorative plastic laminate association (DPLA), ANSI-A-161.2-1979 and "Architectural wood work quality standards, guide specification and quality certification program" guidelines of the architectural woodwork instituted (AWI) where applicable. All laminate fabrications shall be "balanced construction" in accordance with AWI guidelines
- F. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

1. Provide Architect's selections from laminate manufacturer's full range of colors and finishes.

2.5 PLASTIC-LAMINATE FACED CABINETS

- A. Quality Standard: Comply with AWI Section 400 requirements for laminate cabinets.
- B. AWI Type of Cabinet Construction: Flush overlay.
- C. Laminate Cladding for Exposed Surfaces: High-pressure decorative laminate complying with the following requirements:
 1. Horizontal Surfaces Other Than Tops: HGS.
 2. Postformed Surfaces: HGP.
 3. Vertical Surfaces: HGS.
 4. Edges: HGS.
- D. Materials for Semiexposed Surfaces: Provide surface materials indicated below:
 1. Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, Grade VGS.
 2. Drawer Sides and Backs: Solid-hardwood lumber.
 3. Drawer Bottoms: Hardwood plywood.
- E. Concealed surfaces: manufacturer's phenolic laminate backer sheets
- F. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
 1. Provide Architect's selections from laminate manufacturer's full range of colors and finishes

2.6 PLASTIC-LAMINATE COUNTERTOPS

- A. Quality Standard: Comply with AWI Section 400 requirements for high-pressure decorative laminate countertops.
- B. High-Pressure Decorative Laminate Grade: HGS.
- C. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
 1. Provide Architect's selections from manufacturer's full range of colors and finishes.
- D. Edge Treatment: Same as laminate cladding on horizontal surfaces.
- E. Core Material: Particleboard.
- F. Core Material at Sinks: Exterior-grade plywood.
- G. Concealed surfaces

2.7 SOLID-SURFACING-MATERIAL COUNTERTOPS

- A. Quality Standard: Comply with AWI Section 400 requirements for countertops.
- B. Solid-Surfacing-Material Thickness: 1/2 inch.
- C. Colors, Patterns, and Finishes: Provide materials and products that result in colors of solid-surfacing material complying with the following requirements:
 - 1. Provide Architect's selections from manufacturer's full range of colors and finishes.
- D. Fabricate tops in one piece with shop-applied backsplashes and edges, unless otherwise indicated. Comply with solid-surfacing-material manufacturer's written recommendations for adhesives, sealers, fabrication, and finishing.

2.8 SHOP FINISHING

- A. Quality Standard: Comply with AWI Section 1500, unless otherwise indicated.
 - 1. Grade: Provide finishes of same grades as items to be finished.
- B. General: Finish architectural woodwork at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.
- C. Preparations for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural woodwork, as applicable to each unit of work.
 - 1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of woodwork. Apply two coats to back of paneling and to end-grain surfaces. Concealed surfaces of plastic-laminate-clad woodwork do not require backpriming when surfaced with plastic laminate, backing paper, or thermoset decorative overlay.

PART 3. - EXECUTION

3.1 PREPARATION

- A. Condition woodwork to average prevailing humidity conditions in installation areas before installation.
- B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.2 INSTALLATION

- A. Quality Standard: Install woodwork to comply with AWI Section 1700 for the same grade specified in Part 2 of this Section for type of woodwork involved.
- B. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 1/8 inch in 96 inches.
- C. Scribe and cut woodwork to fit adjoining work, and refinish cut surfaces and repair

damaged finish at cuts.

- D. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.
- E. Standing and Running Trim: Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to greatest extent possible. Do not use pieces less than 36 inches long, except where shorter single-length pieces are necessary. Scarf running joints and stagger in adjacent and related members.
 - 1. Fill gaps, if any, between top of base and wall with plastic wood filler, sand smooth, and finish same as wood base, if finished.
 - 2. Install wall railings on indicated metal brackets securely fastened to wall framing.
 - 3. Install standing and running trim with no more variation from a straight line than 1/8 inch in 96 inches.
- F. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
 - 1. Install cabinets with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
 - 2. Maintain veneer sequence matching of cabinets with transparent finish.
 - 3. Fasten wall cabinets through back, near top and bottom, at ends and not more than 16 inches o.c. with No. 10 wafer-head screws sized for 1-inch penetration into wood framing, blocking, or hanging strips or No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall finish.
- G. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
 - 1. Align adjacent solid-surfacing-material countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
 - 2. Install countertops with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
 - 3. Secure backsplashes to tops with concealed metal brackets at 16 inches o.c. and to walls with adhesive.
 - 4. Calk space between backsplash and wall with sealant specified in Division 7, Section 07920 - JOINT SEALANTS.
- H. Paneling: Anchor paneling to supporting substrate with concealed panel-hanger clips. Do not use face fastening, unless otherwise indicated.
 - 1. Install flush paneling with no more than 1/16 inch in 96-inch vertical cup or bow and 1/8 inch in 96-inch horizontal variation from a true plane.
- I. Complete the finishing work specified in this Section to extent not completed at shop or before installation of woodwork. Fill nail holes with matching filler where exposed. Apply specified finish coats, including stains and paste fillers if any, to exposed

surfaces where only sealer/prime coats were applied in shop.

3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
- B. Clean, lubricate, and adjust hardware.
- C. Clean woodwork on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 06402

**NEW PASSENGER TERMINAL
DULUTH INTERNATIONAL AIRPORT
DULUTH, MINNESOTA**

**SECTION 06422 – FLUSH
WOOD PANELING**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Flush wood paneling (wood-veneer wall surfacing).
 - 2. Wood furring, blocking, shims, hanging strips, and panel clips for installing flush wood paneling.
 - 3. Shop finishing of flush wood paneling.
- B. Related Requirements:
 - 1. Section 06100 "Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing paneling and that are concealed within other construction before paneling installation.

1.3 REFERENCES

- A. AWI Quality Standards (Architectural Woodwork Institute).
- B. ASTM E84 (Method of test for surface burning characteristics of building materials).

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.
- B. LEED Submittals:
 - 1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

2. Certificates: Chain-of-custody certificates indicating that paneling complies with forest certification and chain-of-custody requirements. Include statement indicating cost for each certified wood product.
 3. Product Data for Credit IEQ 4.1: For installation adhesives, documentation including printed statement of VOC content.
 4. Product Data for Credit IEQ 4.4: For composite wood products and fabrication adhesives, documentation indicating that products contain no urea formaldehyde.
- C. Shop Drawings: Show location of paneling, large-scale details at panel joints and edge conditions indicating adjacent materials, attachment devices, and other components. Include dimensioned plans and elevations.
- D. Samples for Verification:
1. Provide three (3) Veneer-faced panel corner sections with two veneered edges, 12 by 12 inches, for each species and cut. Include at least one face-veneer seam and finish as specified.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and Manufacturer.
- B. Product Certificates: For each type of product.
- C. Woodwork Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.
- D. Evaluation Reports: For fire-retardant-treated paneling, from ICC-ES.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: The manufacturer must be a firm with a minimum of five (5) years of experience and a successful record of in service performance in the actual production of the specified products.
- B. Installer Qualifications: Installer shall be a firm with not less than two (2) years of successful experience in installation of wood paneling of similar requirements to this project.
- C. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 1. Build mockups of typical paneling as shown on Drawings.
 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. The Flat Veneer Panels shall be delivered to the project site in original, unopened packages. Do not deliver paneling until painting and similar operations that could damage paneling have been completed in installation areas. Care in handling must be exercised to avoid damage. All shipments to the job site shall be made on wooden pallets.
- B. The Flat Veneer Panels shall be stored flat and level in a fully enclosed space. For a minimum of seventy-two (72) hours immediately prior to ceiling installation, the Flat Veneer Panels shall be stored in the room in which they will be installed. The temperature and humidity of the room shall closely approximate those conditions that will exist when the building is occupied. The Flat Veneer Panels shall be stored off the floor.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install paneling until building is enclosed, wet work is complete, and HVAC system is operating and will maintain temperature between 60 and 90 deg F and relative humidity between 25 and 55 percent during the remainder of the construction period.
- B. Field Measurements: Where paneling is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Locate concealed framing, blocking, and reinforcements that support paneling by field measurements before being enclosed and indicate measurements on Shop Drawings.

1.9 COORDINATION

- A. The layout and installation of the Flat Veneer Wall Panel Systems shall be coordinated with other work penetrating the wall. This includes light fixtures, Life Safety Components, HVAC equipment, and fire suppression system components.

1.10 WARRANTIES

- A. Manufacturer: All materials supplied by the paneling manufacturer shall be guaranteed against manufacturing defects for one (1) year. Because of differing site conditions, wood stains and colorings can vary with age and shall be excluded from this warranty.
- B. Installer: All work shall be guaranteed for one (1) year from final acceptance of completed work.

PART 2 - PRODUCTS

2.1 PANELING FABRICATORS

- A. Source Limitations: Engage a qualified fabricator to assume undivided responsibility for production of paneling.
- B. Fabricators: Subject to compliance with requirements, available fabricators offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. St. Germain's Cabinet, Inc.
 2. Barsanti Woodwork Corp.
 3. Construction Specialties, Inc.
 4. Damschen Wood, Inc.
 5. Eggers Industries
 6. JR Jones Fixture Company
 7. Marlite
 8. Rulon Company
 9. Wilkie Sanderson
 10. World of Wood, Ltd.

2.2 PANELING, GENERAL

- A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of flush wood paneling (wood-veneer wall surfacing) indicated for construction, finishes, installation, and other requirements.
 1. Provide certificates from AWI certification program indicating that paneling complies with requirements of grades specified.

2.3 FLUSH WOOD PANELING (WOOD-VENEER WALL SURFACING)

- A. Grade: Economy.
- B. Wood Species and Cut: As listed on Materials Schedule
- C. Matching of Adjacent Veneer Leaves: Slip match.
- D. Matching within Panel Face: Balance match.

- E. Matching of Adjacent Veneer Leaves and within Panel Face: Slip match.
- F. Panel-Matching Method: No matching is required between panels. Select and arrange panels for similarity of grain pattern and color between adjacent panels.
- G. Panel Core Construction: Fire-retardant particleboard or fire-retardant, medium-density fiberboard.
 - 1. Thickness: 3/4 inch.
- H. Exposed Panel Edges: Inset wood-veneer matching faces.
- I. Panel Reveals: Closed.
- J. Fire-Retardant-Treated Paneling: Panels shall consist of wood-veneer and fire-retardant particleboard or fire-retardant, medium-density fiberboard. Panels shall have a Class A Interior Finish designation per ASTM E 84, with a flame-spread index of 25 or less and a smoke-developed index of 450 or less and be listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction.
- K. Assemble panels by gluing and concealed fastening.

2.4 MATERIALS

- A. Materials, General: Provide materials that comply with requirements of referenced quality standard for each quality grade specified unless otherwise indicated.
- B. Wood Moisture Content: 5 to 10 percent.
- C. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each quality grade specified unless otherwise indicated.
 - 1. Recycled Content of Medium-Density Fiberboard and Particleboard: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 50 percent.
 - 2. Medium-Density Fiberboard: ANSI A208.2, Grade 130, made with binder containing no urea formaldehyde.
 - 3. Particleboard: ANSI A208.1, Grade M-2, made with binder containing no urea formaldehyde.
- D. Adhesives: Do not use adhesives that contain urea formaldehyde.

2.5 FIRE-RETARDANT-TREATED MATERIALS

- A. Fire-Retardant-Treated Materials, General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

1. Use treated materials that comply with requirements of referenced woodworking standard. Do not use materials that are warped, discolored, or otherwise defective.
 2. Use fire-retardant-treatment formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants to distinguish treated materials from untreated materials.
 3. Identify fire-retardant-treated materials with appropriate classification marking of qualified testing agency in the form of removable paper label or imprint on surfaces that will be concealed from view after installation.
- B. Fire-Retardant Particleboard: Panels complying with the following requirements, made from softwood particles and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 25 or less per ASTM E 84.
1. For panels 3/4 inch thick and less, comply with ANSI A208.1 for Grade M-2 except for the following minimum properties: modulus of rupture, 1600 psi; modulus of elasticity, 300,000 psi; internal bond, 80 psi; and screw-holding capacity on face and edge, 250 and 225 lbf, respectively.
- C. Fire-Retardant Fiberboard: Medium-density fiberboard panels complying with ANSI A208.2, made from softwood fibers, synthetic resins, and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 200 or less per ASTM E 84.

2.6 INSTALLATION MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: kiln dried to less than 15 percent moisture content.
- B. Flat Strap and Backing Plate: Steel sheet for blocking and bracing.
1. Minimum Base-Metal Thickness: 0.0312 inch.
- C. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls.
- D. Panel Clips: Aluminum, with 1/4" nominal thickness and 3/8" lift off or manufacturer's approved standard.

- E. VOC Limits for Installation Adhesives: Use products that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
1. Wood Glues: 30 g/L.
 2. Multipurpose Construction Adhesives: 70 g/L.
 3. Contact Adhesive: 80 g/L.
 4. Special-Purpose Contact Adhesive (contact adhesive that is used to bond melamine covered board, metal, unsupported vinyl, rubber, or wood veneer 1/16 inch or less in thickness to any surface): 250 g/L.

2.7 FABRICATION

- A. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.
- B. Complete fabrication, including assembly and finishing, to maximum extent possible, before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
- C. Shop cut openings, to maximum extent possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

2.8 SHOP FINISHING

- A. General: Finish paneling at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.
- B. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing paneling, as applicable to each unit of work.
 1. Backpriming: Apply two coats of sealer or primer, compatible with finish coats, to concealed surfaces of paneling

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installation, condition paneling to average prevailing humidity conditions in installation areas.
- B. Before installing paneling, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

- C. Panels must be applied over a smooth solid, flat backing such as plywood or drywall. All drywall joints should be taped and finished. Walls should be primed before installation begins.

3.2 INSTALLATION

- A. Install blocking and strapping as required for reinforcement of substrate in accordance with panel manufacturer's recommendations.
 - 1. Coordinate panel anchorage with framing for installation of blocking and strapping as required prior to installation of substrate by others
- B. Install paneling level, plumb, true, and straight with no distortions. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches. Install with no more than 1/16 inch in 96-inch vertical cup or bow and 1/8 inch in 96-inch horizontal variation from a true plane.
 - 1. For flush paneling with revealed joints, install with variations in reveal width, alignment of top and bottom edges, and flushness between adjacent panels not exceeding 1/16 inch.
- C. Anchor paneling to supporting substrate with concealed panel-hanger clips. Do not use face fastening unless otherwise indicated.

3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective paneling, where possible, to eliminate defects; where not possible to repair, replace paneling. Adjust for uniform appearance.
- B. Clean paneling on exposed surfaces. Touch up shop-applied finishes to restore soiled areas.

END OF SECTION 06422

**NEW PASSENGER TERMINAL
DULUTH INTERNATIONAL AIRPORT
DULUTH, MN**

**SECTION 06611 – SOLID POLYMER
FABRICATIONS**

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 WORK INCLUDES

- A. Solid polymer countertops as shown on the Drawings and specified herein.

1.3 SUBMITTALS

- A. Shop Drawings: Indicate dimensions, component sizes, fabrication details, attachment provisions and coordination requirements with adjacent work.
- B. Samples: Submit minimum 6"x6" samples. Indicate full range of color and pattern variation. Approved samples will be retained as a standard for work.
- C. Product Data: Indicate product description, fabrication information and compliance with specified performance requirements.
- D. Maintenance Data: Submit manufacturer's care and maintenance data, including repair and cleaning instructions. Include in project close-out documents.

1.4 SUSTAINABLE DESIGN SUBMITTALS

- A. Section 01361 - Sustainable Design Requirements: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
 - 1. Materials Resources Certificates:
 - a. Certify recycled material content for recycled content products.
 - b. Certify source for local and regional materials and distance from Project site.

- 2. Indoor Air Quality Certificates:
 - a. Certify volatile organic compound content for each interior adhesive and sealant and related primer.
- C. Product Cost Data: Submit cost of products to verify compliance with Project sustainable design requirements. Exclude cost of labor and equipment to install products.
 - 1. Provide cost data for the following products:
 - a. Products with recycled material content.
 - b. Local and regional products.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver no components to project site until areas are ready for installation. Store indoors.
- B. Handle materials to prevent damage to finished surfaces. Provide protective coverings to prevent physical damage or staining following installation for duration of project.

1.6 QUALITY CRITERIA

- A. Applicable standards: Standards of the following, as referenced herein:
 - 1. American National Standards Institute (ANSI).
 - 2. American Society for Testing and Materials (ASTM).
 - 3. National Electrical Manufacturers Association (NEMA).
- B. Allowable tolerances:
 - 1. Variation in component size: +/- 1/8".
 - 2. Location of openings: +/- from indicated location.
- C. Sustainable Design Requirements:
 - 1. Recycled Content Materials: Furnish materials with recycled content.
 - 2. Regional Materials: Furnish materials extracted, processed, and manufactured within 500 miles of Project site.

1.7 WARRANTY

- A. Provide manufacturer's warranty. The manufacturer shall warrant that the manufacturer shall at its option repair or replace, without charge, such product if it fails due to manufacturing defect during the first 10 years after initial installation. This shall include reasonable labor charges needed to repair or replace the product covered hereunder.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufactures: Subject to compliance with requirements, manufactures offering products that may be incorporated into the Work include, but are not limited to the following:
- B. Approved Manufacturers:
 - 1. Corian
 - 2. Avonite
 - 3. Hi-Macs by LG Hausys America Inc.
- C. Substitutions: Under provisions of Section 01631.
- D. Basis-of-Design Product: The design is based on the products named in the Material Schedule. Subject to compliance with requirements, provide either the named products or comparable products by one of the manufactures specified. Comparable products are subject to review and approval through the submittal process specified.

2.2 MATERIAL

- A. Countertops: adhesively joined with no exposed seams, having edge details and thickness as indicated on the drawings.

2.3 ACCESSORY PRODUCTS

- A. Joint Adhesive: Manufacturer's standard two-part adhesive kit to create inconspicuous, non-porous joints.
- B. Panel Adhesive: Manufacturer's standard neoprene-based panel adhesive meeting ANSI A136.1-1967 and UL listed.
- C. Sealant: Manufacturer's standard mildew-resistant, FDA/UL recognized silicone sealant in colors matching component.

2.4 FABRICATION

- A. Factory fabricate components to greatest extent practicable to sizes and shapes indicated, in accordance with approved shop drawings.
- B. Form joints between components using manufacturer's standard joint adhesive; without conspicuous joints.
- C. Cut and finish component edges with clean, sharp returns. Route radii and contours to template. Repair or reject defective and inaccurate work.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install components plumb and level, scribed to adjacent finishes, in accordance with approved shop drawings and product installation data.
- B. Form field joints using manufacturer's recommended adhesive, with joints inconspicuous in finished work. Keep components and hands clean when making joints.
- C. Remove adhesive, sealants and other stains. Replace stained components.

3.2 SCHEDULE

- A. Refer to Millwork Finish Schedule for a listing of rooms requiring work of this section.

END OF SECTION 06611

**NEW PASSENGER TERMINAL
DULUTH INTERNATIONAL AIRPORT
DULUTH, MINNESOTA**

**SECTION 07131 – SELF-ADHERING
SHEET WATERPROOFING**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Modified Bituminous Sheet Waterproofing.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, and tested physical and performance properties of waterproofing.
 - 2. Include manufacturer's written instructions for evaluating, preparing, and treating substrate.
- B. LEED Submittals:
 - 1. Product Certificates for Credit MR 5: For products and materials required to comply with requirements for regional materials, certificates indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating distance to Project, cost for each regional material, and fraction by weight that is considered regional.
- C. Shop Drawings: Show locations and extent of waterproofing and details of substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining waterproofing, and other termination conditions.
- D. Samples: For each exposed product and for each color and texture specified, including the following products:
 - 1. 8-by-8-inch square of waterproofing and flashing sheet.
 - 2. 8-by-8-inch square of insulation.
 - 3. 4-by-4-inch square of drainage panel.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

- B. Field quality-control reports.
- C. Sample Warranties: For special warranties.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by waterproofing manufacturer.

1.6 FIELD CONDITIONS

- A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate.
 - 1. Do not apply waterproofing in snow, rain, fog, or mist.
- B. Maintain adequate ventilation during preparation and application of waterproofing materials.

1.7 WARRANTY

- A. Manufacturer's Warranty: Manufacturer's standard materials-only warranty in which manufacturer agrees to furnish replacement waterproofing material for waterproofing that does not comply with requirements or that fails to remain watertight within specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Source Limitations for Waterproofing System: Obtain waterproofing materials, protection course, and molded-sheet drainage panels from single source from single manufacturer.

2.2 MODIFIED BITUMINOUS SHEET WATERPROOFING

- A. Modified Bituminous Sheet: Minimum 60-mil nominal thickness, self-adhering sheet consisting of 56 mils of rubberized asphalt laminated on one side to a 4-mil- thick, polyethylene-film reinforcement, and with release liner on adhesive side.
 - 1. Physical Properties:
 - a. Tensile Strength, Membrane: 325 psi minimum; ASTM D 412, Die C, modified.

- b. Ultimate Elongation: 350 percent minimum; ASTM D 412, Die C, modified.
- c. Low-Temperature Flexibility: Pass at minus 45 deg F; ASTM D 1970.
- d. Crack Cycling: Unaffected after 100 cycles of 1/8-inch movement; ASTM C 836.
- e. Puncture Resistance: 60 lbf minimum; ASTM E 154.
- f. Water Absorption: 0.2 percent weight-gain maximum after 48-hour immersion at 70 deg F; ASTM D 570.
- g. Water Vapor Permeance: 0.05 perms (2.9 ng/Pa x s x sq. m) maximum; ASTM E 96/E 96M, Water Method.
- h. Hydrostatic-Head Resistance: 230 feet minimum; ASTM D 5385.

2.3 AUXILIARY MATERIALS

- A. General: Furnish auxiliary materials recommended by waterproofing manufacturer for intended use and compatible with sheet waterproofing.
 - 1. Furnish liquid-type auxiliary materials that comply with VOC limits of authorities having jurisdiction.
- B. Primer: Liquid primer recommended for substrate by sheet-waterproofing material manufacturer.
- C. Surface Conditioner: Liquid, waterborne surface conditioner recommended for substrate by sheet-waterproofing material manufacturer.
- D. Liquid Membrane: Elastomeric, two-component liquid, cold fluid applied, of trowel grade or low viscosity.
- E. Substrate Patching Membrane: Low-viscosity, two-component, modified asphalt coating.
- F. Metal Termination Bars: Aluminum bars, approximately 1 by 1/8 inch thick, predrilled at 9-inch centers.

2.4 INSULATION

- A. Insulation, General: Comply with Division 7 Section "Thermal Insulation."
- B. Board Insulation: Extruded-polystyrene board insulation complying with ASTM C 578, square or shiplap edged.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. DiversiFoam Products.
 - b. Dow Chemical Company (The).
 - c. Owens Corning Insulating Systems LLC.
 - d. Pactiv Building Products.

- e. T. Clear Corporation, a subsidiary of Fin Pan Inc.
- 2. Type IV, 25-psi minimum compressive strength.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the waterproofing.
 - 1. Verify that concrete has cured and aged for minimum time period recommended in writing by waterproofing manufacturer.
 - 2. Verify that substrate is visibly dry and within the moisture limits recommended in writing by manufacturer. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

- A. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for waterproofing application.

3.3 INSULATION INSTALLATION

- A. Install one or more layers of board insulation to achieve required thickness over waterproofed surfaces. Cut and fit to within 3/4 inch of projections and penetrations.
- B. On vertical surfaces, set insulation units in adhesive or tape applied according to manufacturer's written instructions.
- C. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

3.4 PROTECTION, REPAIR, AND CLEANING

- A. Protect waterproofing from damage and wear during remainder of construction period.
- B. Protect installed board insulation from damage due to UV light, harmful weather exposures, physical abuse, and other causes. Provide temporary coverings where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

- C. Correct deficiencies in or remove waterproofing that does not comply with requirements; repair substrates, reapply waterproofing, and repair sheet flashings.
- D. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 07131

**NEW PASSENGER TERMINAL
INTERNATIONAL AIRPORT
DULUTH, MINNESOTA**

**SECTION 07412 – FORMED
METAL WALL PANELS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Exposed-fastener, lap-seam metal wall panels.
- B. Related Sections:
 - 1. Section 05310 "Steel Roof Deck" for roof decking.
 - 2. Section 05400 "Cold-Formed Metal Framing" for wall framing.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.
- B. LEED Submittals:
 - 1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
- C. Shop Drawings:
 - 1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
 - 2. Accessories: Include details of the flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches.

- D. Samples for Verification: For each type of exposed finish, prepared on Samples of size indicated below:
 - 1. Metal Panels: 12 inches long by actual panel width. Include fasteners, closures, and other metal panel accessories.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- C. Sample Warranties: For special warranties.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For metal panels to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.
- B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Retain strippable protective covering on metal panels during installation.

1.8 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

1.9 COORDINATION

- A. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.10 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including rupturing, cracking, or puncturing.
 - b. Deterioration of metals and other materials beyond normal weathering.
 - 2. Warranty Period: Two years from date of Substantial Completion.
- B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **25**percent.
- B. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 1592:
 - 1. Wind Loads: Determine loads based on the following minimum design wind pressures:
 - a. Uniform pressure of 20 lbf/sq. ft., acting inward or outward.

- b. Loads as indicated for project location per SEI/ASCE 7.
- 2. Deflection Limits: For wind loads, no greater than 1/180 of the span.
- C. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. when tested according to ASTM E 283 at the following test-pressure difference:
 - 1. Test-Pressure Difference: 1.57 lbf/sq. ft..
- D. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 331 at the following test-pressure difference:
 - 1. Test-Pressure Difference: 2.86 lbf/sq. ft.
- E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F, ambient; 180 deg , material surfaces.

2.2 CONCEALED-FASTENER, LAP-SEAM METAL WALL PANELS

- A. General: Provide factory-formed metal panels designed to be field assembled by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners and factory-applied sealant in side laps. Include accessories required for weathertight installation.
- B. Flush-Profile, Concealed-Fastener Metal Wall Panels: Formed with vertical panel edges and intermediate stiffening ribs symmetrically spaced between panel edges; with flush joint between panels.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide CENTRIA CS660E or comparable product by one of the following:
 - a. Architectural Building Components.
 - b. ATAS International, Inc.
 - c. Berridge Manufacturing Company.
 - d. CENTRIA Architectural Systems.
 - e. Dimension Metals, Inc.
 - f. Fabral.
 - g. Morin; a Kingspan Group company.
 - 2. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with ASTM A 653/A 653M, G90 coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A 792/A 792M, Class AZ50 coating designation; structural quality.

Prepainted by the coil-coating process to comply with ASTM A 755/A 755M.

- a. Nominal Thickness: 0.036 inch (20 ga.) min.
 - b. Exterior Finish: Three-coat fluoropolymer
 - c. Color: Match Insulated Core Metal Panels.
- 3. Panel Coverage: 16 inches.
 - 4. Panel Height: 0.875 inch.

2.3 WALL LOUVER UNITS

- A. General: Provide louvers where indicated, designed to integrate with metal wall panel profile and secondary support system without receptor channels or other flashing, of types and performance indicated.
- B. Horizontal, Drainable-Blade Fixed Louver:
 - 1. Louver Size: As indicated on Drawings.
 - 2. Louver Depth: Match metal wall panel system depth.
 - 3. Free Area: 30 percent, min.
- C. Base Metal and Finish: Match metal wall panel base metal and finish.
- D. Louver Screens: Mounted in removable aluminum frame.
 - 1. Bird Screen: ½-inch mesh aluminum, crimped.

2.4 MISCELLANEOUS MATERIALS

- A. Miscellaneous Metal Subframing and Furring: ASTM C 645, cold-formed, metallic-coated steel sheet, ASTM A 653/A 653M, G90 coating designation or ASTM A 792/A 792M, Class AZ50 aluminum-zinc-alloy coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.
- B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.
 - 1. Closures: Provide closures at eaves and rakes, fabricated of same metal as metal panels.
 - 2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
 - 3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 0.875 inch thick, flexible closure strips; cut or premolded to match metal panel

profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

- C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.
- D. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.
- E. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.
 - 1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape.
 - 2. Joint Sealant: ASTM C 920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.
 - 3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

2.5 FABRICATION

- A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- C. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.
- D. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.
 - 1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.

2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
4. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.
 - a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal wall panel manufacturer for application but not less than thickness of metal being secured.

2.6 FINISHES

- A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Steel Panels and Accessories:
 1. Three-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.
 1. Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal wall panel manufacturer.

- B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.

3.3 METAL PANEL INSTALLATION

- A. General: Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
 - 1. Shim or otherwise plumb substrates receiving metal panels.
 - 2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
 - 3. Install screw fasteners in predrilled holes.
 - 4. Locate and space fastenings in uniform vertical and horizontal alignment.
 - 5. Install flashing and trim as metal panel work proceeds.
 - 6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
 - 7. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
 - 8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.
- B. Fasteners:
 - 1. Steel Panels: Use stainless-steel fasteners for surfaces exposed to the exterior; use galvanized-steel fasteners for surfaces exposed to the interior.
- C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.
- D. Lap-Seam Metal Panels: Fasten metal panels to supports with fasteners at each lapped joint at location and spacing recommended by manufacturer.

1. Lap ribbed or fluted sheets one full rib. Apply panels and associated items true to line for neat and weathertight enclosure.
 2. Provide metal-backed washers under heads of exposed fasteners bearing on weather side of metal panels.
 3. Locate and space exposed fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.
 4. Install screw fasteners with power tools having controlled torque adjusted to compress washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.
 5. Flash and seal panels with weather closures at perimeter of all openings.
- E. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
1. Install components required for a complete metal panel system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal wall panel manufacturer; or, if not indicated, provide types recommended by metal panel manufacturer.
- F. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that are permanently watertight.
1. Install exposed flashing and trim that is without buckling and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and achieve waterproof performance.
 2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

3.4 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect completed metal wall panel installation, including accessories.
- B. Remove and replace metal wall panels where tests and inspections indicate that they do not comply with specified requirements.
- C. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.

- D. Prepare test and inspection reports.

3.5 CLEANING AND PROTECTION

- A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.
- B. After metal panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.
- C. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07412

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**SECTION 07620
SHEET METAL FLASHING
AND TRIM**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following sheet metal flashing and trim:
 - 1. Formed roof drainage sheet metal fabrications.
 - 2. Formed low-slope roof sheet metal fabrications.
 - 3. Formed wall sheet metal fabrications.
- B. Related Sections include the following:
 - 1. Division 6 Section "Rough Carpentry" for wood nailers, curbs, and blocking.
 - 2. Division 7 Section "Formed Metal Wall Panels" for sheet metal flashing and trim integral with metal wall panels.
 - 3. Division 7 Section "Roof Specialties" for manufactured roof specialties not part of sheet metal flashing and trim.
 - 4. Division 7 Section "Joint Sealants" for field-applied sheet metal flashing and trim sealants.

1.3 PERFORMANCE REQUIREMENTS

- A. General: Sheet metal flashing and trim assemblies as indicated shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.
- B. Fabricate and install flashing capable of resisting the wind forces according to requirements of the International Building Code for 120 mph wind.
- C. Thermal Movements: Provide sheet metal flashing and trim that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of sheet metal and trim thermal movements. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
2. Water Infiltration: Provide sheet metal flashing and trim that do not allow water infiltration to building interior.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.
- B. Shop Drawings: Show fabrication and installation layouts of sheet metal flashing and trim, including plans, elevations, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work. Include the following:
 1. Identification of material, thickness, weight, and finish for each item and location in Project.
 2. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.
 3. Details for joining, supporting, and securing sheet metal flashing and trim, including layout of fasteners, cleats, clips, and other attachments. Include pattern of seams.
 4. Details of termination points and assemblies, including fixed points.
 5. Details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction.
 6. Details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counterflashings as applicable.
 7. Details of special conditions.
 8. Details of connections to adjoining work.
 9. Detail formed flashing and trim at a scale of not less than 1-1/2 inches per 12 inches.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified fabricator.
- B. Warranty: Sample of special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For sheet metal flashing, trim, and accessories to include in maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual." Conform to dimensions and profiles shown unless more stringent requirements are indicated.

B. Preinstallation Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, Installer, and installers whose work interfaces with or affects sheet metal flashing and trim including installers of roofing materials, roof accessories, unit skylights, and roof-mounted equipment.
2. Review methods and procedures related to sheet metal flashing and trim.
3. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
4. Review special roof details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect sheet metal flashing.
5. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver sheet metal flashing materials and fabrications undamaged. Protect sheet metal flashing and trim materials and fabrications during transportation and handling.
- B. Unload, store, and install sheet metal flashing materials and fabrications in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack materials on platforms or pallets, covered with suitable weathertight and ventilated covering. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.

1.9 COORDINATION

- A. Coordinate installation of sheet metal flashing and trim with interfacing and adjoining construction to provide a leakproof, secure, and noncorrosive installation.

PART 2 - PRODUCTS

2.1 SHEET METALS

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying a strippable, temporary protective film before shipping.
- B. Aluminum Sheet: ASTM B 209, Alloy 3003, 3004, 3105, or 5005, Temper suitable for forming and structural performance required, but not less than H14, finished as follows:
 1. Mill Finish: One-side bright. Use at concealed locations.

2. Factory Prime Coating: Where painting after installation is indicated, provide pretreatment and white or light-colored, factory-applied, baked-on epoxy primer coat; with a minimum dry film thickness of 0.2 mil.
3. High-Performance Organic Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - a. Fluoropolymer 2-Coat System: Manufacturer's standard 2-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 2605.
 - 1) Color: As selected by Architect from manufacturer's full range.
- C. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304, dead soft, fully annealed.
 1. Finish: 2D (dull, cold rolled)
 2. Surface: Smooth, flat

2.2 UNDERLAYMENT MATERIALS

- A. Composite Sheet: 40-mil thick, self-adhering, polymer modified bitumen bonded to polyethylene sheet complying with ASTM D 1970.

2.3 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation.
- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads.
 1. Exposed Fasteners: Heads matching color of sheet metal by means of plastic caps or factory-applied coating.
 2. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws, gasketed, with hex washer head.
 3. Blind Fasteners: High-strength aluminum or stainless-steel rivets.
 4. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.
- C. Solder for Lead: ASTM B 32, Grade Sn50, 50 percent tin and 50 percent lead.
- D. Sealing Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealing tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape.

- E. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane or silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- F. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant, polyisobutylene plasticized, heavy bodied for hooked-type expansion joints with limited movement.
- G. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.
- H. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil (0.4-mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.
- I. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.4 FABRICATION, GENERAL

- A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal thicknesses, and other characteristics of item indicated. Shop fabricate items where practicable. Obtain field measurements for accurate fit before shop fabrication.
- B. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
- C. Fabricate sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.
 - 1. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
 - 2. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
- D. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA recommendations.
- E. Expansion Provisions: Where lapped or bayonet-type expansion provisions in the Work cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
- F. Conceal fasteners and expansion provisions where possible on exposed-to-view sheet metal flashing and trim, unless otherwise indicated.

- G. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
 - 1. Thickness: As recommended by SMACNA's "Architectural Sheet Metal Manual" and FMG Loss Prevention Data Sheet 1-49 for application but not less than thickness of metal being secured.

2.5 ROOF DRAINAGE SHEET METAL FABRICATIONS

- A. Parapet Scuppers: Fabricate scuppers of dimensions required with closure flange trim to exterior, 4-inch-wide wall flanges to interior, and base extending 4 inches beyond cant or tapered strip into field of roof. Fabricate from the following materials:
 - 1. Stainless Steel: 0.019 inch thick.

2.6 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

- A. Roof-Edge Flashing (Gravel Stop) and Fascia Cap: Fabricate in minimum 96-inch-long, but not exceeding 10-foot-long, sections.
 - 1. Joint Style: Butt, with 12-inch-wide, concealed backup plate.
 - 2. Fabricate with scuppers as indicated, of dimensions required with 4-inch-wide flanges and base extending 4 inches beyond cant or tapered strip into field of roof. Fasten gravel guard angles to base of scupper.
 - 3. Fabricate from the following materials:
 - a. Aluminum: 0.050 inch thick.
- B. Copings: Fabricate in minimum 96-inch-long, but not exceeding 10-foot-long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and interior leg. Miter corners, seal, and solder or weld watertight.
 - 1. Joint Style: Butt, with 12-inch-wide, concealed backup plate.
 - 2. Fabricate from the following materials:
 - a. Aluminum: 0.050 inch thick.

2.7 MISCELLANEOUS SHEET METAL FABRICATIONS

- A. Equipment Support Flashing: Fabricate from the following material:
 - 1. Stainless Steel: 0.0187 inch thick.

2.8 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations

in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of work.
 - 1. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
 - 2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
 - 1. Torch cutting of sheet metal flashing and trim is not permitted.
- B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by fabricator or manufacturers of dissimilar metals.
 - 1. Coat side of uncoated aluminum, stainless-steel, and lead sheet metal flashing and trim with bituminous coating where flashing and trim will contact wood, ferrous metal, or cementitious construction.
 - 2. Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet or install a course of polyethylene underlayment.
 - 3. Bed flanges in thick coat of asphalt roofing cement where required for waterproof performance.
- C. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.
- D. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and butyl sealant.
- E. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
 - 1. Space cleats not more than 12 inches apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.

- F. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
- G. Fasteners: Use fasteners of sizes that will penetrate substrate not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.
 - 1. Aluminum: Use aluminum or stainless-steel fasteners.
 - 2. Stainless Steel: Use stainless-steel fasteners.
- H. Seal joints with butyl sealant as required for watertight construction.
 - 1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 deg F, set joint members for 50 percent movement either way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
 - 2. Prepare joints and apply sealants to comply with requirements in Division 7 Section "Joint Sealants."

3.3 ROOF FLASHING INSTALLATION

- A. General: Install sheet metal roof flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight.
- B. Copings: Anchor to resist uplift and outward forces according to recommendations in FMG Loss Prevention Data Sheet 1-49 for specified wind zone and as indicated.
 - 1. Interlock exterior bottom edge of coping with continuous cleats anchored to substrate at 24-inch centers.
 - 2. Anchor interior leg of coping with screw fasteners and washers at 24-inch centers.
- C. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for butyl sealant, extending a minimum of 4 inches over base flashing. Install stainless-steel draw band and tighten.
- D. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Install flashing as follows:
 - 1. Turn lead flashing down inside vent piping, being careful not to block vent piping with flashing.

2. Seal with butyl sealant and clamp flashing to pipes penetrating roof except for lead flashing on vent piping.

3.4 MISCELLANEOUS FLASHING INSTALLATION

- A. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with butyl sealant to equipment support member.

3.5 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder and sealants.
- C. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain in a clean condition during construction.
- D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07620

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SECTION 07710 – ROOF SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Copings.
 - 2. Roof-edge flashings.
 - 3. Roof-edge drainage systems.
 - 4. Reglets and counterflashings.
- B. Related Sections:
 - 1. Division 6 Section 06100 "Rough Carpentry" for wood nailers, curbs, and blocking.
 - 2. Division 7 Section 07620 "Flashing and Trim" for custom- and site-fabricated sheet metal flashing and trim.
 - 3. Division 7 Section 07920 "Joint Sealants" for field-applied sealants between roof specialties and adjacent materials.

1.3 PERFORMANCE REQUIREMENTS

- A. General Performance: Roof specialties shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.
- B. FM Approvals' Listing: Manufacture and install copings and roof-edge flashings that are listed in FM Approvals' "RoofNav" and approved for windstorm classification Class 1-120. Identify materials with FM Approvals' markings.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of thermal movements. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For roof specialties. Include plans, elevations, expansion-joint locations, keyed details, and attachments to other work. Distinguish between plant- and field-assembled work. Include the following:
 - 1. Details for expansion and contraction; locations of expansion joints, including direction of expansion and contraction.
 - 2. Pattern of seams and layout of fasteners, cleats, clips, and other attachments.
 - 3. Details of termination points and assemblies, including fixed points.
 - 4. Details of special conditions.
- C. Samples for Initial Selection: For each type of roof specialty indicated with factory-applied color finishes.
- D. Samples for Verification: For copings and roof-edge drainage systems made from 12-inch lengths of full-size components including fasteners, cover joints, accessories, and attachments.

1.5 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for copings and roof-edge flashings.
- B. Warranty: Sample of special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For roofing specialties to include in maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Meet with Owner's Representatives, Installer, and installers whose work interfaces with or affects roof specialties including installers of roofing materials and accessories.
 - 2. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
 - 3. Review special roof details, roof drainage, and condition of other construction that will affect roof specialties.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Do not store roof specialties in contact with other materials that might cause staining, denting, or other surface damage. Store roof specialties away from uncured concrete and masonry.
- B. Protect strippable protective covering on roof specialties from exposure to sunlight and high humidity, except to extent necessary for the period of roof specialties installation.

1.9 COORDINATION

- A. Coordinate installation of manufactured roof specialties with interfacing and adjoining construction to provide a leakproof, secure and noncorrosive installation.

1.10 WARRANTY

- A. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace roof specialties that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 EXPOSED METALS

- A. Aluminum Sheet: ASTM B 209, alloy as standard with manufacturer for finish required, with temper to suit forming operations and performance required.
 - 1. Surface: Smooth, flat finish.
 - 2. Mill Finish: As manufactured.
 - 3. Exposed Coil-Coated Finishes: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - a. Two-Coat Fluoropolymer: AAMA 620. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight.

- B. Aluminum Extrusions: ASTM B 221 alloy and temper recommended by manufacturer for type of use and finish indicated, finished as follows:
 - 1. Exposed High-Performance Organic Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - a. Two-Coat Fluoropolymer: AAMA 2605. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight.
 - 2. Clear Anodic Finish, Coil Coated: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

2.2 CONCEALED METALS

- A. Aluminum Sheet: ASTM B 209, alloy and temper recommended by manufacturer for type of use and structural performance indicated, mill finished.
- B. Aluminum Extrusions: ASTM B 221, alloy and temper recommended by manufacturer for type of use and structural performance indicated, mill finished.
- C. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304.
- D. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 coating designation.

2.3 UNDERLAYMENT MATERIALS

- A. Felt: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, nonperforated.
- B. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.
 - 1. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F.
 - 2. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F.
 - 3. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Carlisle Coatings & Waterproofing; CCW WIP 300HT.
 - b. Grace Construction Products, a unit of W. R. Grace & Co.; Ultra.
 - c. Henry Company; Blueskin PE200 HT.
 - d. Metal-Fab Manufacturing, LLC; MetShield.
 - e. Owens Corning; WeatherLock Metal High Temperature Underlayment.
- C. Polyethylene Sheet: 6-mil-thick polyethylene sheet complying with ASTM D 4397.

- D. Slip Sheet: Building paper, 3-lb/100 sq. ft. minimum, rosin sized.

2.4 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.
- B. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to meet performance requirements. Furnish the following unless otherwise indicated:
1. Exposed Penetrating Fasteners: Gasketed screws with hex washer heads matching color of sheet metal.
 2. Fasteners for Aluminum: Aluminum or Series 300 stainless steel.
 3. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.
 4. Fasteners for Zinc-Coated (Galvanized) Steel Sheet: Series 300 stainless steel or hot-dip zinc-coated steel according to ASTM A 153/A 153M or ASTM F 2329.
- C. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant of type, grade, class, and use classifications required by roofing-specialty manufacturer for each application.
- D. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.5 COPINGS

- A. Copings: Manufactured coping system consisting of formed-metal coping cap in section lengths not exceeding 12 feet, concealed anchorage; corner units, end cap units, and concealed splice plates with same finish as coping caps.
1. Coping-Cap Material: Formed aluminum, 0.080 inch thick.
 - a. Finish Two-coat fluoropolymer.
 - b. Color: Match Architect's samples.
 2. Corners: Factory mitered and soldered.
 3. Coping-Cap Attachment Method: Face leg hooked to continuous cleat with back leg fastener exposed, fabricated from coping-cap material.
 4. Face Leg Cleats: Concealed, continuous galvanized-steel sheet.

2.6 ROOF-EDGE FLASHINGS

- A. Canted Roof-Edge Fascia and Gravel Stop: Manufactured, two-piece, roof-edge fascia consisting of snap-on metal fascia cover in section lengths not exceeding 12 feet and a continuous formed galvanized-steel sheet cant, 0.028 inch thick, minimum, with extended vertical leg terminating in a drip-edge cleat. Provide matching corner units.
1. Fascia Cover: Fabricated from the following exposed metal:
 - a. Formed Aluminum: 0.063 inch thick.

2. Corners: Factory mitered and soldered.
 3. Splice Plates: Concealed, of same material, finish, and shape as fascia cover.
 4. Fascia Accessories: Overflow scuppers.
- B. Roof-Edge Fascia: Manufactured, two-piece, roof-edge fascia consisting of snap-on metal fascia cover in section lengths not exceeding 12 feet and a continuous formed- or extruded-aluminum anchor bar with integral drip-edge cleat to engage fascia cover. Provide matching corner units.
1. Fascia Cover: Fabricated from the following exposed metal:
 - a. Formed Aluminum: 0.063 inch thick.
 2. Corners: Factory mitered and soldered.
 3. Splice Plates: Concealed, of same material, finish, and shape as fascia cover.
 4. Fascia Accessories: Overflow scuppers.
- C. One-Piece Gravel Stops: Manufactured, one-piece, metal gravel stop in section lengths not exceeding 12 feet, with a horizontal flange and vertical leg, drain-through fascia terminating in a drip edge, and concealed splice plates of same material, finish, and shape as gravel stop. Provide matching corner units.
1. Fabricate from the following exposed metal:
 - a. Formed Aluminum: 0.050 inch thick.
 2. Corners: Factory mitered and soldered.
- D. Aluminum Finish: Two-coat fluoropolymer.
1. Color: Match Architect's sample.

2.7 ROOF-EDGE DRAINAGE SYSTEMS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Castle Metal Products.
 2. Merchant & Evans, Inc.
 3. Metal-Era, Inc.
- B. Gutters: Manufactured in uniform section lengths not exceeding 16 feet, with matching corner units, ends, outlet tubes, and other accessories. Elevate back edge at least 1 inch above front edge. Furnish flat-stock gutter straps, gutter brackets, expansion joints, and expansion-joint covers fabricated from same metal as gutters.
1. Fabricate from the following exposed metal: Formed Aluminum: 0.050 inch thick.
 2. Gutter Profile: Box.
 3. Gutter Supports: Manufacturer's standard supports as selected by Architect with finish matching the gutters.

- C. Downspouts: Plain rectangular complete with elbows, manufactured from the following exposed metal. Furnish with metal hangers, from same material as downspouts, and anchors.
 - 1. Fabricate from the following exposed metal: Formed Aluminum: 0.050 inch thick.

2.8 REGLETS AND COUNTERFLASHINGS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Castle Metal Products.
 - 2. Cheney Flashing Company.
 - 3. Fry Reglet Corporation.
 - 4. Heckmann Building Products Inc.
 - 5. Hickman Company, W. P.
 - 6. Keystone Flashing Company, Inc.
 - 7. Metal-Era, Inc.
 - 8. Metal-Fab Manufacturing, LLC.
 - 9. MM Systems Corporation.
 - 10. National Sheet Metal Systems, Inc.

2.9 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.
- B. Examine walls, roof edges, and parapets for suitable conditions for roof specialties.
- C. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

- A. Felt Underlayment: Install with adhesive for temporary anchorage to minimize use of mechanical fasteners under roof specialties. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches).
- B. Self-Adhering Sheet Underlayment: Install wrinkle free. Apply primer if required by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer rather than nails for installing underlayment at low temperatures. Apply in shingle fashion to shed water. Overlap edges not less than 3-1/2 inches. Roll laps with roller. Cover underlayment within 14 days.
- C. Slip Sheet: Install with tape or adhesive for temporary anchorage to minimize use of mechanical fasteners under roof specialties. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches.

3.3 INSTALLATION, GENERAL

- A. General: Install roof specialties according to manufacturer's written instructions. Anchor roof specialties securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete roof-specialty systems.
 - 1. Install roof specialties level, plumb, true to line and elevation; with limited oil-canning and without warping, jogs in alignment, buckling, or tool marks.
 - 2. Provide uniform, neat seams with minimum exposure of solder and sealant.
 - 3. Install roof specialties to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture.
 - 4. Torch cutting of roof specialties is not permitted.
 - 5. Do not use graphite pencils to mark metal surfaces.
- B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
 - 1. Coat concealed side of uncoated aluminum roof specialties with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
 - 2. Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of self-adhering, high-temperature sheet underlayment.
 - 3. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof specialties for waterproof performance.

- C. Expansion Provisions: Allow for thermal expansion of exposed roof specialties.
 - 1. Space movement joints at a maximum of 12 feet with no joints within 18 inches of corners or intersections unless otherwise shown on Drawings.
 - 2. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures.
- D. Fastener Sizes: Use fasteners of sizes that will penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.
- E. Seal joints with sealant as required by roofing-specialty manufacturer.
- F. Seal joints as required for watertight construction. Place sealant to be completely concealed in joint. Do not install sealants at temperatures below 40 deg F.

3.4 COPING INSTALLATION

- A. Install cleats, anchor plates, and other anchoring and attachment accessories and devices with concealed fasteners.
- B. Anchor copings to meet performance requirements.
 - 1. Interlock face leg drip edge into continuous cleat anchored to substrate at manufacturer's required spacing that meets performance requirements. Anchor back leg of coping with screw fasteners and elastomeric washers at manufacturer's required spacing that meets performance requirements.

3.5 ROOF-EDGE FLASHING INSTALLATION

- A. Install cleats, cants, and other anchoring and attachment accessories and devices with concealed fasteners.
- B. Anchor roof edgings with manufacturer's required devices, fasteners, and fastener spacing to meet performance requirements.

3.6 CLEANING AND PROTECTION

- A. Clean and neutralize flux materials. Clean off excess solder and sealants.
- B. Remove temporary protective coverings and strippable films as roof specialties are installed. On completion of installation, clean finished surfaces including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain roof specialties in a clean condition during construction.
- C. Replace roof specialties that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 07710

**NEW PASSENGER TERMINAL
DULUTH INTERNATIONAL AIRPORT
DULUTH, MINNESOTA**

**SECTION 07841 – THROUGH - PENETRATION
FIRESTOP SYSTEMS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.

1.2 SUMMARY

- A. Provide firestopping penetration sealing system which shall have a continuous bond between substrate and penetrating item to assure a positive and effective fire and smoke seal. Provide sealing system for all penetrations through floor slabs (not in protected enclosures), fire walls and other fire-rated partitions or assemblies.
- B. This section includes firestop systems for the following:
 - 1. Penetrations through fire-resistance-rated walls and partitions including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.
 - 2. Penetrations through smoke barriers and construction enclosing compartmentalized areas involving both empty openings and openings containing penetrating items.
 - 3. Sealant joints in fire-resistance-rated construction.
 - 4. Construction-gap firestop systems at connections of same or different materials in fire-rated construction.
 - 5. Construction-gap firestop systems occurring within fire-rated wall assemblies.
 - 6. Construction-gap firestop systems occurring at the top of fire-rated walls.
- C. Coordinate all sleeves (sizes and locations) specified in Divisions 15 and 16 of these specifications.
- D. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 7, Section 07920 - JOINT SEALANTS for non-fire-resistive-rated joint sealants.
 - 2. Division 15 sections specifying ducts and piping penetrations.
 - 3. Division 16 sections specifying cable and conduit penetrations.

1.3 SYSTEM PERFORMANCE REQUIREMENTS

- A. General: Provide firestop systems that are produced and installed to resist the spread of fire, according to requirements indicated, resist passage of smoke and other gases, and maintain original fire resistance rating of assembly penetrated.

- B. F-Rated Through-Penetration Firestop Systems: Provide through-penetration firestop systems with F ratings indicated, as determined per ASTM E814, but not less than that equaling or exceeding the fire-resistance rating of the constructions penetrated.
- C. T-Rated Through-Penetration Firestop Systems: Provide through-penetration firestop systems with T ratings, in addition to F ratings, as determined per ASTM E814, where indicated and where systems protect penetrating items exposed to contact with adjacent materials in occupiable floor areas. T-rated assemblies are required where the following conditions exist:
 - 1. Where firestop systems protect penetrations located outside of wall cavities and fire-resistive shaft enclosures.
 - 2. Where firestop systems protect penetrations located in construction containing doors required to have a temperature-rise rating.
 - 3. Where firestop systems protect penetrating items larger than a 4-inch-diameter nominal pipe or 16 sq. in. in overall cross-sectional area.
- D. Fire-Resistive Joint Sealants: Provide joint sealants with fire-resistance ratings indicated, as determined per ASTM E119, but not less than that equaling or exceeding the fire-resistance rating of the construction in which the joint occurs.
- E. For firestop systems exposed to view, traffic, moisture, and physical damage, provide products that do not deteriorate when exposed to these conditions.
 - 1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
 - 2. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.
 - 3. For floor penetrations with annular spaces exceeding 4 inches or more in width and exposed to possible loading and traffic, provide firestop systems capable of supporting the floor loads involved either by installing plates or by other means.
- F. For through-penetration firestop systems exposed to view, provide products with flame-spread ratings of less than 25 and smoke-developed ratings of less than 450, as determined per ASTM E84.

1.4 ACTION SUBMITTALS

- A. Product data for each type of product specified. Data shall include product characteristics, typical uses, performance and limitation criteria and test data.
- B. LEED Submittals:
 - 1. Product Data for Credit IEQ 4.1: For penetration firestopping sealants and sealant primers, documentation including printed statement of VOC content.
- C. Product certificates signed by manufacturers of firestop systems products certifying that their products comply with specified requirements.

- D. Shop Drawings: Indicate dimensions, description of materials and finishes, specific modifications, component connections, anchorage methods, hardware and installation procedures.
 - 1. Include detail drawings of each proposed assembly identifying intended products and applicable UL, GA or FM system number or UL classified devices. Indicate which firestop materials will be used and thickness for different hourly ratings.
- E. Engineering Judgments: Submit manufacturer's drawings for all nonstandard applications where no UL, GA or FM tested system exists. All drawings must indicate the "tested" UL, GA or FM system upon which the judgment is based so as to assess the relevance of the judgment to some known performance.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
 - 1. A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."
 - 2. A firm experienced in installing penetration firestopping similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements.
- B. Installer Certificates: From Installer indicating penetration firestopping has been installed in compliance with requirements and manufacturer's written recommendations.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for penetration firestopping

1.6 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: Provide firestop systems that comply with the following requirements and those specified under the "System Performance Requirements" article:
 - 1. Firestop systems tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL, Warnock Hersey, or another agency performing testing and follow-up inspection services for firestop systems that is acceptable to authorities having jurisdiction.
 - 2. Through-penetration firestop systems are identical to those tested per ASTM E814 under conditions where positive furnace pressure differential of at least 0.01 inch of water is maintained at a distance of 0.78 inch below the fill materials surrounding the penetrating items in the test assembly. Provide rated systems complying with the following requirements:

- a. Through-penetration firestop system products bear classification marking of qualified testing and inspecting agency.
 - b. Through-penetration firestop systems correspond to those indicated by reference to through-penetration firestop system designations listed by UL, GA or FM in their "Fire Resistance Directory," or Warnock Hersey.
- 3. Fire-resistive joint sealant systems are identical to those tested for fire-response characteristics per ASTM E 119 under conditions where the positive furnace pressure differential is at least 0.01 inch of water, as measured 0.78 inch from the face exposed to furnace fire. Provide systems complying with the following requirements:
 - a. Fire-Resistance Ratings of Joint Sealants: As indicated by reference to design designations listed by UL in their "Fire Resistance Directory" or by another qualified testing and inspecting agency.
 - b. Joint sealants, including backing materials, bear classification marking of qualified testing and inspection agency.
- B. Single-Source Responsibility: Obtain through-penetration firestop systems for each kind of penetration and construction condition indicated from a single manufacturer.
- C. Coordinating Work: Coordinate construction of openings and penetrating items to ensure that designated through-penetration firestop systems are installed per specified requirements.
- D. Do not use any product containing solvents that require hazardous waste disposal or which after curing dissolve in water.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver firestop system products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer; date of manufacture; lot number; shelf life, if applicable; qualified testing and inspecting agency's classification marking applicable to Project; curing time; and mixing instructions for multicomponent materials.
- B. Store and handle firestop system materials to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install penetration firestopping when ambient or substrate temperatures are outside limits permitted by penetration firestopping manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.
- B. Install and cure penetration firestopping per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.8 SEQUENCING AND SCHEDULING

- A. Coordinate the work of this section with the work of other trades.
- B. Do not cover up those firestopping installations that will become concealed behind other construction until authorities having jurisdiction, if required, have examined each installation.

1.9 WARRANTY

- A. Provide written warranty, signed by manufacturer of firestopping materials and his authorized installer, agreeing to replace/repair defective materials and workmanship as required to maintain firestopping conditions. Warranty shall state that the firestopping materials have been installed and used properly and for the purpose which intended.
 - 1. Warranty period is 2 years after date of Substantial Completion.
- B. If products offered have a manufacturer's warranty that states that Owner/user shall test application/determine suitability then Contractor shall have independently monitored tests performed on conditions identical to proposed construction, and shall submit copies of these tests for review. Submittals made without this testing will not be considered or approved.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers: Subject to compliance with requirements, provide firestop system products by one of the following:
 - 1. 3M Fire Protection Products.
 - 2. Cafco Through Penetration Systems; Isolatak International.
 - 3. Hilti Firestop Systems.
 - 4. International Protective Coatings Corporation.
 - 5. SpecSeal Firestop Products; Specified Technologies, Inc.
 - 6. Dow Corning Corp.

2.2 FIRESTOP SYSTEMS, GENERAL

- A. Compatibility: Provide firestop systems composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestop systems under conditions of service and application, as demonstrated by firestop systems manufacturer based on testing and field experience.
- B. Accessories: Provide components for each firestop systems system that are needed to install fill materials and to comply with "System Performance Requirements" article in Part 1. Use only components specified by the firestop systems manufacturer and approved by the qualified testing and inspecting agency for the designated fire-resistance-rated systems. Accessories include but are not limited to the following items:

1. Permanent forming/damming/backing materials including the following:
 - a. Semirefractory fiber (mineral wool) insulation.
 - b. Ceramic fiber.
 - c. Sealants used in combination with other forming/damming materials to prevent leakage of fill materials in liquid state.
 - d. Fire-rated formboard.
 - e. Joint fillers for joint sealants.
 2. Temporary forming materials.
 3. Substrate primers.
 4. Collars.
 5. Steel sleeves.
- C. Penetration seals shall be of the type and shape required to continuously fill the annular space between the pipe, conduit, cable, etc., and the wall or floor opening with or without sleeves.
- D. Seal shall be constructed to provide electrical insulation between the pipe and wall, thus reducing the chances of cathodic reaction between these members.
- E. Provide materials as required for all blank openings through floor and walls where a fire rating is required.
- F. Provide metal sleeves, collars and plates not specified in other sections as required to meet the fire resistance ratings in which the penetrations occur.

2.3 FILL MATERIALS FOR THROUGH-PENETRATION FIRESTOP SYSTEMS

- A. Ceramic-Fiber and Mastic Coating: Ceramic fibers in bulk form formulated for use with mastic coating, and ceramic fiber manufacturer's mastic coating.
- B. Ceramic-Fiber Sealant: Single-component formulation of ceramic fibers and inorganic binders.
- C. Endothermic, Latex Compound Sealant: Single-component, endothermic, latex formulation.
- D. Intumescent, Latex Sealant: Single-component, intumescent, latex formulation.
- E. Intumescent Putty: Nonhardening, dielectric, water-resistant putty containing no solvents, inorganic fibers, or silicone compounds.
- F. Intumescent Wrap Strips: Single-component, elastomeric sheet with aluminum foil on one side.
- G. Job-Mixed Vinyl Compound: Prepackaged vinyl-based powder product for mixing with water at Project site to produce a paintable compound, passing ASTM E136, with flame-spread and smoke-developed ratings of zero per ASTM E84.
- H. Mortar: Prepackaged dry mix composed of a blend of inorganic binders, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogenous mortar.

- I. Pillows / Bags: Re-usable, heat-expanding pillows / bags composed of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents and fire-retardant additives.
- J. Silicone Foam: Two-component, silicone-based liquid elastomer that, when mixed, expands and cures in place to produce a flexible, nonshrinking foam.
- K. Silicone Sealant: Moisture-curing, single-component, silicone-based, neutral-curing elastomeric sealant of grade indicated below:
 - 1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces and nonsag formulation for openings in vertical and other surfaces requiring a nonslumping / gunnable sealant, unless indicated firestop system limits use to nonsag grade for both opening conditions.
- L. Solvent-Release-Curing Intumescent Sealant: Solvent-release- curing, single-component, synthetic-polymer-based sealant of grade indicated below:
 - 1. Grade: Pourable (self-leveling) formulation for openings in horizontal surfaces and nonsag formulation for openings in vertical and other surfaces requiring a nonslumping / gunnable sealant, unless indicated firestop system limits use to nonsag grade for both opening conditions.

2.4 FIRE-RESISTIVE ELASTOMERIC JOINT SEALANTS

- A. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer indicated that complies with ASTM C920 requirements, including those referenced for Type, Grade, Class, and Uses, and requirements specified in this Section applicable to fire-resistive joint sealants.
- B. Sealant Colors: Provide color of exposed joint sealants as selected by Architect from manufacturer's standards.
- C. Single-Component, Neutral-Curing Silicone Sealant: Type S; Grade NS; Class 25; exposure-related Use NT, and joint-substrate-related Uses M, G, A, and (as applicable to joint substrates indicated) O.
 - 1. Additional Movement Capability: Provide sealant with the capability to withstand the following percentage changes in joint width existing at time of installation, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C719, and remain in compliance with other requirements of ASTM C920 for uses indicated:
 - a. 100 percent movement in extension and 50 percent movement in compression for a total of 150 percent movement.
- D. Multicomponent, Nonsag, Urethane Sealant: Type M; Grade NS; Class 25; exposure-related Use NT, and joint-substrate-related Uses M, A, and (as applicable to joint substrates indicated) O.

1. Additional Movement Capability: Provide sealant with the capability to withstand the following percentage change in joint width existing at time of installation, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C719, and remain in compliance with other requirements of ASTM C920 for uses indicated:
 - a. 50 percent movement in both extension and compression for a total of 100 percent movement.
- E. Single-Component, Nonsag, Urethane Sealant: Type S; Grade NS; Class 25; and Uses NT, M, A, and (as applicable to joint substrates indicated) O.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Clean out openings and joints immediately prior to installing firestop systems to comply with recommendations of firestop systems manufacturer and the following requirements:
 1. Remove all foreign materials from surfaces of opening and joint substrates and from penetrating items that could interfere with adhesion of firestop systems.
 2. Clean opening and joint substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with firestop systems. Remove loose particles remaining from cleaning operation.
 3. Remove laitance and form release agents from concrete.

3.3 INSTALLING THROUGH-PENETRATION FIRESTOPS

- A. General: Comply with the "System Performance Requirements" article in Part 1 and the through-penetration firestop manufacturer's installation instructions and drawings pertaining to products and applications indicated.
- B. Install forming / damming materials and other accessories of types required to support fill materials during their application and in the position needed to produce the cross-sectional shapes and depths required to achieve fire ratings of designated through-penetration firestop systems. After installing fill materials, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.
- C. Install fill materials for through-penetration firestop systems by proven techniques to produce the following results:
 1. Completely fill voids and cavities formed by openings, forming materials, accessories, and penetrating items.

2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.
- D. Any material found to be defective shall be removed and replaced by the applicator.

3.4 INSTALLING FIRE-RESISTIVE JOINT SEALANTS

- A. General: Comply with the "System Performance Requirements" article in Part 1, with ASTM C 1193, and with the sealant manufacturer's installation instructions and drawings pertaining to products and applications indicated.
- B. Install joint fillers to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability and develop fire-resistance rating required.
- C. Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint width that optimum sealant movement capability. Install sealants at the same time joint fillers are installed.
- D. Tool nonsag sealants immediately after sealant application and prior to the time skinning or curing begins. Form smooth, uniform beads of configuration indicated or required to produce fire-resistance rating, as well as to eliminate air pockets, and to ensure contact and adhesion of sealants with sides of joint. Remove excess sealant from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.
- E. Any material found to be defective shall be removed and replaced by the applicator.

3.5 CLEANING

- A. Clean off excess fill materials and sealants adjacent to openings and joints as work progresses by methods and with cleaning materials approved by manufacturers of firestop systems products and of products in which opening and joints occur.
- B. Protect firestop systems during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated firestop systems immediately and install new materials to produce firestop systems complying with specified requirements.

END OF SECTION 07841

**NEW PASSENGER TERMINAL
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DULUTH, MINNESOTA**

SECTION 07920 – JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes:
 - 1. Elastomeric sealants.
 - 2. Latex joint sealants.
 - 3. Acoustical joint sealants.
 - 4. Preformed joint sealants and compressible fillers.
- B. Related Sections include the following:
 - 1. Section 07842 "Through-Penetration Firestop Systems" for sealing joints in fire-resistance-rated construction.
 - 2. Division 8 Section 08801 "Interior Glazing" for glazing sealants.
 - 3. Division 8 Section 08460 "Automatic Entrance Doors" for structural and other glazing sealants.

1.3 PERFORMANCE REQUIREMENTS

- A. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

1.4 ACTION SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- B. LEED Submittals:
 - 1. Product Data for Credit IEQ 4.1: For sealants and sealant primers used inside the weatherproofing system, documentation including printed statement of VOC content.
- C. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

- D. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 3/8-inch-wide joints formed between two 6-inch-long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- E. Joint-Sealant Schedule: Include the following information:
 - 1. Joint-sealant application, joint location, and designation.
 - 2. Joint-sealant manufacturer and product name.
 - 3. Joint-sealant formulation.
 - 4. Joint-sealant color.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Product Certificates: For each kind of joint sealant and accessory, from manufacturer.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that sealants comply with requirements.
- D. Preconstruction Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:
 - 1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
 - 2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
- E. Field-Adhesion Test Reports: For each sealant application tested.
- F. Warranties: Sample of special warranties.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized Installer who is approved or licensed for installation of elastomeric sealants required for this Project.
- B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.
- C. Product Testing: Test joint sealants using a qualified testing agency.
 - 1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.
 - 2. Test elastomeric joint sealants for compliance with requirements specified by reference to ASTM C 920, and where applicable, to other standard test methods.
 - 3. Test other joint sealants for compliance with requirements indicated by referencing standard specifications and test methods.

1.7 PROJECT CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
 - 2. When joint substrates are wet.
 - 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
 - 4. Contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.8 WARRANTY

- A. Special Installer's Warranty: Installer's standard form in which Installer agrees to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer's standard form in which elastomeric sealant manufacturer agrees to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.
- C. Special warranties specified in this Article exclude deterioration or failure of elastomeric joint sealants from the following:
 - 1. Movement of the structure resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression caused by structural settlement or errors attributable to design or construction.
 - 2. Disintegration of joint substrates from natural causes exceeding design specifications.
 - 3. Mechanical damage caused by individuals, tools, or other outside agents.
 - 4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.

- B. VOC Content of Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - 1. Architectural Sealants: 250 g/L.
 - 2. Sealant Primers for Nonporous Substrates: 250 g/L.
 - 3. Sealant Primers for Porous Substrates: 775 g/L
- C. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 ELASTOMERIC JOINT SEALANTS

- A. Elastomeric Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
- B. Single-Component Pourable Neutral-Curing Silicone Sealant:
 - 1. Products:
 - a. Dow Corning Corporation; 890-SL.
 - b. Pecora Corporation; 300 Pavement Sealant (Self Leveling).
 - c. Dow Corning Corporation; SL Parking Structure Sealant.
 - 2. Type and Grade: S (single component) and P (pourable).
 - 3. Class: 100/50.
 - 4. Use Related to Exposure: T (traffic).
 - 5. Uses Related to Joint Substrates: M, A, and O, as applicable to joint substrates indicated.
 - a. Use O Joint Substrates: Ceramic tile.
- C. Single-Component Neutral-Curing Silicone Sealant:
 - 1. Products:
 - a. Dow Corning Corporation; 799.
 - b. GE Silicones; UltraGlaze SSG4000.
 - c. GE Silicones; UltraGlaze SSG4000AC.
 - d. Polymeric Systems Inc.; PSI-631.
 - e. Schnee-Morehead, Inc.; SM5731 Poly-Glaze Plus.
 - f. Tremco; Proglaze SG.
 - g. Tremco; Spectrem 2.
 - h. Tremco; Tremsil 600.
 - 2. Type and Grade: S (single component) and NS (nonsag).
 - 3. Class: 25.
 - 4. Use Related to Exposure: NT (nontraffic).
 - 5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.
 - a. Use O Joint Substrates: Aluminum coated with a high-performance coating and ceramic tile.

D. Single-Component Mildew-Resistant Neutral-Curing Silicone Sealant:

1. Products:
 - a. Pecora Corporation; 898.
 - b. Tremco; Tremsil 600 White.
2. Type and Grade: S (single component) and NS (nonsag).
3. Class: 25.
4. Use Related to Exposure: NT (nontraffic).
5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.
 - a. Use O Joint Substrates: Color anodic aluminum, aluminum coated with a high-performance coating and ceramic tile.

E. Single-Component Nonsag Urethane Sealant:

1. Products:
 - a. Sika Corporation, Inc.; Sikaflex - 1a.
 - b. Sonneborn, Division of ChemRex Inc.; Ultra.
 - c. Sonneborn, Division of ChemRex Inc.; NP 1.
 - d. Tremco; Vulkem 116.
2. Type and Grade: S (single component) and NS (nonsag).
3. Class: 25.
4. Uses Related to Exposure: T (traffic) and NT (nontraffic).
5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.
 - a. Use O Joint Substrates: Color anodic aluminum, aluminum coated with a high-performance coating and ceramic tile.

F. Single-Component Nonsag Urethane Sealant:

1. Products:
 - a. Bostik Findley; Chem-Calk 900.
 - b. Pecora Corporation; Dynatrol I-XL.
 - c. Polymeric Systems Inc.; Flexiprene 1000.
 - d. Tremco; DyMonic.
2. Type and Grade: S (single component) and NS (nonsag).
3. Class: 25.
4. Use Related to Exposure: NT (nontraffic).
5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.
 - a. Use O Joint Substrates: Color anodic aluminum, aluminum coated with a high-performance coating and ceramic tile.

G. Single-Component Pourable Urethane Sealant:

1. Products:
 - a. Bostik Findley; Chem-Calk 950.
 - b. Pecora Corporation; Urexpam NR-201.
 - c. Polymeric Systems Inc.; Flexiprene 952.
 - d. Tremco; Vulkem 45.

2. Type and Grade: S (single component) and P (pourable).
 3. Class: 25.
 4. Use Related to Exposure: T (traffic).
 5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.
 - a. Use O Joint Substrates: Color anodic aluminum, aluminum coated with a high-performance coating and ceramic tile.
- H. Butyl-Rubber-Based Solvent-Release Joint Sealant (Roofing only): Comply with ASTM C 1085.
1. Products:
 - a. Bostik Findley; Bostik 300.
 - b. Fuller, H. B. Company; SC-0296.
 - c. Pecora Corporation; BC-158.
 - d. Polymeric Systems Inc.; PSI-301
 - e. Sonneborn, Division of ChemRex Inc.; Sonneborn Multi-Purpose Sealant.
 - f. Tremco; Tremco Butyl Sealant.

2.3 LATEX JOINT SEALANTS

- A. Latex Sealant: Comply with ASTM C 834, Type P, Grade NF.
- B. Products:
1. Bostik Findley; Chem-Calk 600.
 2. Pecora Corporation; AC-20+.
 3. Schnee-Morehead, Inc.; SM 8200.
 4. Sonneborn, Division of ChemRex Inc.; Sonolac.
 5. Tremco; Tremflex 834.

2.4 ACOUSTICAL JOINT SEALANTS

- A. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834 and the following:
1. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
 2. Products:
 - a. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant.
 - b. United States Gypsum Co.; SHEETROCK Acoustical Sealant.
- B. Acoustical Sealant for Concealed Joints: Manufacturer's standard, nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant recommended for sealing interior concealed joints to reduce airborne sound transmission.

1. Products:
 - a. Pecora Corporation; BA-98.
 - b. Tremco; Tremco Acoustical Sealant.

2.5 PREFORMED JOINT SEALANTS AND COMPRESSIBLE FILLERS

- A. Precompressed Sealant: Silicone pre-coated, preformed, pre-compressed, self-expanding, sealant system.
 1. Expanding foam to be open-cell polyurethane foam impregnated with a water-based, non-drying, polymer-modified acrylic adhesive. Seal shall combine factory-applied, low-modulus silicone and a backing of acrylic-impregnated expanding foam into a unified hybrid sealant system. Silicone must be proved to have been tested for hardness according to ASTM D2240 (Shore-A hardness not to exceed 25). Silicone external color facings to be factory-applied to the foam while it is partially pre-compressed to a width greater than maximum joint extension and cured before final compression. When compressed to final supplied dimension, distinct and uniform folds must be created in the silicone coating.
 2. Material shall be capable of movements of +50%, -50% (100% total) of nominal material size. Sealant must be supplied precompressed to less than the joint size, packaged in shrink-wrapped lengths (sticks) with a mounting adhesive on one face. End to end joins of consecutive lengths of material to be butted and joined bellows surfaces to be lightly coated with silicone. To obtain identical color sealant, use sealant supplied by manufacturer.
 3. Basis of Design: SEISMIC COLORSEAL-DS (Double-Sided) by EMSEAL
- B. Compressible Fillers: Expanded closed-cell Ethylene Propylene Diene (EPDM) sponge rubber.
 1. Basis of Design: Everlastic EPDM Sponge 3000 by Williams Products, Inc.

2.6 JOINT-SEALANT BACKING

- A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), B (bicellular material with a surface skin) or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:
- C. Elastomeric Tubing Sealant Backings: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to minus 26 deg F. Provide products with low compression set and of size and shape to provide a secondary seal, to

control sealant depth, and to otherwise contribute to optimum sealant performance.

- D. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.7 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 2. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning

operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:

- a. Concrete.
- b. Masonry.
- c. Unglazed surfaces of ceramic tile.

- 3. Remove laitance and form-release agents from concrete.
- 4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:

- a. Metal.
- b. Glass.
- c. Glazed surfaces of ceramic tile.

- B. Joint Priming: Prime joint substrates, where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Acoustical Sealant Application Standard: Comply with recommendations in ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.
- D. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of sealant backings.
 - 2. Do not stretch, twist, puncture, or tear sealant backings.
 - 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
 2. Completely fill recesses in each joint configuration.
 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
1. Remove excess sealant from surfaces adjacent to joints.
 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 3. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.
 4. Provide flush joint configuration where indicated per Figure 5B in ASTM C 1193.
 5. Provide recessed joint configuration of recess depth and at locations indicated per Figure 5C in ASTM C 1193.
 - a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

3.4 FIELD QUALITY CONTROL

- A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:
1. Extent of Testing: Test completed elastomeric sealant joints as follows:
 - a. Perform 1 test for each day of sealant application.
 2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab in Appendix X1 in ASTM C 1193.
 - a. For joints with dissimilar substrates, verify adhesion to each substrate separately; do this by extending cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
 3. Inspect joints for complete fill, for absence of voids, and for joint configuration complying with specified requirements. Record results in a field-adhesion-test log.
 4. Inspect tested joints and report on the following:
 - a. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.
 - b. Whether sealants filled joint cavities and are free of voids.
 - c. Whether sealant dimensions and configurations comply with specified requirements.
 5. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test

dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.

6. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

- B. Evaluation of Field Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.5 CLEANING

- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.6 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION 07920

**NEW PASSENGER TERMINAL
DULUTH INTERNATIONAL AIRPORT
DULUTH, MINNESOTA**

**SECTION 08110 – STEEL DOORS
AND FRAMES**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Standard hollow metal work.
- B. Related Sections:
 - 1. Division 8 Section 08710 "Finish Hardware" for door hardware for hollow metal doors and frames.
 - 2. Division 9 Section 09900 "Painting" for field painting hollow metal doors and frames
 - 3. Division 16 Sections for electrical connections including conduit and wiring for door controls and operators.

1.3 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.
- B. Standard Hollow Metal Work: Hollow metal work fabricated according to ANSI/SDI A250.8.

1.4 COORDINATION

- A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
 - 1. Include construction details, material descriptions, core descriptions, fire-resistance rating, temperature-rise ratings, and finishes.
- B. LEED Submittals:

1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
- C. Shop Drawings: Include the following:
1. Elevations of each door type.
 2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
 3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 4. Locations of reinforcement and preparations for hardware.
 5. Details of each different wall opening condition.
 6. Details of anchorages, joints, field splices, and connections.
 7. Details of accessories.
 8. Details of moldings, removable stops, and glazing.
 9. Details of conduit and preparations for power, signal, and control systems.
- D. Samples for Verification:
1. For each type of exposed finish required, prepared on Samples of not less than 3 by 5 inches.
 2. For "Doors" and "Frames" subparagraphs below, prepare Samples about 12 by 12 inches to demonstrate compliance with requirements for quality of materials and construction:
 - a. Doors: Show vertical-edge, top, and bottom construction; core construction; and hinge and other applied hardware reinforcement. Include separate section showing glazing if applicable.
 - b. Frames: Show profile, corner joint, floor and wall anchors, and silencers. Include separate section showing fixed hollow metal panels and glazing if applicable.
- E. Schedule: Provide a schedule of hollow metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with door hardware schedule.

1.6 INFORMATIONAL SUBMITTALS

- A. Oversize Construction Certification: For assemblies required to be fire rated and exceeding limitations of labeled assemblies.
- B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each type of hollow metal door and frame assembly.

1.7 QUALITY ASSURANCE

- A. Source Limitations: Obtain hollow metal work from single source from single manufacturer.

- B. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at as close to neutral pressure as possible according to NFPA 252 or UL 10B.
 - 1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.
 - 2. Temperature-Rise Limit: At vertical exit enclosures and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F (250 deg C) above ambient after 30 minutes of standard fire-test exposure.
- C. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9. Label each individual glazed lite.
- D. Smoke-Control Door Assemblies: Comply with [FPA 105 or UL 1784.
- E. Preinstallation Conference: Conduct conference at Project site.
- F. Design pressure certification up to +/- 80 psf.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
 - 1. Provide additional protection to prevent damage to factory-finished units.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow metal work under cover at Project site.
 - 1. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch-high wood blocking. Do not store in a manner that traps excess humidity.
 - 2. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

1.9 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Amweld International, LLC.
 2. Ceco Door Products; an Assa Abloy Group company.
 3. Curries Company; an Assa Abloy Group company.
 4. Pioneer Industries, Inc.
 5. Steelcraft; an Ingersoll-Rand company.

2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G90 (Z180) metallic coating.
- D. Frame Anchors: ASTM A 591/A 591M, Commercial Steel (CS), 40Z (12G) coating designation; mill phosphatized.
1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.
- E. Inserts, Bolts, and Fasteners: Manufacturer's standard units:
1. For exterior walls use hot-dip galvanized according to ASTM A 153/A 153M.
 2. Fasteners for glazing stops: oval head spanner screws, unless otherwise indicated.
- F. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow metal frames of type indicated.
- G. Grout: ASTM C 476, except with a maximum slump of 4 inches, as measured according to ASTM C 143/C 143M.
- H. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool with 6- to 12-lb/cu. Ft. density; with maximum flame-spread and smoke-development indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
- I. Glazing: Comply with requirements in Division 8 Section "Glazing."
- J. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.3 STANDARD HOLLOW METAL DOORS

- A. General: Provide doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8.
 - 1. Design: Flush panel.
 - 2. Core Construction: Manufacturer's standard, polystyrene or, polyurethane, core.
 - a. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.
 - b. Thermal-Rated (Insulated) Doors: Where indicated, provide doors fabricated with thermal-resistance value (R-value) of not less than 6.0 deg F x h x sq. ft./Btu when tested according to ASTM C 1363.
 - 1) Locations: Exterior doors and interior doors where indicated.
 - 3. Vertical Edges for Single-Acting Doors: Beveled edge.
 - a. Beveled Edge: 1/8 inch in 2 inches.
 - 4. Vertical Edges for Double-Acting Doors: Round vertical edges with 2-1/8-inch radius.
 - 5. Top and Bottom Edges: Closed with flush or inverted 0.042-inch-thick, end closures or channels of same material as face sheets.
 - 6. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."
- B. Exterior Doors: Face sheets fabricated from metallic-coated steel sheet. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
 - 1. Level 3 and Physical Performance Level A (Extra Heavy Duty), Model 2 (Seamless).
- C. Interior Doors: Face sheets fabricated from cold-rolled steel sheet unless metallic-coated sheet is indicated. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
 - 1. Level 2 and Physical Performance Level B (Heavy Duty), Model 2 (Seamless).
- D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.
- E. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.
- F. Pre conduit frames and doors with UL rated Electro Lynx conduit and back boxes as required for electro mechanical hardware specified in Section 08710.

2.4 STANDARD HOLLOW METAL FRAMES

- A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.

- B. Exterior Frames: Fabricated from metallic-coated steel sheet.
 - 1. Fabricate frames with mitered or coped corners.
 - 2. Fabricate frames as full profile welded unless otherwise indicated.
 - 3. Frames for Level 3 Steel Doors: 0.067-inch-thick steel sheet.
- C. Interior Frames: Fabricated from cold-rolled steel sheet unless metallic-coated sheet is indicated.
 - 1. Fabricate frames with mitered or coped corners.
 - 2. Fabricate frames as face welded unless otherwise indicated.
 - 3. Frames for Level 2 Steel Doors: 0.053-inch-thick steel sheet.
 - 4. Frames for Wood Doors: 0.053-inch-thick steel sheet.
 - 5. Frames for Borrowed Lights: Same as adjacent door frame.
 - 6. Frames for all door openings over 3'6": 0.067-inch-thick steel sheet.
- D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcement plates from same material as frames.
- E. Pre conduit frames and doors with UL rated Electro Lynx conduit and back boxes as required for electro mechanical hardware specified in Section 08710.

2.5 FRAME ANCHORS

- A. Jamb Anchors:
 - 1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches (250 mm) long; or wire anchors not less than 0.177 inch thick.
 - 2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
 - 3. Compression Type for Drywall Slip-on Frames: Adjustable compression anchors.
 - 4. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch-diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.
- B. Floor Anchors: Formed from same material as frames, not less than 0.042 inch thick, and as follows:
 - 1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
 - 2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at finish floor surface.

2.6 HOLLOW METAL PANELS

- A. Provide hollow metal panels of same materials, construction, and finish as specified for adjoining hollow metal work.

2.7 STOPS AND MOLDINGS

- A. Moldings for Glazed Lites in Doors: Minimum 0.032 inch thick, fabricated from same material as door face sheet in which they are installed.
- B. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch high unless otherwise indicated.
- C. Loose Stops for Glazed Lites in Frames: Minimum 0.032 inch thick, fabricated from same material as frames in which they are installed.

2.8 LOUVERS

- A. Provide louvers for interior doors, where indicated, that comply with SDI 111C, with blades or baffles formed of 0.020-inch-thick, cold-rolled steel sheet set into 0.032-inch-thick steel frame.
 - 1. Sightproof Louver: Stationary louvers constructed with inverted V-shaped or Y-shaped blades.
 - 2. Lightproof Louver: Stationary louvers constructed with baffles to prevent light from passing from one side to the other, any angle.
 - 3. Fire-Rated Automatic Louvers: Louvers constructed with movable blades closed by actuating fusible link, and listed and labeled for use in fire-rated door assemblies of type and fire-resistance rating indicated by same testing and inspecting agency that established fire-resistance rating of door assembly.

2.9 ACCESSORIES

- A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.
- B. Ceiling Struts: Minimum 1/4-inch-thick by 1-inch-wide steel.
- C. Grout Guards: Formed from same material as frames, not less than 0.016 inch thick.

2.10 FABRICATION

- A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117.
- C. Hollow Metal Doors:
 - 1. Exterior Doors: Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.

2. All steel doors and frames receiving electro-mechanical hardware shall be factory pre wired with UL approved conduit and junction boxes with ElectroLynx quick connect system Option 3 or approved equal.
 3. Glazed Lites: Factory cut openings in doors.
 4. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted.
- D. Hollow Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
 2. All steel doors and frames receiving electro-mechanical hardware shall be factory pre wired with UL approved conduit and junction boxes with ElectroLynx quick connect system Option 3 or approved equal.
 3. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
 4. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 5. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
 6. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
 7. Jamb Anchors: Provide number and spacing of anchors as follows:
 8. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - a. Two anchors per jamb up to 60 inches high.
 - b. Three anchors per jamb from 60 to 90 inches high.
 - c. Four anchors per jamb from 90 to 120 inches high.
 - d. Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.
 - 1) Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - e. Three anchors per jamb up to 60 inches high.
 - f. Four anchors per jamb from 60 to 90 inches high.
 - g. Five anchors per jamb from 90 to 96 inches high.
 - h. Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
 - i. Two anchors per head for frames above 42 inches wide and mounted in metal-stud partitions.
 - 1) Compression Type: Not less than two anchors in each jamb.
 - 2) Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.
 9. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Keep holes clear during construction.
 - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.

- b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
- E. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.
- F. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 8 Section "Door Hardware."
 - 1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
 - 2. Reinforce doors and frames to receive nontemplated, mortised and surface-mounted door hardware.
 - 3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
 - 4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 16 Sections.
- G. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.
 - 1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow metal work.
 - 2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
 - 3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
 - 4. Provide loose stops and moldings on inside of hollow metal work.
 - 5. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.

2.11 STEEL FINISHES

- A. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.
 - 1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

- B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.
- C. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness to the following tolerances:
 - 1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - 2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 - 3. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - 4. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.
- C. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

- A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.
- B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11.
 - 1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
 - a. At fire-protection-rated openings, install frames according to NFPA 80.
 - b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
 - c. Install frames with removable glazing stops located on secure side of opening.
 - d. Install door silencers in frames before grouting.
 - e. Remove temporary braces necessary for installation only after frames have been properly set and secured.

- f. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
 - g. Field apply bituminous coating to backs of frames that are filled with grout containing antifreezing agents.
- 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
 - a. Floor anchors may be set with powder-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
- 3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
- 4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
- 5. Concrete Walls: Solidly fill space between frames and concrete with grout. Take precautions, including bracing frames, to ensure that frames are not deformed or damaged by grout forces.
- 6. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
- 7. In-Place Gypsum Board Partitions: Secure frames in place with postinstalled expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
- 8. Ceiling Struts: Extend struts vertically from top of frame at each jamb to overhead structural supports or substrates above frame unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction. Provide adjustable wedged or bolted anchorage to frame jamb members.
- 9. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.
- C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.
 - 1. Non-Fire-Rated Standard Steel Doors:
 - a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
 - b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
 - c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
 - d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.

2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
 3. Smoke-Control Doors: Install doors according to NFPA 105.
- D. Glazing: Comply with installation requirements in Division 8 Section "Glazing" and with hollow metal manufacturer's written instructions.
1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

3.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.
- B. Remove grout and other bonding material from hollow metal work immediately after installation.
- C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- D. Metallic-Coated Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION 08110

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**SECTION 08385 - HIGH-SPEED
OVERHEAD DOORS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.

1.2 SUMMARY

- A. General: Provide all labor, material, equipment, related services and supervision required, including manufacturing, erection and installation for high-speed overhead doors in accordance with the requirements of the Contract Documents.
- B. Extent of high-speed overhead doors is shown on drawings.
- C. Provide complete operating door assemblies including door curtain, guides, counterbalance mechanism, hardware, operating hardware, electric operation, programmable logic controller, safety devices, sensor detection and installation accessories. Provide electric "heat-tracing" at door tracks.
- D. Related sections include the following:
 - 1. Division 9, Section 09900 "Painting" for field-applied paint finish on steel channel frames.
 - 2. Division 16 Sections for electrical service and connections for powered operators and accessories.

1.3 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide high-speed overhead doors capable of operating under the following loads and stresses.
 - 1. Wind Load: Uniform pressure (velocity pressure) of 20.6 lbs./sq. ft., acting inward and outward.
- B. Speed: Doors shall have a minimum upward and downward speed of 48 inches per second.

1.4 ACTION SUBMITTALS

- A. **Product Data:** For each type and size of high-speed overhead doors and accessories. Include details of construction relative to materials, dimensions of individual components, profiles, and finishes. Provide roughing-in diagrams, operating instructions, and maintenance information. Include the following:
 - 1. Setting drawings, templates, and installation instructions for built-in or embedded anchor devices.
 - 2. Motors: Show nameplate data and ratings; characteristics; mounting arrangements; size and location of winding termination lugs, conduit entry, and grounding lug; and coatings.
- B. **Shop Drawings:** For special components and installations not dimensioned or detailed in manufacturer's data sheets.
 - 1. Wiring Diagrams: Detail wiring for power, signal, and control systems. Differentiate between manufacturer-installed and field-installed wiring and between components provided by door manufacturer and those provided by others.
- C. **Samples for Verification:** Of each type of exposed finish required, prepared on Samples of size indicated below and of same thickness and material indicated for Work. Where finishes involve normal color and texture variations, include Sample sets showing the full range of variations expected.
 - 1. Door Panel: 12 inch by 12 inch.

1.5 QUALITY ASSURANCE

- A. **Installer Qualifications:** Engage an experienced installer who is an authorized representative of the high-speed overhead door manufacturer for both installation and maintenance of units required for this Project.
- B. **Source Limitations:** Obtain high-speed overhead doors through one source from a single manufacturer. Furnish each door as a complete unit, including hardware, accessories, mounting and installation components.
 - 1. Obtain operators and controls from the high-speed overhead door manufacturer.
- C. **Inserts and Anchorages:** Furnish inserts and anchoring devices that must be set in concrete to install units. Provide setting drawings, templates, instructions and directions to install anchorage devices. Coordinate delivery with other work to avoid delay. Installation of inserts and anchorage devices are covered in Divisions 3 sections.

1.6 WARRANTY:

- A. Manufacturer shall warrant:

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1. Balance/Tension springs for a period of five (5) years.
 2. Door fabric for a period of five (5) years.
- B. Manufacturer shall warrant mechanical and electrical components against defects in material and workmanship for one (1) year.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturer's Basis of Design: The named manufacturer and associated product is the basis of design for the project. Other manufacturer's whose products may be incorporated into the work, subject to compliance with requirements, are also listed. The Contractor is responsible for any modifications to the work resulting from the use of materials other than the basis of design, at no additional cost to the Owner.
1. Albany International, "Rapid Roll Model 670 HD."
- B. Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Rite-Hite.
 2. Dynaco USA, Inc.
 3. Overhead Door Corporation.
 4. Chase Doors.

2.2 MATERIAL AND COMPONENTS

- A. Door Panel:
1. Fabric: Fabricate panel of fabric comprised of a polyester monofilament woven, double layer seamless fabric, impregnated and coated with PVC.
 - a. Thickness: 0.08 inch.
 - b. Impact Strength: Capable of sustaining impacts up to 3,000 lbs. per square inch.
 - c. Tensile Strength: 1,500 lbs. per inch lengthwise and 2,200 lbs. per inch crosswise.
 - d. Colors: As selected by Architect from Manufacturer's standard colors.
- B. Door Roll: 5.5 inches diameter, steel tube from 11 gauge galvanized steel complying with ASTM A513. Drum tube deflection shall not exceed 0.01 inch per foot and shall not exceed 0.14 inch over the entire length.
- C. Counterbalance System:

1. Internally mounted counterbalance/curtain tension system shall utilize an extension spring along with a cable and pulley mechanism.
 2. Construct pulleys of high-impact injected molded plastic. Pulleys shall contain two permanently sealed and lubricated ball bearings.
 3. Provide factory lubricated steel cables with fiber core with Alloy 319 die cast aluminum drums.
- D. Bottom Beam: Beam shall be anodized alloy 6063 extruded aluminum; profile shall be 4.5 inches high and capable of being removed if necessary.
- E. Primary Safety Edge: Through-beam photo cells shall be mounted on retractable steel guides at each end of the bottom beam. Photocell position shall be between door panel guide and 6 inches below bottom edge of door panel during door travel. At closing, photocell shall detect any object and reverse door immediately before bottom edge rubber profile strikes object.
- F. Secondary Safety Edge: EDPM rubber profile shall pneumatically operate a pressure switch. Safety edge cover shall be weatherproof yellow polyester woven PVC impregnated material. On contact with foreign object, door shall reverse to full open position.
- G. Safety Photocell: Provide a safety photocell in proximity to door line.
- H. Side Frames: 14 gauge galvanized steel section including hinged cover together with 12 gauge steel structural C-channel to guide door panel in its upward and downward movement. Provide brush seals to seal against door panel.
1. Finish: Durable, chemical and corrosion resistant-painted coating applied to steel components. Custom color as selected by Architect.
 2. Provide electric heat-trace.
- I. Rapid Reset System or Self Repair System:
1. Provide either Rapid Reset or Self Repair System in accordance with manufacturer's recommendations for door size.
- J. Electrical Operation:
1. High-speed doors shall be electrically operated by a heavy duty drive unit featuring a self-inhibiting worm gear. The motor and gearbox shall be designed for high-cycle operation. Door position shall be controlled by a bi-directional pulse encoder. Basic operation features shall include soft starting and stopping, automatic closing timer, emergency stop, one actuating push button, a safety photocell and a manual disengagement lever to place the door in manual operation. A safety disengagement switch shall be included with the disengagement mechanism.
 2. Electrical Motor:

- a. Provide high-starting torque, reversible intermittent duty, enclosed non-ventilated electric motor, sized to move door in either direction, from any position, at no less than the specified operating speed.
 - b. Motor: Three (3) phase motor rated for 1.25 h.p.
 - c. Door Speed: Up to 100 inches per second.
 - d. Power Supply: Coordinate wiring requirements and current characteristics of door electrical system with building electrical system. Supply shall be rated at 480 volt, three-phase, 60 Hz, 15 amps.
 - 3. Control Panel:
 - a. Panel enclosure shall be NEMA 4.
 - b. Wiring shall be completed by manufacturer and shall be ULC listed.
 - c. Drive shall be controlled by a programmable logic controller.
 - d. Control functions determined by manufacturer's preparation of programmable logic controller.
 - e. Top and bottom limits to be adjustable from the control panel.
 - f. Optional custom designed control system and/or components.
 - g. Control panel shall include an adjustable, automatic closing timer, emergency stop, one actuating push button and a cycle counter.
 - 4. Push button stations and/or pull switches are standard actuation systems.
 - a. On side of door's normal direction of traffic, each door shall each have push button station on a pedestal mounted for tug driver access from the driver seat.
 - b. Opposite side of door from normal direction of traffic shall have wall mounted push button stations and metallic activated floor loop receiver reset system for vehicle detection to close door..
 - c. Include photocell featuring an infrared beam that maintains "open" signal when interrupted.
 - 5. Door shall be equipped with safety photocell.
- K. Electrical Protection Features:
- 1. Provide fuses to protect from power line overcurrent and from secondary control voltage overcurrent.
 - 2. Provide complete motor monitoring protection from the programmable operation.
 - 3. Provide thermal protection to protect motor from temperature build-up.
 - 4. Provide switch to electrically disconnect control circuitry during manual operation.
 - 5. Provide running timer to protect drive unit from motor run-on.

6. Provide safety edge system that is continuously monitored and prevents door from closing if a fault is detected.
7. Provide emergency stop feature to instantly stop door in any position.
8. Provide start-up protection to ensure there is no movement of door when system detects a failure.

2.3 ACCESSORIES

- A. Heavier drum tube, acrylic fabric, larger bottom beam, heavy duty motor mounting bracket, larger motor, extra wrap of fabric on top roll for stiffness.
- B. Warning horn and light shall indicate when door is about to close.
- C. Windbar shall provide added protection against pressure differentials.
- D. Impact Release System: Connection between aluminum bottom beam and end bracket shall be a steel clevis and brass tang in a 25 degree angle. Load transmission from balance/tension system through clevis and tang shall be the only mechanism that maintains joint during normal operation.

2.4 FINISHES

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.5 STEEL AND GALVANIZED STEEL FINISHES

- A. Powder-Coat Applied Finish: Apply manufacturer's standard powder-coat applied finish consisting of primer and topcoat(s) according to coating manufacturer's written instructions for cleaning, pretreatment, application, thermosetting and minimum dry film thickness.
 1. Color and Gloss: Custom color as selected by Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions under which the work is to be installed and notify Architect and Owner of any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install door and operating equipment complete with necessary hardware, jamb and head mold strips, anchors, inserts, hangers, and equipment supports according to approved shop drawings, manufacturer's written instructions, and as specified.
1. Secure guides to walls, plumb, level and true to line. Anchor guides at spacings indicated on approved shop drawings.
 2. Provide additional support as necessary for attachment of guides, brackets and door and operator mechanisms to interfacing surfaces.

3.3 ADJUSTING

- A. After completing installation, including work by other trades, lubricate bearings and sliding parts; adjust doors to operate easily, free from warp, twist, or distortion and fitting weathertight for entire perimeter.
1. Connect and adjust electrical components and operating hardware.

3.4 DEMONSTRATION

- A. Startup Services: Engage a factory-authorized service representative to perform startup services and to train Owner's maintenance personnel as specified below:
1. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment. Test door closing when activated by detector or alarm connected fire-release system. Reset door closing mechanism after successful test.
 2. Provide training for the Owner's maintenance personnel on procedures and schedules related to startup and shutdown, troubleshooting, servicing, preventive maintenance, and procedures for testing and resetting release devices.
 3. Review data in the maintenance manuals. Refer to Division 1 requirements.
 4. Schedule training with Owner with at least 7 days' advance notice.

END OF SECTION 08385

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**SECTION 08411 – ALUMINUM-FRAMED
ENTRANCES AND STOREFRONTS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Interior storefront framing associated with Breach Control System.
- B. Related Sections include the following:
 - 1. Division 5 Section "Metal Fabrications."
 - 2. Division 8 Section "Interior Glazing."

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For aluminum-framed entrances and storefronts. Include plans, elevations, sections, full-size details, and attachments to other work.
 - 1. Include details of each vertical-to-horizontal intersection of aluminum-framed entrances and storefronts, showing the following:
 - a. Joinery, including concealed welds.
 - b. Anchorage.
 - c. Expansion provisions.
 - d. Glazing.
 - e. Flashing and drainage.
- C. Samples for Initial Selection: For units with factory-applied color finishes.
- D. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.
- E. Fabrication Sample: Of each vertical-to-horizontal intersection of assemblies, made from 12-inch lengths of full-size components and showing details of the following:
 - 1. Joinery, including concealed welds.

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2. Anchorage.
3. Expansion provisions.
4. Glazing.
5. Flashing and drainage.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For aluminum-framed entrances and storefronts to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has a minimum two (2) years documented experience in work of this Section, who has completed glazing similar in material, design, and extent to that indicated for this Project; and whose work has resulted in glass installations with a record of successful in-service performance.

1.7 MOCKUPS

- A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
 1. Build mockup of typical wall areas as shown on Drawings.
 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 WARRANTY

- A. Special Warranty: Installer agrees to repair or replace components of aluminum-framed entrances and storefronts that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
 1. Failures include, but are not limited to, the following:
 - a. Structural failures including, but not limited to, excessive deflection.
 - b. Noise or vibration created by wind and thermal and structural movements.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal.
 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
 - 1. Aluminum-framed storefronts shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
 - 2. Failure also includes the following:
 - a. Thermal stresses transferring to building structure.
 - b. Glass breakage.
 - c. Noise or vibration created by wind and thermal and structural movements.
 - d. Loosening or weakening of fasteners, attachments, and other components.
- B. Structural Loads: Provide storefronts capable of withstanding the following structural loads without exceeding allowable design working stress of materials:
 - 1. Concentrated load of 200 lbf applied at any point and in any direction.
 - 2. Uniform load of 50 lbf / ft. applied in any direction.
- C. Deflection of Framing Members:
 - 1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans up to 13 feet 6 inches and to 1/240 of clear span plus 1/4 inch for spans greater than 13 feet 6 inches or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
 - 2. Deflection Parallel to Glazing Plane: Limited to amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components to less than 1/8 inch.

2.2 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Arch Aluminum & Glass Co., Inc.
 - 2. CMI Architectural.
 - 3. EFCO Corporation.
 - 4. Kawneer North America.
 - 5. Pittco Architectural Metals, Inc.
 - 6. TRACO.
 - 7. Trainor Glass.

8. Tubelite.
9. United States Aluminum.
10. Wausau Window and Wall Systems.

- B. Source Limitations: Obtain all components of aluminum-framed entrance and storefront system, including framing and accessories, from single manufacturer.

2.3 FRAMING

- A. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
1. Construction: Nonthermal.
 2. Glazing System: Retained mechanically with gaskets on two sides and structural sealant on two sides.
 3. Glazing Plane: Front.
 4. Finish: Clear anodic finish.
 5. Fabrication Method: Field-fabricated stick system.
- B. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.
- C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.
- D. Materials:
1. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 - a. Sheet and Plate: ASTM B 209.
 - b. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
 - c. Extruded Structural Pipe and Tubes: ASTM B 429/B 429M.
 - d. Structural Profiles: ASTM B 308/B 308M.
 2. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM, and prepare surfaces according to applicable SSPC standard.
 - a. Structural Shapes, Plates, and Bars: ASTM A 36.
 - b. Cold-Rolled Sheet and Strip: ASTM A 1008.
 - c. Hot-Rolled Sheet and Strip: ASTM A 1011.
- E. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
1. Flame-Spread Index: 25 or less.
 2. Smoke-Developed Index: 50 or less.

2.4 ENTRANCE DOOR SYSTEMS

- A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.
 - 1. Door Construction: 1-3/4-inch overall thickness, with minimum 0.125-inch-thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.
 - 2. Door Design: Narrow stile; 2-1/8-inch nominal width.
 - 3. Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and preformed gaskets.

2.5 GLAZING

- A. Glazing: Comply with Section 08801 "Interior Glazing."
- B. Glazing Gaskets: Comply with Section 08801 "Interior Glazing."
- C. Glazing Sealants: Comply with Section 08801 "Interior Glazing."
- D. Structural Glazing Sealants: ASTM C 1184, chemically curing silicone formulation that is compatible with system components with which it comes in contact, specifically formulated and tested for use as structural sealant and approved by structural-sealant manufacturer for use in storefront system indicated.
 - 1. Color: As selected by Architect from manufacturer's full range of colors.

2.6 ACCESSORIES

- A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
 - 1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
 - 2. Reinforce members as required to receive fastener threads.
- B. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.
- C. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil thickness per coat.

2.7 FABRICATION

- A. Form or extrude aluminum shapes before finishing.

- B. Fabricate components that, when assembled, have the following characteristics:
 - 1. Profiles that are sharp, straight, and free of defects or deformations.
 - 2. Accurately fitted joints with ends coped or mitered.
 - 3. Physical isolation of glazing from framing members.
 - 4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
 - 5. Provisions for field replacement of glazing.
 - 6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
- C. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.
- D. Structural-Sealant-Glazed Framing Members: Include accommodations for using temporary support device to retain glazing in place while structural sealant cures.
- E. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
 - 1. Provide silencers at stops to prevent metal-to-metal contact. Install three silencers on strike jamb of single-door frames and two silencers on head of frames for pairs of doors.
- F. Entrance Doors: Reinforce doors as required for installing entrance door hardware.
 - 1. At pairs of exterior doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.
 - 2. At exterior doors, provide weather sweeps applied to door bottoms.
- G. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.
- H. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.8 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

2.9 SOURCE QUALITY CONTROL

- A. Structural Sealant: Perform quality-control procedures complying with ASTM C 1401 recommendations including, but not limited to, assembly material qualification procedures, sealant testing, and assembly fabrication reviews and checks.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare surfaces that are in contact with structural sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.

3.3 INSTALLATION

- A. General:
 - 1. Comply with manufacturer's written instructions.
 - 2. Do not install damaged components.
 - 3. Fit joints to produce hairline joints free of burrs and distortion.
 - 4. Rigidly secure nonmovement joints.
 - 5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
- B. Metal Protection:
 - 1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
 - 2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- C. Install components plumb and true in alignment with established lines and grades.
- D. Install glazing as specified in Section 08800 "Glazing."
- E. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.
 - 1. Field-Installed Entrance Door Hardware: Install entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

3.4 ERECTION TOLERANCES

- A. Erection Tolerances: Install aluminum-framed entrances and storefronts to comply with the following maximum tolerances:
1. Plumb: 1/8 inch in 10 feet.
 2. Level: 1/8 inch in 20 feet
 3. Alignment:
 - a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch wide, limit offset from true alignment to 1/16 inch
 - b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch wide, limit offset from true alignment to 1/8 inch.
 - c. Where surfaces are separated by reveal or protruding element of 1 inch wide or more, limit offset from true alignment to 1/4 inch.
 4. Location: Limit variation from plane to 1/8 inch in 12 feet 1/2 inch total length.

END OF SECTION 08411

**NEW PASSENGER TERMINAL
DULUTH INTERNATIONAL AIRPORT
DULUTH, MINNESOTA**

**SECTION 08460 -AUTOMATIC
ENTRANCE DOORS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

- 1. Sliding, bi-parting, power-operated automatic entrances including sliding doors, sidelites, side jambs, header with roller track. Operator, bottom door guides, and activation devices.

B. Related Sections:

- 1. Division 08 Section 05500 "Metal Fabrications" for miscellaneous metal framing and supports.
- 2. Division 08 Section 8801 "Interior Glazing"
- 3. Division 13 Section 13700 "Part 1542 Computer controlled Access System" for access control devices installed at door openings and provided as part of a security system
- 4. Division 16 Sections for electrical connections including conduit and wiring for automatic entrance operators.

1.3 DEFINITIONS

- A. AAADM: American Association of Automatic Door Manufacturers.
- B. Activation Device: Device that, when actuated, sends an electrical signal to the door operator to open the door.
- C. IBC: International Building Code.
- D. Safety Device: Device that, to avoid injury, prevents a door from opening or closing.
- E. For automatic door terminology, refer to ANSI/BHMA A156.10 for definitions of terms.

1.4 PERFORMANCE REQUIREMENTS

- A. Provide entrances meeting the requirements of ANSI/BHMA A156.10, American National Standard for Power Operated Doors.
- B. Structural Performance: Automatic entrances shall withstand the effects of gravity loads and wind loads within limits and under conditions indicated according to SEI/ASCE 7.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
- D. Operating Temperature Range: Provide automatic entrances that operate within minus 40 to plus 102 deg F.
- E. Air Infiltration: Maximum air leakage through fixed glazing and framing areas of 1.25 cfm/sq. ft. of fixed entrance system area when tested according to ASTM E 283 at a minimum static-air-pressure difference of 6.24 lbf/sq. ft..
- F. Opening-Force Requirements:
 - 1. Power-Operated Doors: Not more than 30 lbf required to manually set door in motion if power fails, and not more than 15 lbf required to open door to minimum required width.
 - 2. Breakaway Device for Power-Operated Doors: Not more than 50 lbf required for a breakaway door or panel to open.
- G. Entrapment Force Requirements:
 - 1. Power-Operated Sliding Doors: Not more than 30 lbf required to prevent stopped door from closing.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for automatic entrances. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. Shop Drawings: For automatic entrances. Include plans, elevations, sections, details, hardware mounting heights, and attachments to other work.

1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 2. Wiring Diagrams: For power, signal, and control wiring.
 3. Activation and safety devices.
 4. Include hardware schedule and indicate hardware types, functions, quantities, and locations.
- C. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and manufacturer.
- B. Product Certificates: For each type of emergency-exit automatic entrance, from manufacturer.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for automatic entrances.
- D. Field quality-control reports.
- E. Warranties: Sample of special warranties.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For automatic entrances, safety devices, and control systems to include in maintenance manuals

1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A manufacturer with company certificate issued by AAADM.
- B. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation and maintenance of units required for this Project.
- C. Certified Inspector Qualifications: Certified by AAADM.
- D. Source Limitations for Automatic Entrances: Obtain automatic entrances from single source from single manufacturer.
- E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- F. Power-Operated Door Standard: BHMA A156.10.

- G. Emergency-Exit Door Requirements: Comply with requirements of authorities having jurisdiction for automatic entrances serving as a required means of egress.
- H. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review methods and procedures related to automatic entrances including, but not limited to, the following:
 - a. Structural load limitations.
 - b. Construction schedule. Verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - c. Coordination with electrical, glazing, and other trades.
 - d. Required testing, inspecting, and certifying procedures.

1.9 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of openings to receive automatic entrances by field measurements before fabrication.

1.10 COORDINATION

- A. Templates: Obtain templates for doors, frames, and other work specified to be factory prepared for installing automatic entrances, and distribute to parties involved. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing automatic entrances to comply with indicated requirements.
- B. Coordinate hardware with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish. Coordinate hardware for automatic entrances with hardware required for rest of Project.
- C. Electrical System Roughing-in: Coordinate layout and installation of automatic entrances with connections to power supplies.

1.11 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of automatic entrances that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including, but not limited to, excessive deflection.
 - b. Faulty operation of operators, controls, and hardware.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.

2. Warranty Period: Two years from date of Substantial Completion.
- B. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components that show evidence of deterioration of factory-applied finishes within specified warranty period.
1. Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 2. Warranty Period: 10 years from date of Substantial Completion.

1.12 MAINTENANCE SERVICE

- A. Initial Maintenance Service: Beginning at Substantial Completion, provide 12 months' full maintenance by skilled employees of automatic entrance Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper automatic entrance operation at rated speed and capacity. Provide parts and supplies the same as those used in the manufacture and installation of original equipment.
1. Engage a certified inspector to perform safety inspection after each adjustment or repair and at end of maintenance period. Furnish completed inspection reports to Owner.
 2. Perform maintenance, including emergency callback service, during normal working hours.
 3. Include 24-hour-per-day, 7-day-per-week, emergency callback service.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
1. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).
 2. Sheet and Plate: ASTM B 209 (ASTM B 209M).
- B. Steel Reinforcement: With manufacturer's standard corrosion-resistant primer complying with SSPC-PS Guide No. 12.00 applied immediately after surface preparation and pretreatment. Select surface preparation methods

according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.

1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
 2. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
 3. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.
- C. Stainless-Steel Bars: ASTM A 276 or ASTM A 666, Type 304.
- D. Stainless-Steel Tubing: ASTM A 554, Grade MT 304.
- E. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304, stretcher-leveled standard of flatness, in entrance manufacturer's standard thickness.
- F. Glazing: As specified in Division 8 Section "Glazing."
- G. Sealants and Joint Fillers: As specified in Division 7 Section "Joint Sealants."
- H. Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements, except containing no asbestos; formulated for 30-mil (0.76-mm) thickness per coat.
- I. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

2.2 SLIDING AUTOMATIC ENTRANCES

- A. General: Provide manufacturer's standard automatic entrances including doors, sidelites, framing, headers, carrier assemblies, roller tracks, door operators, activation and safety devices, miscellaneous framing and supports and accessories required for a complete installation.
- B. Sliding Automatic Entrance:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Besam Automated Entrance Systems, Inc.; an ASSA ABLOY Group company.
 - b. DORMA Automatics; Div. of DORMA Group North America.
 - c. Horton Automatics; Div. of Overhead Door Corporation.
 - d. Record-USA.
 - e. Stanley Access Technologies; Div. of The Stanley Works.
 2. Configuration: Biparting-sliding doors, with two sliding leaves and sidelites on each side.
 - a. Traffic Pattern: Two way.

- b. Emergency Breakaway Capability: Sliding leaves and sidelites and as indicated on Drawings.
 - c. Mounting: Between jambs.
- 3. Operator Features:
 - a. Power opening and closing.
 - b. Drive System: Chain or belt.
 - c. Adjustable opening and closing speeds.
 - d. Adjustable hold-open time between 0 and 30 seconds.
 - e. Obstruction recycle.
 - f. On-off/hold-open switch to control electric power to operator, key operated.
- 4. Sliding Door Carrier Assemblies and Overhead Roller Tracks: Manufacturer's standard carrier assembly that allows vertical adjustment; consisting of nylon- or delrin-covered, ball-bearing-center steel wheels operating on a continuous roller track, or ball-bearing-center steel wheels operating on a nylon- or delrin-covered, continuous roller track. Support doors from carrier assembly by cantilever and pivot assembly.
 - a. Rollers: Minimum of two ball-bearing roller wheels and two antirise rollers for each active leaf.
- 5. Sliding Door Threshold: Manufacturer's standard threshold members and bottom-guide track system, with stainless-steel, ball-bearing-center roller wheels.
 - a. Configuration: Recessed threshold across door opening and recessed guide track system at sidelites.
- 6. Combination Activation and Safety Device: Combination motion/presence sensor mounted on each side of door header to detect pedestrians in activating zone and to open door.
- 7. Safety Devices: Two photoelectric beams mounted in sidelite jambs to detect pedestrians in presence zone and to prevent door from closing.
- 8. Sidelite Safety Device: Presence sensor, mounted above each sidelite on side of door opening through which doors travel, to detect obstructions and to prevent door from opening.
- 9. Finish: Finish framing, door(s), sidelite(s), and header with Class I, clear anodic finish.

2.3 ENTRANCE COMPONENTS

- A. Framing Members: Manufacturer's standard extruded aluminum, minimum 0.125 inch thick and reinforced as required to support imposed loads.
 - 1. Nominal Size: 1-3/4 by 4-1/2 inches.
- B. Stile and Rail Doors: Manufacturer's standard 1-3/4-inch-thick, glazed doors with minimum 0.125-inch-thick, extruded-aluminum tubular stile and

rail members and clad in stainless-steel sheet. Mechanically fasten corners with reinforcing brackets that are welded, or incorporate concealed tie-rods that span full length of top and bottom rails.

1. Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and manufacturer's standard preformed gaskets.
 2. Stile Design: Narrow stile, 2-inch nominal width or as indicated on Drawings.
 3. Rail Design: 6-inch nominal height or as indicated on Drawings.
- C. Sidelite(s): Manufacturer's standard 1-3/4-inch-deep sidelite(s) with minimum 0.125-inch-thick, extruded-aluminum tubular stile and rail members and clad in stainless-steel sheet, matching door design and finish.
1. Glazing Stops and Gaskets: Same materials and design as for doors.
- D. Headers: Fabricated from minimum 0.125-inch-thick, extruded aluminum and extending full width of automatic entrance units to conceal door operators and controls. Provide hinged or removable access panels for service and adjustment of door operators and controls. Secure panels to prevent unauthorized access.
1. Mounting: Concealed, with one side of header flush with framing.
 2. Capacity: Capable of supporting doors up to 175 lb per leaf over spans up to 14 feet without intermediate supports.
 - a. Provide sag rods for spans exceeding 14 feet.
- E. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.
- F. Signage: Affixed to both sides of each door as required by BHMA A156.10 for type of door and its operation.
1. Application Process: Door manufacturer's standard process.
 2. Provide sign materials with instructions for field application after glazing is installed.

2.4 DOOR OPERATORS AND ACTIVATION AND SAFETY DEVICES

- A. Door Operators: Provide door operators of size recommended by manufacturer for door size, weight, and movement; for condition of exposure; and for long-term, maintenance-free operation under normal traffic load for type of occupancy indicated.
1. Door Operator Performance: Provide door operators that will open and close doors and maintain them in fully closed position when subjected to Project's design wind loads.

2. Electromechanical Operators: Concealed, self-contained, overhead unit powered by fractional-horsepower, permanent-magnet dc motor; with closing speed controlled mechanically by gear train and dynamically by braking action of electric motor; with solid-state microprocessor controller; UL 325; and with manual operation with power off.
- B. Combination Motion/Presence Sensors: Self-contained units; consisting of both motion and presence sensors in a single metal or plastic housing; adjustable to provide detection field sizes and functions required by BHMA A156.10.
 1. Motion Sensor: K-band-frequency, microwave-scanner units; with relay hold time of not less than 2 to 10 seconds.
 2. Presence Sensor: Infrared-scanner units; with relay hold time of not less than 2 to 10 seconds. Sensors shall remain active at all times.
 - C. Photoelectric Beams: Pulsed infrared, sender-receiver assembly for recessed mounting. Beams shall not be active when doors are fully closed.
 - D. Electrical Interlocks: Unless units are equipped with self-protecting devices or circuits, provide electrical interlocks to prevent activation of operator when door is locked, latched, or bolted.
 - E. Opening-Width Control: Two-position switch that in the normal position allows sliding doors to travel to full opening width and in the alternate position reduces opening to a selected partial opening width.

2.5 HARDWARE

- A. General: Provide units in sizes and types recommended by automatic entrance and hardware manufacturers for entrances and uses indicated. Finish exposed parts to match door finish.
- B. Breakaway Device for Power-Operated Doors: Provide breakaway device that allows door to swing out in direction of egress to full 90 degrees from any operating position. Maximum force to open door shall be 50 lbf (222 N) according to BHMA A156.10. Interrupt powered operation of door operator while in breakaway mode.
- C. Pivots:
 1. Center-Pivot Sets: BHMA A156.4, Grade 1, with exposed parts of cast-aluminum alloy.
- D. Deadlocks: Manufacturer's standard deadbolt operated by exterior cylinder and interior thumb turn, with minimum 1-inch- (25-mm-) long throw bolt; BHMA A156.5, Grade 1.
 1. Cylinders: BHMA A156.5, Grade 1, six-pin mortise type.

- a. Keying: Integrate into building master key system.
- 2. Deadbolts: Laminated-steel hook, mortise type, BHMA A156.5, Grade 1.
- 3. Two-Point Locking for Sliding Doors: Mechanism in stile of active door leaf that automatically extends second lockbolt into overhead carrier assembly and threshold.
- 4. Include locking devices for sidelites, to prevent manual break out.
- E. Weather Stripping: Manufacturer's standard replaceable components.
 - 1. Sliding Type: AAMA 701, made of wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing.

2.6 FABRICATION

- A. General: Factory fabricate automatic entrance components to designs, sizes, and thicknesses indicated and to comply with indicated standards.
 - 1. Form aluminum shapes before finishing.
 - 2. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
 - 3. Use concealed fasteners to greatest extent possible. Where exposed fasteners are required, use countersunk Phillips flat-head machine screws finished to match framing.
 - a. Where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration, use self-locking devices.
 - b. Reinforce members as required to receive fastener threads.
 - 4. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose.
- B. Framing: Provide automatic entrances as prefabricated assemblies. Complete fabrication, assembly, finishing, hardware application, and other work before shipment to Project site.
 - 1. Fabricate tubular and channel frame assemblies with manufacturer's standard welded or mechanical joints. Provide subframes and reinforcement as required for a complete system to support required loads.
 - 2. Perform fabrication operations in manner that prevents damage to exposed finish surfaces.
 - 3. Form profiles that are sharp, straight, and free of defects or deformations.
 - 4. Provide components with concealed fasteners and anchor and connection devices.

5. Fabricate components with accurately fitted joints with ends coped or mitered to produce hairline joints free of burrs and distortion.
 6. Fabricate exterior components to drain water passing joints and condensation and moisture occurring or migrating within system to the exterior.
 7. Provide anchorage and alignment brackets for concealed support of assembly from building structure.
 8. Allow for thermal expansion of exterior units.
- C. Doors: Factory fabricated and assembled in profiles indicated. Reinforce as required to support imposed loads and for installing hardware.
- D. Door Operators: Factory fabricated and installed in headers, including adjusting and testing.
- E. Glazing: Fabricate framing with minimum glazing edge clearances for thickness and type of glazing indicated, according to GANA's "Glazing Manual."
- F. Hardware: Factory install hardware to greatest extent possible; remove only as required for final finishing operation and for delivery to and installation at Project site. Cut, drill, and tap for factory-installed hardware before applying finishes.
1. Provide sliding-type weather stripping, mortised into door, at perimeter of doors and breakaway sidelites.
- G. Activation and Safety Devices:
1. General: Factory install devices in doors and headers as required by BHMA A156.10 for type of door and direction of travel.
 2. Install photoelectric beams in vertical jambs of sidelites, with dimension above finished floor as follows:
 - a. Top Beam: 48 inches (1219 mm).
 - b. Bottom Beam: 24 inches (610 mm).

2.7 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Apply organic and anodic finishes to formed metal after fabrication unless otherwise indicated.
- D. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are

acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.8 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances, header support, and other conditions affecting performance of automatic entrances.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Do not install damaged components. Fit frame joints to produce hairline joints free of burrs and distortion. Rigidly secure nonmovement joints. Seal joints watertight.
 - 1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose.
 - 2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- B. Entrances: Install automatic entrances plumb and true in alignment with established lines and grades without warp or rack of framing members and doors. Anchor securely in place.
 - 1. Install surface-mounted hardware using concealed fasteners to greatest extent possible.
 - 2. Set headers, carrier assemblies, tracks, operating brackets, and guides level and true to location with anchorage for permanent support.
 - 3. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within system to exterior.
 - 4. Level recesses for recessed thresholds using nonshrink grout.
- C. Door Operators: Connect door operators to electrical power distribution system as indicated in Division 16 Sections.

- D. Access-Control Devices: Connect access-control devices to access-control system as specified in Division 16 Sections.
- E. Activation and Safety Devices: Install and adjust devices to provide detection field and functions indicated.
- F. Glazing: Install glazing as specified in Division 08 Section "Interior Glazing."
- G. Sealants: Comply with requirements specified in Division 07 Section "Joint Sealants" to provide weathertight installation.
 - 1. Set framing members and flashings in full sealant bed.
 - 2. Seal perimeter of framing members with sealant.
- H. Signage: Apply signage on both sides of each door and breakaway sidelight as required by referenced door standards.
- I. Wiring within Automatic Entrance Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's written limitations on bending radii. Provide and use lacing bars and distribution spools.

3.3 FIELD QUALITY CONTROL

- A. Inspection: Engage Installer's certified inspector to test and inspect automatic entrances and prepare test and inspection reports.
 - 1. Certified inspector shall test and inspect each automatic entrance to determine compliance of installed systems with applicable BHMA standards.
 - 2. Inspection Report: Certified inspector shall submit report in writing to Architect and Contractor within 24 hours after inspection.
- B. Work will be considered defective if it does not pass tests and inspections.

3.4 ADJUSTING

- A. Adjust door operators, controls, and hardware for smooth and safe operation and for weathertight closure; comply with requirements in BHMA A156.10.
- B. Lubricate operating hardware and other moving parts as recommended by manufacturer.
- C. Readjust door operators and controls after repeated operation of completed installation equivalent to 3 days' use by normal traffic (100 to 300 cycles). Lubricate hardware, operating equipment, and other moving parts.

- D. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.5 CLEANING AND PROTECTION

- A. Clean glass and metal surfaces promptly after installation. Remove excess glazing and sealant compounds, dirt, and other substances. Repair damaged finish to match original finish.
 - 1. Comply with requirements in Division 08 Section "Interior Glazing" for cleaning and maintaining glass.

3.6 DEMONSTRATION

- A. Engage a certified inspector to train Owner's maintenance personnel to adjust, operate, and maintain automatic entrances.

END OF SECTION 08460

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SECTION 08710 – DOOR HARDWARE

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Provide all Finish Hardware as shown on the Drawing or as specified herein unless specified excluded and called for in other Sections.
- B. All items of Finish Hardware shall be guaranteed for one year, except closers shall be guaranteed for five years.
- C. Conform to building code and life safety code requirement If more restrictive than those specified herein, including UBC 7-2(1997) for positive pressure. Notify Architect of differences prior to starting work. Conform to Underwriters Laboratories (U.L.) requirements for fire rated openings, including UL10-C for positive pressure.

1.2 REFERENCES

- A. ANSI A117.1 - Specifications for Making Buildings and Facilities Accessible to and Usable by Physically Handicapped People.
- B. NFPA 80 - Fire Doors and Windows.
- C. AWI - Architectural Woodwork Institute - Quality Standards.
- D. NFPA 101 - Code for Safety to Life from Fire in Buildings and Structures.
- E. NFPA 252 - Fire Tests of Door Assemblies.

1.3 SUBMITTALS

- A. Submit under provisions of Section 01 33 00.
- B. Shop Drawings: Indicate locations and mounting heights of each type of hardware, electrical characteristics and connection requirements.
- C. Submit manufacturer's parts lists, and templates.
- D. Samples: Submit sample illustrating style, color, and finish of hardware items.
- E. Samples: Will be incorporated into the Work.
- F. Manufacturer's Installation Instructions: Indicate special procedures, and perimeter conditions requiring special attention.

1.4 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Section 01700.
- B. Record actual locations of installed cylinders and their master key code.

1.5 OPERATION AND MAINTENANCE DATA

- A. Submit under provisions of Section 01700.
- B. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.

1.6 QUALITY ASSURANCE

- A. Perform work in accordance with the following requirements:
 - 1. ANSI A117.1.
 - 2. NFPA 101.
 - 3. NFPA 80.
 - 4. NFPA 252.

1.7 QUALIFICATIONS

- A. Hardware Supplier: Company specializing in supplying commercial door hardware with documented experience.
- B. Hardware Supplier Personnel: Employ a qualified person to assist in the work of this section.

1.8 REGULATORY REQUIREMENTS

- A. Conform to applicable code for requirements applicable to fire rated doors and frames.
- B. Products Requiring Electrical Connection: Listed and classified by testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

1.9 PRE-INSTALLATION CONFERENCE

- A. Convene one week prior to commencing work of this section, under provisions of Section 01300.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Section 01600.

- B. Package hardware items individually; label and identify each package with door opening code to match hardware schedule.
- C. Deliver keys to Owner by security shipment direct from hardware supplier.

1.11 COORDINATION

- A. Coordinate work under provisions of Section 01300.
- B. Coordinate the work with other directly affected sections involving manufacture or fabrication of internal reinforcement for door hardware.

1.12 WARRANTY

- A. Provide one year warranty under provisions of Section 01700.

1.13 MAINTENANCE MATERIALS

- A. Provide maintenance materials under provisions of 01700.
- B. Provide special wrenches and tools applicable to each different or special hardware component.
- C. Provide maintenance tools and accessories supplied by hardware component manufacturer.

1.14 EXTRA MATERIALS

- A. Furnish under provisions of Section 01700.
- B. Provide ten extra key lock cylinders for each master keyed group.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. The following are acceptable manufacturers for the item of hardware indicated. The first manufacturer listed is the manufacturer used in the hardware schedule at the end of this section unless indicated otherwise.
 - 1. Hinges: Hager, Stanley Lawrance, & McKinney.
 - 2. Cylinder: Best 7-pin with interchangeable core. (No substitution).
 - 3. Substitutions: Under provisions of Section 01600.

2.2 KEYING

- A. All lock cylinders shall be Masterkeyed or Grand Masterkeyed as directed by the Owner and Architect.

- B. Keying must be done by lock manufacturer or supplier, Manufacturer or supplier is to keep complete and proper records and identification of master keys and their serial numbers.
- C. Furnish two (2) change keys per lock.
- D. All keys shall be properly marked immediately upon receipt and turned over to the Owner at completion of project

2.3 FINISHES

- A. Finishes: As follows:
 - 1. Butts, Exterior: US32D
 - 2. Interior: US26D
 - 3. Locksets: US26D/US32D
 - 4. Door Closers: ALUM
 - 5. Exit Devices: US26D/US32D
 - 6. Push Bars, Push Plates, Pulls: US32D
 - 7. Kickplates: US32D
 - 8. Stops and Holders: US26D
 - 9. Misc., Hardware: US26D

2.4 BUTTS

- A. The following is a table of butt types in manufacturer's catalogue numbers that are considered acceptable. No substitutions will be allowed:

	<u>Hager</u>	<u>Stanley</u>	<u>McKinney</u>	<u>Lawrence</u>
Type 4	BB1279	BB179	TB2714	BB4101
Type 5	1279	179	2714	4181

- B. Butt types shall be furnished as follows, except as otherwise noted:
 - 1. Interior Doors with Closers: Type 4
 - 2. Interior Doors without Closers: Type 5
- C. Butt quantities and sizes shall be as follows, except as otherwise noted. All butts shall be 4-1/2 x 4-1/2 for 1-3/4" doors and 3-1/2x3-1/2 for 1-3/8" doors.
 - 1. Two (2) butts for doors 60" in height and under.
 - 2. Three (3) butts for doors 61" thru 90" in height.
 - 3. Four (4) butts for doors 91" thru 120" in height or over 3'-8" wide.
 - 4. Four (4) butts for dutch doors.
- D. Provide proper width of butts to clear trim and allow full 180 degree swing.

2.5 LOCKSETS AND LATCHSETS

- A. Unless otherwise indicated in hardware groups, all locks, latches, trim, and deadlocks shall be the products of one manufacturer.
- B. Provide wrought boxes and strikes with proper length to protect trim, provide open back strikes where required. Lock functions shall be as listed in hardware groups.

2.6 EXIT DEVICES

- A. All exit devices shall be UL listed for safety requirements as well as listed for labeled doors.

2.7 DOOR CLOSERS

- A. All closers shall be of rack and pinion construction with separate adjusting valves for latching speed, closing speed and backcheck. All closers to be surface applied and have non-ferrous covers.
- B. All closers to be mounted on room side wherever possible, where wall conditions permit, all doors shall swing 180 degrees.
- C. It shall be the hardware suppliers responsibility to furnish door closers sized to comply with manufacturer's recommendations for door sizes. Furnish thru bolts for all label wood doors.

2.8 DOOR STOPS AND HOLDERS

- A. Unless otherwise indicated, all door stops shall be equal to Glynn Johnson GJWB50W OR GJWB60W.
- B. Where wall bumpers are not applicable, provide overhead door stays equal to Glynn Johnson GJ450 series, unless otherwise specified.
- C. Provide overhead holders and shock absorber equal to Glynn Johnson GJ900M for all exterior doors call for, unless otherwise specified.

2.9 SCHEDULE

- A. Refer to schedule at the end of this section for hardware to be provide for each door listed on Door Schedule.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify site conditions under provisions of Section 01300.

- B. Verify that doors and frames are ready to receive work and dimensions are as indicated on shop drawings.
- C. Verify that electric power is available to power operated devices and of the correct characteristics.

3.2 INSTALLATION

- A. Install hardware in accordance with manufacturer's instructions.
- B. Use templates provided by hardware item manufacturer.
- C. Carefully install hardware, using skilled finish carpenters.
- D. Fit before painters finish is applied, remove and reinstall after finish is complete.
- E. Install hardware so that all operating parts operate smoothly, close tightly, and do not rattle.
- F. Carefully install hardware as listed in the installation instructions furnished with each finish hardware item, adhere to manufacturer's instructions for mounting.
- G. Set metal thresholds in full bed of specified caulking compound, forming tight seal between threshold and surface to which set. Securely anchor thresholds using countersunk non-ferrous screws to match color of threshold.
- H. Provide all anchorage, fasteners, etc. as required for the complete installation of all hardware.
- I. Furnish thru-bolts for all butts (surface type only), closers, exit devices, push bars, and other hardware subject to severe usage or as required by UL
- J. Mounting heights for hardware from finished floor to center line of hardware item:
 - 1. Locksets: ANSI 117.1.
 - 2. Push/Pulls: ANSI 117.1.
 - 3. Dead Locks: ANSI 117.1.
 - 4. Exit Devices: ANSI 117.1.

3.3 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed under provisions of Section 01400.

- B. Factory representative to inspect installation and certify that hardware and installation has been furnished and installed in accordance with manufacturer's instructions and as specified.

3.4 ADJUSTING

- A. Adjust work under provisions of Section 01700.
- B. Adjust hardware for smooth operation.

3.5 PROTECTION OF FINISHED WORK

- A. Protect finished Work under provisions of Section 01500.
- B. Do not permit adjacent work to damage hardware or finish.

3.6 SCHEDULE

- A. The following schedule of hardware will be considered a guide only. It will be the hardware supplier's responsibility to advise the Architect before bidding if a conflict exists.
- B. Refer to floor plans and/or door schedule for hardware group required at each opening. Ignore hardware groups not used on floor plans or door schedule. If conflict exists between The hardware preamble and schedule of hardware groups, the hardware listed in hardware group shall be furnished.
- C. HW SET: 07, Door 218B

			HINGES AS REQUIRED	
1	EA	PANIC HARDWARE	QEL-RX-99L-NL-F	VON
1	EA	CYLINDER	INTERCHANGEABLE CORE	
1	EA	SURFACE CLOSER	4111 SCUSH	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	IVE
1	SET	GASKETING	188S	ZER
1	EA	POWER SUPPLY	PS902-2Q K	SCE
1	EA	POWER TRANSFER	EPT10	VON
ACCESS CONTROL BY OTHER SECTION				

D. HW SET: 61, Door 218A

			HINGES AS REQUIRED	
1	EA	DOOR PULL	8102-8	IVE
1	EA	PUSH PLATE	8200 8" X 16"	IVE
1	EA	SURFACE CLOSER	4011 H	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	IVE
1	EA	STOP		

E. HW SET: 62, Door 224B

			HINGES AS REQUIRED	
1	EA	DOOR PULL	8102-8	IVE
1	EA	PUSH PLATE	8200 8" X 16"	IVE
1	EA	SURFACE CLOSER	4111 SHCUSH	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	IVE

F. HW SET: 63, Door 224A

			HINGES AS REQUIRED	
1	EA	CLASSROOM LOCK	L9070	SCH
1	EA	SURFACE CLOSER	4011	LCN
1	EA	OVERHEAD STOP	900S	GLY
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	IVE

END OF SECTION 08710

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SECTION 08801 – INTERIOR GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
 - 1. Automatic Entrance Doors.
 - 2. Glazed Entrances.
- B. Related Sections include the following:
 - 1. Division 5 Section "Metal Fabrications."
 - 2. Division 8 Section "Automatic Entrance Doors."
 - 3. Division 8 Section "Aluminum-Framed Entrances and Storefronts."

1.3 DEFINITIONS

- A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.
- C. Deterioration of Coated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in metallic coating.
- D. Deterioration of Laminated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1.4 PERFORMANCE REQUIREMENTS

- A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
1. Glass shall be of specified types, free from flaws and complying with grade requirements. All panels of each type of glass shall be produced by the same manufacturer. Each shipment of glass shall bear a manufacturer's statement indicating strength, grade, thickness, type, and quality of the contents.
 2. Glass shall be annealed, heat strengthened, fully tempered, or laminated, as recommended by the glass manufacturer, to ensure against heat breakage and to assure adequate glass performance at the specified design loads. The glass manufacturer's recommendations shall be accompanied by design load and thermal stress analysis calculations. Use of tempered glass shall be limited to areas where design pressures are beyond the capacity of heat strengthened glass or where required for safety glazing.
 3. Unless otherwise indicated, glass lights shall be of uniform appearance in order to maintain visual uniformity throughout the work. Glass required by code to meet safety glass requirements is excepted from this requirement.
 4. Glass thickness of all vertical lights shall be the same and shall be based on design requirements for the most severe condition.
 5. Sizes of glass shall be taken from the actual frames or from guaranteed dimensions provided by the frame supplier.
 6. Tolerances between frame and edges of glass shall be those recommended by the glass manufacturer.
 7. The work shall conform to requirements of CPSC 16 CFR 1201.
 8. Glass 1/4" thick and thicker shall be factory graded and cut.
 9. Sealants shall be supplied by a single manufacturer when available. After acceptance by the Commissioner, all sealant of each type shall be produced by the accepted manufacturer.
- B. Glass Design: Glass thickness designations indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites in the thickness designations indicated for various size openings, but not less than thicknesses and in strengths (annealed or heat treated) required to meet or exceed the following criteria:
1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300, according to the following requirements:
 - a. Specified Design Wind Loads: As indicated, but not less than wind loads applicable to Project as required by ASCE 7 "Minimum Design Loads for Buildings and Other Structures": Section 6.0 "Wind Loads."
 - b. Design Wind Loads: Determine design wind loads applicable to Project from basic wind speed indicated in miles per hour at 33 feet above grade, according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 6.5, "Method 2-

- Analytical Procedure," based on mean roof heights above grade indicated on Drawings.
- c. Maximum Lateral Deflection: For the following types of glass supported on all 4 edges, provide thickness required that limits center deflection at design wind pressure to 1/50 times the short side length or 1 inch, whichever is less.
 - 1) For monolithic-glass lites heat treated to resist wind loads.
 - 2) For insulating glass.
 - 3) For laminated-glass lites.
 - d. Minimum Glass Thickness for Exterior Lites: Not less than 6.0 mm.
- C. Thermal Movements: Provide glazing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
- 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
- D. Thermal and Optical Performance Properties: Provide glass with performance properties specified based on manufacturer's published test data, as determined according to procedures indicated below:
- 1. For monolithic-glass lites, properties are based on units with lites 6.0 mm thick or of thickness indicated.
 - 2. For laminated-glass lites, properties are based on products of construction indicated.

1.5 ACTION SUBMITTALS

- A. Product Data: For each glass product and glazing material indicated.
- B. LEED Submittals:
 - 1. Product Data for Credit IEQ 4.1: For glazing sealants used inside the weatherproofing system, documentation including printed statement of VOC content.
- C. Samples: For the following products, in the form of 12-inch-square Samples for glass.
 - 1. Glass, 3 samples each designated type, displaying safety glass labeling when applicable, 12" x 12".
 - 2. Non-structural glazing gasket, 12" x 12" corner.
 - 3. Structural silicone glazing sealant, glass, and aluminum, 12" x 12".
 - 4. Extruded silicone glazing strips: 12" length.
- D. Shop Drawings:
 - 1. Design Data with recommended glass types, strengths, and thicknesses indicating design loads
 - 2. Recommended glazing materials and details, showing glass clearances, setting blocks, shims, preformed spacers, structural seals, tapes, gaskets and sealants.

- E. Glazing Schedule: Use same designations indicated on Drawings for glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.
- F. Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.6 INFORMATIONAL SUBMITTALS

- A. Product Certificates: Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.
- B. Qualification Data: For installers.
- C. Preconstruction Adhesion and Compatibility Test Report: From glazing sealant manufacturer indicating glazing sealants were tested for adhesion to glass and glazing channel substrates and for compatibility with glass and other glazing materials.
- D. Product Test Reports: For each of the following types of glazing products:
 - 1. Clear float glass.
 - 2. Coated float glass.
 - 3. Laminated glass.
 - 4. Glazing sealants.
 - 5. Glazing gaskets.
- E. Warranties: Special warranties specified in this Section.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in glass installations with a record of successful in-service performance; and who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.
- B. Source Limitations for Glazing Accessories: Obtain glazing accessories through one source from a single manufacturer for each product and installation method indicated.
- C. Glass Product Testing: Obtain glass test results for product test reports in "Submittals" Article from a qualified testing agency based on testing glass products.
 - 1. Glass Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.
- D. Safety Glazing Products: Comply with testing requirements in 16 CFR 1201 and, for wired glass, ANSI Z97.1.

1. Subject to compliance with requirements, obtain safety glazing products permanently marked with certification label of the Safety Glazing Certification Council or another certification agency or manufacturer acceptable to authorities having jurisdiction.
 2. Where glazing units, including Kind FT glass and laminated glass, are specified in Part 2 articles for glazing lites more than 9 sq. ft. (0.84 sq. m) in exposed surface area of one side, provide glazing products that comply with Category II materials, for lites 9 sq. ft. (0.84 sq. m) or less in exposed surface area of one side, provide glazing products that comply with Category I or II materials, except for hazardous locations where Category II materials are required by 16 CFR 1201 and regulations of authorities having jurisdiction.
- E. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
1. GANA Publications: GANA Laminated Division's "Laminated Glass Design Guide" and GANA's "Glazing Manual."
- F. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Install full scale mock up of (3) panels of Glass Type GL-2 to illustrate graphic pattern and repeat for architect's and owner's review and approval prior to production.
 2. Install glazing in mock up specified in Section 05721 "Ornamental Handrails and Railings" to match glazing systems required for Project, including glazing methods.
 3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

1.9 PROJECT CONDITIONS

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
1. Do not install liquid glazing sealants when ambient and substrate temperature conditions are outside limits permitted by glazing sealant manufacturer.

1.10 WARRANTY

- A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form, made out to Owner and signed by coated-glass manufacturer agreeing to replace coated-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
 - 1. Warranty Period: 10 years from date of Substantial Completion.
- B. Manufacturer's Special Warranty on Laminated Glass: Manufacturer's standard form, made out to Owner and signed by laminated-glass manufacturer agreeing to replace laminated-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
 - 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GLASS PRODUCTS, GENERAL

- A. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.
 - 1. Minimum Glass Thickness for Exterior Lites: Not less than 6.0 mm

2.2 MANUFACTURERS

- A. Subject to compliance with requirements provide products from the following manufacturers:
 - 1. AFG
 - 2. Guardian.
 - 3. Interpane.
 - 4. J.E. Berkowitz.
 - 5. Oldcastle.
 - 6. Pilkington.
 - 7. PPG.
 - 8. Viracon.
 - 9. Vivid Glass, a Forms+Surfaces Company

2.3 GLASS PRODUCTS

- A. Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I (clear) unless otherwise indicated.
- B. Annealed Float Glass: ASTM C 1036, Type I (transparent flat glass), Quality-Q3; of class indicated.

- C. Heat-Treated Float Glass: ASTM C 1048; Type I (transparent flat glass); Quality-Q3; of class, kind, and condition indicated.
1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed, unless otherwise indicated.
 2. Provide Kind HS (heat-strengthened) float glass in place of annealed float glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in Part 1 "Performance Requirements" Article.
 3. For uncoated glass, comply with requirements for Condition A.
 4. For coated vision glass, comply with requirements for Condition C (other uncoated glass).
 5. Provide Kind FT (fully tempered) float glass in place of annealed or Kind HS (heat-strengthened) float glass where safety glass is indicated.
- D. Laminated Glass: ASTM C 1172, and complying with other requirements specified and with the following:
1. Interlayer: Polyvinyl butyral of thickness indicated with a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after laminating glass lites and installation.
 - a. For polyvinyl butyral interlayers, laminate lites in autoclave with heat plus pressure.
 2. Laminating Process: Fabricate laminated glass to produce glass free of foreign substances and air or glass pockets.

2.4 GLAZING GASKETS

- A. Dense Compression Gaskets: Molded or extruded gaskets of material indicated below, complying with standards referenced with name of elastomer indicated below, and of profile and hardness required to maintain watertight seal:
1. Neoprene, ASTM C 864.
 2. EPDM, ASTM C 864.
 3. Silicone, ASTM C 1115.
 4. Thermoplastic polyolefin rubber, ASTM C 1115.
 5. Any material indicated above.

2.5 GLAZING SEALANTS

- A. General: Provide products of type indicated, complying with the following requirements:
1. Compatibility: Select glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
 3. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.
- B. Elastomeric Glazing Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
1. Single-Component Neutral- and Basic-Curing Silicone Glazing Sealants:
 - a. Products: Subject to compliance with requirements, provide the following:
 - 1) Dow Corning Corporation; 790.
 - 2) GE Silicones; SilPruf LM SCS2700.
 - 3) Tremco; Spectrem 1 (Basic).
 - 4) GE Silicones; SilPruf SCS2000.
 - 5) Pecora Corporation; 864.
 - 6) Pecora Corporation; 890.
 - 7) Polymeric Systems Inc.; PSI-641.
 - 8) Sonneborn, Div. of ChemRex, Inc.; Omniseal.
 - 9) Tremco; Spectrem 3.
 - b. Type and Grade: S (single component) and NS (nonsag).
 - c. Class: 100/50.
 - d. Use Related to Exposure: NT (nontraffic).
 - e. Uses Related to Glazing Substrates: M, G, A, and, as applicable to glazing substrates indicated, O.
 2. Neutral-Curing Silicone Glazing Sealants:
 - a. Products: Subject to compliance with requirements, provide the following:
 - 1) Dow Corning Corporation; 791.
 - 2) Dow Corning Corporation; 795.
 - 3) GE Silicones; SilPruf NB SCS9000.
 - 4) GE Silicones; UltraPruf II SCS2900.
 - 5) Pecora Corporation; 865.
 - 6) Pecora Corporation; 895.
 - 7) Pecora Corporation; 898.
 - b. Type and Grade: S (single component) and NS (nonsag).
 - c. Class: 50.
 - d. Use Related to Exposure: NT (nontraffic).
 - e. Uses Related to Glazing Substrates: M, G, A, and, as applicable to glazing substrates indicated, O.
 3. Class 25 Neutral-Curing Silicone Glazing Sealant:
 - a. Products: Subject to compliance with requirements, provide the following:
 - 1) Dow Corning Corporation; 799.
 - 2) GE Silicones; UltraGlaze SSG4000.
 - 3) GE Silicones; UltraGlaze SSG4000AC.
 - 4) Polymeric Systems Inc.; PSI-631.
 - 5) Schnee-Morehead, Inc.; SM5731 Poly-Glaze Plus.
 - 6) Tremco; Proglaze SG.

- 7) Tremco; Spectrem 2.
- 8) Tremco; Tremsil 600.
- b. Type and Grade: S (single component) and NS (nonsag).
- c. Class: 25.
- d. Use Related to Exposure: NT (nontraffic).
- e. Uses Related to Glazing Substrates: M, G, A, and, as applicable to glazing substrates indicated, O.

2.6 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based elastomeric tape with a solids content of 100 percent; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; packaged on rolls with a release paper backing; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
 - 1. AAMA 804.3 tape, where indicated.
 - 2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
 - 3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.
- B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; packaged on rolls with release liner protecting adhesive; and complying with AAMA 800 for the following types:
 - 1. Type 1, for glazing applications in which tape acts as the primary sealant.

2.7 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions with a Shore, Type A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

- G. Perimeter Insulation for Fire-Resistive Glazing: Identical to product used in test assembly to obtain fire-resistance rating.

2.8 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
- B. Grind smooth and polish exposed glass edges and corners.

2.9 MONOLITHIC-GLASS TYPES

- A. Glass Type GL-2: Clear tempered pattern glass, for use in interior partitions and architectural woodwork.
 - 1. Product: Vivid Glass “VFI-Kalahari”, or approved equal.
 - 2. Minimum thickness: 6.0 mm.
- B. Glass Type GL-3: Clear fully tempered float glass, for use in interior windows, doors, partitions and ornamental railings unless otherwise indicated.
 - 1. Minimum thickness: 6.0 mm.
 - 2. Provide safety glazing labeling.
- C. Glass Type GL-3.1: Clear fully tempered float glass with reflective mirror film on entire public side, for use in interior windows at CBP Rooms 163 and 245 doors.
 - 1. Minimum thickness: 6.0 mm.
 - 2. Provide safety glazing labeling.
- D. Glass Type GL-3.2: Clear fully tempered float glass with translucent frosted film applied between 27 inches and 75 inches above the finish floor elevation, for use in office and conference room sidelights.
 - 1. Minimum thickness: 6.0 mm.
 - 2. Provide safety glazing labeling.

2.10 LAMINATED-GLASS TYPES

- A. Glass Type GL-4: Decorative glass composed of clear laminated glass with triple layer custom graphic between two plies of float glass, for use in interior partitions.
 - 1. Product: Vivid Glass Vivigraphic View “VGV3506-00-GG”, or approved equal matching graphic pattern design and layout provided by Architect and Architect’s control sample.
 - 2. Minimum thickness of Each Glass Ply: 3.0 mm.
 - 3. Minimum interlayer Thickness: 0.060 inch.
 - 4. Provide safety glazing labeling

- B. Glass Type GL-5: Clear laminated glass with two plies of float glass, for use on elevator cabs and hoistways and interior partitions.
 - 1. Minimum thickness of Each Glass Ply: 6.0 mm.
 - 2. Interlayer Thickness: 0.060 inch.
 - 3. Provide safety glazing labeling.
- C. Glass Type GL-6: Clear laminated glass with two plies of float glass, for use in automatic entrances.
 - 1. Minimum thickness of Each Glass Ply: 12.0 mm.
 - 2. Interlayer Thickness: 0.060 inch.
 - 3. Provide safety glazing labeling.
- D. Glass Type GL-6.1: Translucent laminated glass with two plies of float glass, for use in automatic entrances where indicated.
 - 1. Minimum thickness of Each Glass Ply: 12.0 mm.
 - 2. Interlayer Thickness: 0.060 inch.
 - 3. Interlayer Color: White, matching Vanceva Color No. 0099.
 - 4. Provide safety glazing labeling

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine framing glazing, with Installer present, for compliance with the following:
 - 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
 - 2. Presence and functioning of weep system.
 - 3. Minimum required face or edge clearances.
 - 4. Effective sealing between joints of glass-framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant

thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.

- C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
- D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.
- E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- G. Provide spacers for glass lites where length plus width is larger than 50 inches as follows:
 - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
 - 2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
- K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 GASKET GLAZING (DRY)

- A. Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

- C. Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- D. Install gaskets so they protrude past face of glazing stops.

3.5 CLEANING AND PROTECTION

- A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended by glass manufacturer.
- C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.
- D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.
- E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

END OF SECTION 08801

**NEW PASSENGER TERMINAL
DULUTH INTERNATIONAL AIRPORT
DULUTH, MINNESOTA**

**SECTION 09111 – NON-STRUCTURAL
STEEL FRAMING**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes non-load-bearing steel framing members for the following applications:
 - 1. Interior framing systems e.g., supports for partition walls, framed soffits, furring and support for other interior finishes requiring framing.
 - 2. Interior suspension systems supports for ceilings and suspended soffits.
 - 3. Metal strapping as backing for support of wall cabinets, closet shelving and bracketed counter and work surfaces not supported by base cabinets.
- B. Related Sections include the following:
 - 1. Division 5 Section 05400 "Cold-Formed Metal Framing" for exterior and interior load-bearing and exterior non-load-bearing framing.
 - 2. Division 9 Section 09250 "Gypsum Board" for gypsum panels and other components of wall assemblies.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. LEED Submittals:
 - 1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

1.4 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
 - 1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal, unless otherwise indicated.
 - 2. Protective Coating: ASTM A 653/A 653M, G40 hot-dip galvanized, unless otherwise indicated.

2.2 SUSPENSION SYSTEM COMPONENTS

- A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch-diameter wire, or double strand of 0.0475-inch-diameter wire.
- B. Hanger Attachments to Concrete:
 - 1. Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching wire hangers and capable of sustaining, without failure, a load equal to 5 times that imposed by construction as determined by testing according to ASTM E 488 by an independent testing agency.
 - a. Type: Postinstalled, chemical anchor or postinstalled, expansion anchor.

2. Powder-Actuated Fasteners: Suitable for application indicated, fabricated from corrosion-resistant materials with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, a load equal to 10 times that imposed by construction as determined by testing according to ASTM E 1190 by an independent testing agency.
- C. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.162-inch diameter.
- D. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.0538 inch and minimum 1/2-inch-wide flanges.
 1. Depth: As indicated on Drawings.
- E. Furring Channels (Furring Members):
 1. Steel Studs: ASTM C 645.
 - a. Minimum Base-Metal Thickness: 0.0179 inch.
 - b. Depth: As indicated on Drawings.
 2. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch deep.
 - a. Minimum Base Metal Thickness: 0.0179 inch.
- F. Grid Suspension System for Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.
 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Armstrong World Industries, Inc.; Drywall Grid Systems.
 - b. Chicago Metallic Corporation; Drywall Furring System.
 - c. USG Corporation; Drywall Suspension System.
 - d. Approved equivalent.

2.3 STEEL FRAMING FOR FRAMED ASSEMBLIES

- A. Steel Studs and Runners: ASTM C 645.
 1. Minimum Base-Metal Thickness: 0.0312 inch.
 2. Depth: As indicated on Drawings.

- B. Slip-Type Head Joints: Where indicated, provide one of the following:
1. Single Long-Leg Runner System: ASTM C 645 top runner with 2-inch-deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top runner and with continuous bridging located within 12 inches of the top of studs to provide lateral bracing.
 2. Double-Runner System: ASTM C 645 top runners, inside runner with 2-inch-deep flanges in thickness not less than indicated for studs and fastened to studs, and outer runner sized to friction fit inside runner.
 3. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
 - a. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Steel Network Inc. (The); VertiTrack VTD Series.
 - 2) Superior Metal Trim; Superior Flex Track System (SFT).
 - 3) Approved equivalent.
- C. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.
1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Fire Trak Corp.; Fire Trak attached to studs with Fire Trak Slip Clip.
 - b. Metal-Lite, Inc.; The System.
 - c. Approved equivalent.
- D. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
1. Minimum Base-Metal Thickness: 0.0312 inch.
- E. Cold-Rolled Channel Bridging: 0.0538-inch bare-steel thickness, with minimum 1/2-inch-wide flanges.
1. Depth: 1-1/2 inches minimum.
 2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch-thick, galvanized steel.

- F. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
 - 1. Minimum Base Metal Thickness: 0.0179 inch.
 - 2. Depth: 7/8 inch.
- G. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches wall attachment flange of 7/8 inch minimum bare-metal thickness of 0.0179 inch and depth required to fit insulation thickness indicated.

2.4 SHAFT-WALL FRAMING

- A. Studs: Manufacturer's standard profile for repetitive members, corner and end members, and fire-resistance-rated assembly indicated.
 - 1. Depth: As indicated.
 - 2. Minimum Base-Metal Thickness: 0.18 inch.
- B. Runner Tracks: Manufacturer's standard J-profile track with manufacturer's standard long-leg length, but at least 2 inches long and matching studs in depth.
- C. Firestop Tracks: Provide firestop track at head of shaft wall on each floor level.

2.5 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards.
 - 1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
- B. Isolation Strip at Exterior Walls: Provide one of the following:
 - 1. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), nonperforated.
 - 2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C 754, except comply with framing sizes and spacing indicated.
 - 1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.
- B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- C. Install bracing at terminations in assemblies.
- D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.3 INSTALLING SUSPENSION SYSTEMS

- A. Install suspension system components in sizes and spacings indicated on Drawings, but not less than those required by referenced installation standards for assembly types and other assembly components indicated.
- B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.
- C. Suspend hangers from building structure as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.

- a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
- 2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
 - a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
- 3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
- 4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
- 5. Do not attach hangers to steel roof deck.
- 6. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
- 7. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.
- E. Seismic Bracing: Sway-brace suspension systems with hangers used for support.
- F. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.
- G. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

3.4 INSTALLING FRAMED ASSEMBLIES

- A. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

- B. Install studs so flanges within framing system point in same direction.
1. Space studs as follows:
 - a. Single-Layer Application: 16 inches o.c., unless otherwise indicated.
 - b. Multilayer Application: 16 inches o.c., unless otherwise indicated.
 - c. Tile backing panels: 16 inches o.c., unless otherwise indicated.
- C. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.
1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
 2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
 - a. Install two studs at each jamb, unless otherwise indicated.
 - b. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
 3. Other Framed Openings: Frame openings other than door openings the same as required for door openings, unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
 4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
 - a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
 5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
 6. Curved Partitions:
 - a. Bend track to uniform curve and locate straight lengths so they are tangent to arcs.
 - b. Begin and end each arc with a stud, and space intermediate studs equally along arcs. On straight lengths of not less than 2 studs at ends of arcs, place studs 6 inches o.c.

D. Direct Furring:

1. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.

E. Z-Furring Members:

1. Erect insulation (specified in Division 7 Section "Building Insulation") vertically and hold in place with Z-furring members spaced 24 inches o.c.
2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches from corner and cut insulation to fit.

- F. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

END OF SECTION 09111

**NEW PASSENGER TERMINAL
DULUTH INTERNATIONAL AIRPORT
DULUTH, MN**

**SECTION 09130 - ACOUSTICAL
SUSPENSION SYSTEMS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SYSTEM DESCRIPTION

- A. Suspended ceiling system consisting of main tees and cross tees equipped with panel centering device, snapped together to form modules for the installation of lay-in acoustical panels, air diffusers and light fixtures.

1.3 QUALITY ASSURANCE

- A. Subcontractor qualifications: Installer shall have successful experience in installation of ceiling suspension systems on projects with requirements similar to requirements specified.
- B. Requirements of regulatory agencies: Codes and regulations of authorities having jurisdiction.
- C. Source quality control: Manufacturer will provide test certification for suspension system as required to meet performance standards specified by various agencies.

1.4 REFERENCES

- A. ASTM C635, Standard Specifications for Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
- B. ASTM C636, Recommended Practice for Installation of Metal Suspension System for Acoustical Tile and Lay-in Panels.
- C. CISCA Ceiling Systems Installation Handbook.

1.5 SUBMITTALS

- A. Samples: Submit data for suspension system main tees and cross tees for review of finish color and appearance.

- B. Shop drawings:
 - 1. Reflected ceiling plans: Submit ceiling suspension system layout to indicate ceiling modules and related lighting and mechanical systems.
 - 2. Assembly drawings: Indicate module dimensions, accessory attachments and installation of related components.
- C. Manufacturer's data:
 - 1. System details: Submit manufacturer's descriptive literature or standard drawings showing details of system with project conditions clearly identified, and manufacturer's recommended installation instructions.
 - 2. Color chart: Submit manufacturer's standard color chart for selection of color.
- D. Maintenance materials: Provide 5 percent of amount of main tees and cross tees installed.

1.6 SUSTAINABLE DESIGN SUBMITTALS

- A. Section 01361 - Sustainable Design Requirements: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
 - 1. Materials Resources Certificates:
 - a. Certify recycled material content for recycled content products.
 - b. Certify source for local and regional materials and distance from Project site.
 - 2. Indoor Air Quality Certificates:
 - a. Certify volatile organic compound content for each interior adhesive and sealant and related primer.
- C. Product Cost Data: Submit cost of products to verify compliance with Project sustainable design requirements. Exclude cost of labor and equipment to install products.
 - 1. Provide cost data for the following products:
 - a. Products with recycled material content.
 - b. Local and regional products.

1.7 EXTRA MATERIALS

- A. Section 01631 – Products and Substitutions: Spare parts and maintenance products.

1.8 DELIVERY, STORAGE AND HANDLING

- A. Delivery of materials: Deliver materials in original, unopened packages clearly labeled with manufacturer's name, item description, part number, type and class, as applicable.
- B. Inspection: Promptly inspect delivered materials; file freight claims for damage during shipment and order replacement material, as required.
- C. Storage: Store in manner that will prevent warpage, scratches, or damage of any kind. Prevent interference to/by other trades and any other adverse job conditions due to storage locations or methods.
- D. Handling: Handle in such manner to insure against racking, distortion or physical damage of any kind.

1.9 PROJECT CONDITIONS

- A. Environmental requirements:
 - 1. Building conditions: Building shall be enclosed with all windows and exterior doors in place and glazed, and the roof watertight before installation of suspension system.
 - 2. Interior temperature/humidity in building: Climatic conditions in areas to receive ceiling suspension systems shall range from 60 °F to 85 °F and relative humidity of not more than 80% shall be maintained before installation of components.
- B. Coordination with other work:
 - 1. General: Coordinate with other work supported by or penetrating through the ceiling, including mechanical and electrical work and partition systems.
 - 2. Mechanical work: Ductwork above suspension system shall be complete and permanent heating and cooling systems operating.
 - 3. Electrical work: Installation of conduit above suspension system shall be complete before installation of suspension system.
- C. Protection: Protect completed work above suspension system from damage during installation of suspension system components.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufactures: Subject to compliance with requirements, manufactures offering products that may be incorporated into the Work include, but are not limited to the following:

- B. Approved Manufacturers:
 - 1. USG Interiors
 - 2. Armstrong Ceilings
 - 3. Certain Teed Ceilings
- C. Substitutions: Under provisions of Section 01631.
- D. Basis-of-Design Product: The design is based on the products named in the Material Schedule. Subject to compliance with requirements, provide either the named products or comparable products by one of the manufactures specified. Comparable products are subject to review and approval through the submittal process specified.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Examine areas to receive materials for conditions which will adversely affect installation. Provide written report of discrepancies.
- B. Do not start work until unsatisfactory conditions are corrected.
- C. Work to be concealed: Verify work above ceiling suspension system is complete and installed in manner which will not affect layout and installation of suspension system components.
- D. Beginning of installation shall signify acceptance of conditions in areas to receive ceiling suspension system.

3.2 PREPARATION

- A. Field dimensions must be verified prior to installation.

3.3 INSTALLATION

- A. Standard reference: Install in accordance with ASTM C636, CISCA installation standards, and any other applicable code requirements.
- B. Manufacturer's reference: Install in accordance with manufacturer's current printed recommendations.
- C. Hanger Wires:
 - 1. Spacing: Space hanger wires on main tees a maximum of 48"o.c., attaching hangers directly to structure above, or as needed to support loads.
 - 2. Limitations: Do not support wires from mechanical and/or electrical equipment, piping or other equipment occurring above ceiling.

- D. Light fixture clip: Snap over main tees and cross tees at each corner of light fixture.

3.4 CLEANING

- A. Suspension: Remove infill material and perform any necessary cleaning maintenance with nonsolvent-based commercial cleaner.
- B. Touch up all minor scratches and spots, as acceptable, or replace damaged sections when touch-up is not permitted.
- C. Painting: Repainting of suspension member shall be with a high-quality solvent base paint and applied as recommended by paint manufacturer.
- D. Removal of debris: Remove all debris resulting from work of this section.

3.5 SCHEDULE

- A. Refer to Room Finish Schedule for a listing of rooms requiring work of this section.

END OF SECTION 09130

**NEW PASSENGER TERMINAL
DULUTH INTERNATIONAL AIRPORT
DULUTH, MINNESOTA**

**SECTION 09250
GYPSUM BOARD**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Interior gypsum board and other components of gypsum board wall assemblies.
 - 2. Gypsum board shaft wall assemblies.
 - 3. Tile backing panels.
- B. Related Sections include the following:
 - 1. Division 5 Section 05400 "Cold-Formed Metal Framing" for load-bearing steel framing that supports gypsum board.
 - 2. Division 7 Section 07841 "Through-Penetration Firestop Systems" for head-of-wall assemblies that incorporate gypsum board.
 - 3. Division 9 Section 09111 "Non-Structural Steel Framing" for non-structural framing and suspension systems that support gypsum board.
 - 4. Division 9 Section 09900 "Painting" for primers applied to gypsum board surfaces.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. LEED Submittals:
 - 1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

2. Product Certificates for Credit MR 5: For products and materials required to comply with requirements for regional materials, certificates indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating distance to Project, cost for each regional material, and fraction by weight that is considered regional.
3. Product Data for Credit IEQ 4.1: For adhesives used to laminate gypsum board panels to substrates, documentation including printed statement of VOC content.

1.4 QUALITY ASSURANCE

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

1.5 STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against damage from weather, condensation, direct sunlight, construction traffic, and other causes. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.
- B. Do not install interior products until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.
 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PANELS, GENERAL

- A. Size: Provide in maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.2 INTERIOR GYPSUM BOARD

- A. General: Complying with ASTM C 36/C 36M or ASTM C 1396/C 1396M, as applicable to type of gypsum board indicated and whichever is more stringent.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. American Gypsum Co.
 - b. G-P Gypsum.
 - c. Lafarge North America Inc.
 - d. National Gypsum Company.
 - e. USG Corporation.
- B. Type X:
 - 1. Thickness: 5/8 inch unless otherwise indicated.
 - 2. Long Edges: Tapered.
- C. Type C: ASTM C 1396
 - 1. Thickness: As required by fire-resistance-rated assembly indicated on Drawings.
 - 2. Long Edges: Tapered.
- D. Flexible Type: Manufactured to bend to fit radii and to be more flexible than standard regular-type gypsum board of same thickness.
 - 1. Thickness: 1/4 inch.
 - 2. Long Edges: Tapered.
- E. Ceiling Type: Manufactured to have more sag resistance than regular-type gypsum board.
 - 1. Thickness: 1/2 inch unless otherwise indicated.
 - 2. Long Edges: Tapered.

- F. Abuse-Resistant Type: Manufactured to produce greater resistance to surface indentation, through-penetration (impact resistance), and abrasion than standard, regular-type and Type X gypsum board.
 - 1. Core: As indicated on Drawings.
 - 2. Long Edges: Tapered.
- G. Moisture- and Mold-Resistant Type: With moisture- and mold-resistant core and surfaces.
 - 1. Core: 5/8 inch, Type X.
 - 2. Long Edges: Tapered.
- H. Gypsum Shaftliner Board, Type X: ASTM C 1396/C 1396M; manufacturer's proprietary fire-resistive liner panels with paper faces.
 - 1. Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.
 - 2. Thickness: 1 inch.
 - 3. Long Edges: Double bevel

2.3 TILE BACKING PANELS

- A. Water-Resistant Gypsum Backing Board: ASTM C 630/C 630M or ASTM C 1396/C 1396M.
 - 1. Manufacturers: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. American Gypsum Co.
 - b. G-P Gypsum.
 - c. Lafarge North America Inc.
 - d. National Gypsum Company.
 - e. USG Corporation.
 - 2. Core: As indicated on Drawings.
- B. Glass-Mat, Water-Resistant Backing Board:
 - 1. Complying with ASTM C 1178/C 1178M.
 - a. Product: Subject to compliance with requirements, provide "DensShield Tile Guard" by G-P Gypsum.

2. Complying with ASTM C1177/C 1177M.
 - a. Product: Subject to compliance with requirements, provide "DensArmor Plus Interior Guard" by G-P Gypsum.

3. Core: As indicated on Drawings.

C. Cementitious Backer Units: ANSI A118.9.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
2. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Custom Building Products; Wonderboard.
 - b. FinPan, Inc.; Util-A-Crete Concrete Backer Board.
 - c. USG Corporation; DUROCK Cement Board.
3. Thickness: As indicated on Drawings.

2.4 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
2. Shapes:
 - a. Cornerbead.
 - b. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - c. L-Bead: L-shaped; exposed long flange receives joint compound.
 - d. Expansion (control) joint.
 - e. Curved-Edge Cornerbead: With notched or flexible flanges.

B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Fry Reglet Corp.
 - b. Gordon, Inc.
 - c. Pittcon Industries.
2. Aluminum: Alloy and temper with not less than the strength and durability properties of **ASTM B 221**, Alloy 6063-T5.
3. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified.

2.5 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
 1. Interior Gypsum Wallboard: Paper.
 2. Exterior Gypsum Soffit Board: Paper.
 3. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.
 4. Tile Backing Panels: As recommended by panel manufacturer.
- C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
 1. Prefilling: At open joints and damaged surface areas, use setting-type taping compound.
 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
 - a. Use setting-type compound for installing paper-faced metal trim accessories.
 3. Fill Coat: For second coat, use setting-type, sandable topping compound.
 4. Finish Coat: For third coat, use setting-type, sandable topping compound.
 5. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound.

D. Joint Compound for Tile Backing Panels:

1. Water-Resistant Gypsum Backing Board: Use setting-type taping compound and setting-type, sandable topping compound.
2. Glass-Mat, Water-Resistant Backing Panel: As recommended by backing panel manufacturer.
3. Cementitious Backer Units: As recommended by backer unit manufacturer.

2.6 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
- C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
 1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
 2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- D. Diamond Mesh: Flattened 9 ga. expanded steel sheet with 1½" x 2" maximum diamond.
- E. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
 1. Thickness: as indicated.
 2. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
- F. Acoustical Sealant: As specified in Division 7 Section "Joint Sealants."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames and framing, for compliance with requirements and other conditions affecting performance.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
 - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
 - 2. Fit gypsum panels around ducts, pipes, and conduits.
 - 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch-wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch-wide spaces at these locations, and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

- I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

3.3 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
 - 1. Type X: As indicated on Drawings.
 - 2. Type C: As indicated on Drawings.
 - 3. Flexible Type: Apply in double layer at curved assemblies.
 - 4. Ceiling Type: As indicated on Drawings.
 - 5. Abuse-Resistant Type: As indicated on Drawings.
 - 6. Moisture- and Mold-Resistant Type: As indicated on Drawings.
- B. Single-Layer Application:
 - 1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing, unless otherwise indicated.
 - 2. On partitions/walls, apply gypsum panels vertically (parallel to framing), unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - b. At stairwells and other high walls, install panels horizontally, unless otherwise indicated or required by fire-resistance-rated assembly.
 - 3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
 - 4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.
- C. Multilayer Application:
 - 1. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.

2. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

D. Curved Surfaces:

1. Install panels horizontally (perpendicular to supports) and unbroken, to extent possible, across curved surface plus 12-inch-long straight sections at ends of curves and tangent to them.
2. For double-layer construction, fasten base layer to studs with screws 16 inches o.c. Center gypsum board face layer over joints in base layer, and fasten to studs with screws spaced 12 inches o.c.

3.4 APPLYING TILE BACKING PANELS

- A. Water-Resistant Gypsum Backing Board: Install at showers, tubs, and where indicated. Install with 1/4-inch gap where panels abut other construction or penetrations.
- B. Glass-Mat, Water-Resistant Backing Panel: Comply with manufacturer's written installation instructions and install where indicated. Install with 1/4-inch gap where panels abut other construction or penetrations.
- C. Cementitious Backer Units: ANSI A108.11, at locations indicated to receive tile.
- D. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.5 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.
- C. Interior Trim: Install in the following locations:
 1. Cornerbead: Use at outside corners, unless otherwise indicated.
 2. LC-Bead: Use at exposed panel edges.
 3. L-Bead: Use where indicated.
 4. Curved-Edge Cornerbead: Use at curved openings.
- D. Exterior Trim: Install in the following locations:
 1. Cornerbead: Use at outside corners.
 2. LC-Bead: Use at exposed panel edges.

- E. Aluminum Trim: Install in locations indicated on Drawings.

3.6 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
 - 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
 - 2. Level 2: Panels that are substrate for tile.
 - 3. Level 4: At panel surfaces that will be exposed to view, unless otherwise indicated.
 - a. Primer and its application to surfaces are specified in other Division 9 Sections.
 - 4. Level 5: Where indicated on Drawings.
 - a. Primer and its application to surfaces are specified in other Division 9 Sections.
- E. Glass-Mat Gypsum Sheathing Board: Finish according to manufacturer's written instructions for use as exposed soffit board.
- F. Glass-Mat, Water-Resistant Backing Panels: Finish according to manufacturer's written instructions.
- G. Cementitious Backer Units: Finish according to manufacturer's written instructions.

3.7 PROTECTION

- A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

- B. Remove and replace panels that are wet, moisture damaged, and mold damaged.
1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 09250

**NEW PASSENGER TERMINAL
DULUTH INTERNATIONAL AIRPORT
DULUTH, MN**

SECTION 09310 - TILE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes:
 - 1. Quarry tile
 - 2. Glass Mosaic Tile
 - 3. Waterproof membrane for thin-set tile installations.
 - 4. Metal edge strips installed as part of tile installations.

1.3 REFERENCES

- A. ANSI A108 Series/A118 Series/A136.1 - American National Standard Specifications for Installation of Ceramic Tile
- B. TCA (Tile Council of America) - Handbook for Ceramic Tile Installation.

1.4 SUBMITTALS

- A. Section 01300 - Submittals: Submittal procedures.
- B. Product Data: Submit instructions for using grouts and adhesives.
- C. Samples: Submit tile illustrating pattern and color.
- D. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.5 SUSTAINABLE DESIGN SUBMITTALS

- A. Section 01361 – Sustainable Design Requirements: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
 - 1. Materials Resources Certificates:
 - a. Certify recycled material content for recycled content products.

- b. Certify source for local and regional materials and distance from Project site.
 - 2. Indoor Air Quality Certificates:
 - a. Certify volatile organic compound content for each interior adhesive and sealant and related primer.

C. Product Cost Data: Submit cost of products to verify compliance with Project sustainable design requirements. Exclude cost of labor and equipment to install products.

- 1. Provide cost data for the following products:
 - a. Products with recycled material content.
 - b. Local and regional products.

1.6 CLOSEOUT SUBMITTALS

- A. Section 01700 – Contract Closeout: Closeout procedures.
- B. Operation and Maintenance Data: Submit recommended cleaning methods, cleaning materials, stain removal methods, and polishes and waxes.

1.7 QUALITY ASSURANCE

- A. Perform Work in accordance with TCA Handbook and ANSI A108 Series/A118 Series.
- B. Maintain one copy copies of each document on site.

1.8 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
- B. Installer: Company specializing in performing Work of this section with minimum three years documented experience.

1.9 MOCKUP

- A. Section 01400 - Quality Control –Testing Services: Requirements for mockup.
- B. Construct mock-up with finish grout, and specified accessories.
- C. Locate where directed by Architect.
- D. Incorporate accepted mockup as part of Work.

1.10 PRE-INSTALLATION MEETING

- A. Section 01300 - Submittals: Preinstallation meeting.

- B. Convene minimum one week before starting Work of this section.

1.11 DELIVERY, STORAGE, AND HANDLING

- A. Section 01631 – Products and Substitutions: Product storage and handling requirements.
- B. Protect adhesives and grouts from freezing or overheating.

1.12 ENVIRONMENTAL REQUIREMENTS

- A. Section 01631 – Products and Substitutions.
- B. Do not install adhesives and grouts in unventilated environment.
- C. Maintain ambient and substrate temperature of 50 degrees F during installation of mortar materials.

1.13 EXTRA MATERIALS

- A. Section 01700 - Contract Closeout Requirements: Spare parts and maintenance products.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufactures: Subject to compliance with requirements, manufactures offering products that may be incorporated into the Work include, but are not limited to the following:
- B. Approved Manufacturers:
 - 1. Dal Tile
 - 2. American Olean
- C. Substitutions: Under provisions of Section 01631.
- D. Basis-of-Design Product: The design is based on the products named in the Material Schedule. Subject to compliance with requirements, provide either the named products or comparable products by one of the manufactures specified. Comparable products are subject to review and approval through the submittal process specified.

2.2 BASE/PATTERN

- A. Base shall be as shown on the Drawings.
- B. Pattern shall be as shown on the Drawings.

2.3 ADHESIVE MATERIALS

- A. Manufacturers
 - 1. Adhesive: LATICRETE International, Inc.
 - 2. Other acceptable manufacturers offering equivalent products:
 - a. Mappi
 - b. PCI
 - 3. Substitutions: Under provisions of Section 01631.
- B. Adhesive: "LATICRETE 125 Sound & Crack Adhesive" as manufactured by LATICRETE International, Inc.

2.4 GROUT MATERIALS

- A. Manufacturers
 - 1. Grout: LATICRETE International, Inc.
 - 2. Other acceptable manufacturers offering equivalent products:
 - a. Mappi
 - b. PCI
 - 3. Substitutions: Under provisions of Section 01631.
- B. Grout: Grouting materials shall be Spectralock 2000 IG Grout as manufactured by LATICRETE International, Inc.

2.5 MORTAR MIX AND GROUT MIX

- A. Mix and proportion pre-mix setting bed and grout materials in accordance with manufacturer's instructions.

2.6 ACCESSORIES

- A. Tile Substrate: Wonder-Board® as supplied by American Olean Tile Company.
- B. Waterproofing Membrane:
 - 1. REDGARD Waterproofing and Anti-Fracture Membrane as manufactured by Custom Building Products.
 - 2. Pro-Red® Waterproofing Membrane 963 as manufactured by C-Cure.
- C. Floor Metal Edge Protection and Transitions: Schluter Schiene in aluminum finish. Height to match tile and setting- bed thickness.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Section 01300 - Submittals: Coordination and project conditions.
- B. Verify surfaces are ready to receive work.

3.2 PREPARATION

- A. Protect surrounding work from damage.
- B. Vacuum clean surfaces and damp clean.
- C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.
- D. Install cementitious backer board. Tape joints and corners, cover with skim coat of dry-set mortar to feather edge.
- E. Prepare substrate surfaces for adhesive installation.

3.3 INSTALLATION

- A. Install tile, thresholds, and grout in accordance with applicable requirements of ANSI A108.1 through A108.10, and TCA Handbook recommendations.
- B. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.
- C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor, base and wall joints.
- D. Place tile with joints uniform in width, subject to variance in tolerance allowed in tile size. Make joints watertight, without voids, cracks, excess mortar, or excess grout.
 - 1. Porcelain Tile: 1/16 inch inch.
- E. Form internal angles coved and external angles bullnosed.
- F. Install ceramic accessories rigidly in prepared openings.
- G. Sound tile after setting. Replace hollow sounding units.
- H. Keep control joints free of adhesive or grout. Apply sealant to joints.
- I. Allow tile to set for a minimum of 48 hours prior to grouting.

- J. Grout tile joints.
 - K. Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.
 - L. Installation - Floors - Thin-Set Methods:
 - 1. Over interior concrete substrates, install in accordance with TCA Handbook Method F113, dry-set or latex-portland cement bond coat, with standard grout, unless otherwise indicated.
 - a. Where waterproofing membrane is indicated, install in accordance with TCA Handbook Method F122, with latex-portland cement grout.
 - 2. Over wood substrates, install in accordance with TCA Handbook Method F142, with standard grout, unless otherwise indicated.
 - M. Installation - Wall Tile:
 - 1. Over cementitious backer units install in accordance with TCA Handbook Method W244, using membrane at toilet rooms, kitchens, and locker rooms.
 - 2. Over gypsum wallboard on wood or metal studs install in accordance with TCA Handbook Method W243, thin-set with dry-set or latex-portland cement bond coat, unless otherwise indicated.
 - a. Where waterproofing membrane is indicated other than at showers and bathtub walls, install in accordance with TCA Handbook Method W222, one coat method.
 - 3. Over interior concrete and masonry install in accordance with TCA Handbook Method W202, thin-set with dry-set or latex-portland cement bond coat.
- 3.4 CLEANING
- A. Section 01710 – Clean Up: Final cleaning.
 - B. Clean tile and grout surfaces.
- 3.5 PROTECTION OF INSTALLED CONSTRUCTION
- A. Section 01700 – Contract Closeout: Protecting installed construction.
 - B. Do not permit traffic over finished floor surface for 4 days after installation.
- 3.6 SCHEDULE
- A. Refer to Room Finish Schedule for a listing of rooms requiring work of this section.

END OF SECTION 09310

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**SECTION 09511 - ACOUSTIC
PANEL CEILINGS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 DESCRIPTION OF WORK

- A. Acoustic ceiling panel installation.

1.3 SYSTEM DESCRIPTION

- A. Firecode Panels: Suspended fire rated ceiling system consisting of Acoustone Glacier acoustical panels, ceiling suspension system, air diffusers and light fixtures.

1.4 DELIVERY AND STORAGE

- A. All materials shall be delivered in their original unopened packages and stored in an enclosed shelter providing protection from damage and exposure to the elements.
- B. Storage time of ceiling material at the jobsite should be as short as possible, and environmental conditions should be as near as possible to those specified for occupancy. Cartons should be removed from pallets and stringers to prevent distortion of material.
- C. Damaged or deteriorated materials shall removed from the premises. Immediately before installation, panels shall be stored for a sufficient time to stabilize them at temperature and humidity conditions ambient during installation and anticipated for occupancy.

1.5 QUALITY ASSURANCE

- A. Subcontractor qualifications: Installer shall have successful experience in the installation of suspended ceiling systems on projects with requirements similar to requirements specified.
- B. Requirements of regulatory agencies: Codes and regulations of authorities having jurisdiction.

- C. Source quality control:
 - 1. Test reports: Manufacturer shall provide test certification for minimum requirements as tested in accordance with applicable industry standards and/or to meet performance standards specified by various agencies.
 - 2. Changes from system: System performance following any substitution of materials or change in assembly design shall be certified by the manufacturer.

1.6 REFERENCES

- A. ASTM C636: Manufacturing and Installation of Suspended Ceilings.
- B. CICA Ceiling Systems Installation Handbook.

1.7 SUBMITTALS

- A. Samples: Submit representative sample of color and finish of all exposed materials.
- B. Manufacturer's data: Submit manufacturer's catalog cuts or standard drawings showing details of system with project conditions clearly identified and manufacturer's recommended installation instructions.
- C. Maintenance materials: Submit one percent of amount of ceiling components installed.

1.8 PROJECT CONDITIONS

- A. Environmental requirements for interior installation: Climatic condition range of 60°-85° F.
- B. Coordination with other work:
 - 1. Mechanical work: Ductwork above ceiling shall be complete, and permanent heating and cooling systems operating to climate conditions prior to installation of ceiling components.
 - 2. Electrical work: Installation of conduit above ceiling shall be complete before installation of ceiling components.
- C. Protection: Protect completed work above ceiling system from damage during installation of ceiling components.

1.9 SUSTAINABLE DESIGN SUBMITTALS

- A. Section 01361 - Sustainable Design Requirements: Requirements for sustainable design submittals.

- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
 - 1. Materials Resources Certificates:
 - a. Certify recycled material content for recycled content products.
 - b. Certify source for local and regional materials and distance from Project site.
 - 2. Indoor Air Quality Certificates:
 - a. Certify volatile organic compound content for each interior adhesive and sealant and related primer.
- C. Product Cost Data: Submit cost of products to verify compliance with Project sustainable design requirements. Exclude cost of labor and equipment to install products.
 - 1. Provide cost data for the following products:
 - a. Products with recycled material content.
 - b. Local and regional products.

1.10 EXTRA MATERIALS

- A. Section 01700 – Contract Closeout: Spare parts and maintenance products.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufactures: Subject to compliance with requirements, manufactures offering products that may be incorporated into the Work include, but are not limited to the following:
- B. Approved Manufacturers:
 - 1. USG Interiors
 - 2. Armstrong Ceilings
 - 3. Certain Teed Ceilings
- C. Substitutions: Under provisions of Section 01631.
- D. Basis-of-Design Product: The design is based on the products named in the Material Schedule. Subject to compliance with requirements, provide either the named products or comparable products by one of the manufactures specified. Comparable products are subject to review and approval through the submittal process specified.

PART 3 - EXECUTION**3.1 INSPECTION**

- A. Examine areas to receive ceiling panels for conditions that will adversely affect installation. Provide written report of discrepancies.
- B. Do not start work until unsatisfactory conditions are corrected.
- C. Work to be concealed: Verify work above ceiling is complete and installed in manner that will not affect layout and installation of ceiling panels.
- D. Beginning of installation shall signify acceptance of conditions in areas to receive ceiling panels.
- E. Fire-rating requirements: Construction above fire-rated assembly shall meet requirements of UL Designs.

3.2 PREPARATION

- A. Field dimensions must be verified prior to installation.

3.3 INSTALLATION

- A. Standard reference: Install ceiling panels in accordance with ASTM C636 and CICA Ceiling Systems Installation Handbook.
- B. Manufacturer's reference: Install ceiling panels in exposed grid systems, supported on all edges, in accordance with manufacturer's current printed recommendations.
- C. Drawing Reference: Install ceiling panels in accordance with the Drawings.

3.4 SCHEDULE

- A. Refer to Room Finish Schedule for a listing of rooms requiring work of this section.

END OF SECTION 09511

**NEW PASSENGER TERMINAL
DULUTH INTERNATIONAL AIRPORT
DULUTH, MN**

**SECTION 09524 - LINEAR
WOOD PANEL CEILING**

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 REFERENCES

- A. ASTM C635, Standard Specifications for Metal Suspension Systems
- B. ASTM C636, Recommended Practice for Installation of Metal Suspension System
- C. ATSM E84, Standard Test Method for Surface Burning Characteristics of Building Materials
- D. CISCA Ceiling Systems Installation Handbook.
- E. CISCA Wood Ceilings Technical Guidelines

1.3 SUMMARY

- A. Section Includes:
 - 1. Linear wood panel ceiling
 - 2. Suspension system.
 - 3. Wire hangers, fasteners, main runners, cross tees, and wall angle moldings.

1.4 SUBMITTALS

- A. Samples: Submit panel finish and suspension system main and cross tees for acceptance.
- B. Shop drawings:
 - 1. Reflected ceiling plans: Submit ceiling suspension system layout indicating dimensions, lighting fixture locations, and related mechanical components.
 - 2. Assembly drawings: Indicate installation details, accessory attachments and installation of related lighting fixtures and related mechanical system components.
 - 3. Samples: Minimum 4 inch x 6 inch samples of specified acoustical panel; 8 inch long samples of exposed wall molding and suspension system, including main runner and 4 foot cross tees.

- C. Manufacturer's data:
 - 1. System details: Submit manufacturer's catalog cuts, literature, or standard drawings showing details of system with project conditions clearly identified and manufacturer's recommended installation instructions.
- D. LEED Submittals:
 - 1. Product Data for Credit EQ 4.1: For adhesives, including printed statement of VOC content.
 - 2. Product Data for Credit EQ 4.4: For composite-wood products, documentation indicating that product contains no urea formaldehyde.
 - 3. Certificates for Credit MR 7: Chain-of-custody certificates certifying that products specified to be made from certified wood comply with forest certification requirements. Include evidence that manufacturer is certified for chain of custody by an FSC-accredited certification body.
 - 4. Include statement indicating costs for each certified wood product.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Delivery of materials: Deliver materials in original unopened packages, clearly labeled with manufacturer's name, item description, specification number, type, and class as applicable.
- B. Inspection: Promptly inspect delivered materials, file freight claims for damage during shipment, and order replacement materials as required. Any damaged materials shall be promptly removed from the job site.
- C. Storage: Store in manner that will prevent warpage, water damage, or damage of any kind. Prevent interference to/by other trades and any other adverse job conditions due to storage locations or methods.
- D. Handling: Handle in such a manner as to ensure against racking, distortion, or physical damage of any kind.

1.6 QUALITY ASSURANCE

- A. Subcontractor qualifications: Installer shall have not less than three years of successful experience in the installation of ceiling suspension systems on projects with requirements similar to requirements specified.
- B. Requirements of regulatory agencies: Codes and regulations of authorities having jurisdiction.
- C. Source quality control: Manufacturer will provide test certification for ceiling system as required to meet industry performance standards specified by various agencies.

- D. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

1.7 PROJECT CONDITIONS

- A. Building conditions: Building shall be enclosed with all windows and exterior doors in place and glazed, and the roof watertight before installation of suspension system.
- B. Interior temperature/humidity in building: Climatic conditions in areas to receive ceiling suspension systems shall range from 60°F (16°C) to 85°F (29°C) and relative humidity of not more than 55% shall be maintained before installation of components.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufactures: Subject to compliance with requirements, manufactures offering products that may be incorporated into the Work include, but are not limited to the following:
- B. Approved Manufacturers:
 - 1. USG Interiors
 - 2. Armstrong Ceilings
 - 3. Certain Teed Ceilings
- C. Substitutions: Under provisions of Section 01631.
- D. Basis-of-Design Product: The design is based on the products named in the Material Schedule. Subject to compliance with requirements, provide either the named products or comparable products by one of the manufactures specified. Comparable products are subject to review and approval through the submittal process specified.

2.2 PRODUCT DESCRIPTION:

- A. USG TRUE WOOD Linear Strips as manufactured by USG Interiors, Inc., Chicago, Illinois, U.S.A. Linear Wood Strips shall be made from prime grade, all-natural wood. They shall be manufactured in random lengths with tongue-and-groove ends, or in nominal fixed lengths depending on area dimensions.
- B. Interior Areas: For interior ceiling areas, the Linear, Open Style shall be a 6" module, having wood strips 3/4" thick x 5 1/4" wide, and having a 3/4" reveal with a factory-installed fiberfelt spacer between the wood strips. The Open Style fiberfelt spacer is provided in a standard black color.

2.3 SUSPENSION SYSTEMS

- A. The suspension system shall be USG Drywall Suspension, installed on #12-gauge wire hangers.

2.4 EDGES, BORDERS, and PERIMETER TRIMS

- A. Edges, borders, and perimeter trims shall be designated by specifier in accordance with standard design details available. All wood ceiling products specified shall be supplied by the ceiling manufacturer.

2.5 FINISHES and COLORS

- A. All Linear Wood Strips shall be factory-finished with clear sealers, wood stains, or semi-transparent color treatments as selected. All finishes shall be selected by the Architect.

PART 3 PART 3 - EXECUTION

3.1 PREPARATION

- A. Ceiling Layout: The contractor shall measure ceiling areas and establish the layout of the hangers and USG Drywall Suspension, in accordance with installation instructions.
- B. Coordination: The contractor shall furnish the layout for supports that shall be installed for suspension of ceilings. He shall furnish concrete inserts, steel deck hanger clips, or similar devices for installation, in time to coordinate the work.

3.2 INSTALLATION

- A. General: The contractor shall install materials in accordance with USG Corporation printed instructions. The contractor will comply with applicable regulations and industry standards.
- B. Perimeters: Using a leveling device, the contractor shall lay out and install perimeter trim, as specified.
- C. Suspensions: The contractor shall install suspension systems to comply with appropriate industry standards. The contractor shall locate DGL24 Main Tee perpendicular to wood direction, 4" from one wall for the first main tee, continuing 24" maximum, on center, ending within 4" of the opposite wall.

- D. #12-Gauge Wire hangers shall be installed 4' on center, along each main tee. The wire hangers shall be attached to inserts, screw eyes, or other connecting devices that are secure and appropriate for suspending the ceiling and that will not deteriorate or fail with age or elevated temperatures.
- E. Wood Strip Installation: The contractor shall screw to snap wood strips onto main tees. Installation shall proceed, in sequence, from one wall to the opposite side.
- F. When installing Linear Open Style ceilings with fiberfelt spacer, the contractor shall hang wood strips with felt edge facing the area yet to be filled. When installing Linear Open Style ceilings with hardboard spacer, the contractor shall hang a wood strip, then insert the hardboard spacer in the notched area on the back of the board with spacer edge facing the area yet to be filled. Then the next board may be installed over the spacer.
- G. HVAC and Light Fixture Suspensions: Electrical and mechanical installations must be supported independently of the linear wood ceiling

3.3 ADJUSTMENT, CLEANING, and REPAIR

- A. Contractor shall make final adjustments to level or contours.
- B. Upon completion of ceiling installation, all Linear Wood Strips and borders shall be cleaned free of dirt, dust, grease, oils, and fingerprints.
- C. All work that cannot be successfully cleaned or repaired, shall be removed and replaced.

3.4 INSPECTION

- A. Upon completion of ceiling installation, the owner's representative shall inspect all finished surfaces to ensure that the work has been completed in a manner satisfactory to the owner. Any deficiencies in the installed ceiling shall be corrected by the contractor at no additional cost to the owner, or to the ceiling manufacturer..

END OF SECTION 09524

**NEW PASSENGER TERMINAL
DULUTH INTERNATIONAL AIRPORT
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**SECTION 09650 - RESILIENT
TILE FLOORING**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Resilient vinyl plank flooring.
- B. Resilient base.

1.3 SUBMITTALS

- A. Submit manufacturer's product literature and samples under provisions of Section 01300 - Submittals.
- B. Include duplicate samples of flooring material, color and patterns.
- C. Submit manufacturer's printed installation instructions under provisions of Section 01300 - Submittals.
- D. Submit manufacturer's notarized certificate under provisions of Section 01300 - Submittals that products meet or exceed specified requirements.

1.4 OPERATION AND MAINTENANCE DATA

- A. Submit manufacturer's maintenance instructions under provisions of Section 01700 - Contract Closeout.

1.5 QUALITY ASSURANCE

- A. Manufacturer: Company specializing in vinyl resilient flooring with five years experience.
- B. Applicator: Company specializing in installation of vinyl resilient flooring with three years documented experience.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver resilient vinyl tile and accessories to the project site in original factory containers, each carton clearly marked as to manufacturer, pattern, size, gauge, and lot number.

- B. Deliver adhesive to be used for resilient vinyl tile and accessories to the project site in original factory containers, each container clearly marked as to manufacturer.
- C. Store materials to prevent damage.

1.7 PROJECT CONDITIONS

- A. Maintain minimum 70 degrees F air temperature at flooring installation area for three days prior to, during and for 48 hours after installation.
- B. Store flooring materials in area of application. Allow three days for materials to reach equal temperature as area.
- C. Prevent exposure to installation to excessive heat or direct sunlight until adhesive has attained final set.

1.8 SUSTAINABLE DESIGN SUBMITTALS

- A. Section 01361 - Sustainable Design Requirements: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
 - 1. Materials Resources Certificates:
 - a. Certify recycled material content for recycled content products.
 - b. Certify source for local and regional materials and distance from Project site.
 - 2. Indoor Air Quality Certificates:
 - a. Certify volatile organic compound content for each interior adhesive and sealant and related primer.
- C. Product Cost Data: Submit cost of products to verify compliance with Project sustainable design requirements. Exclude cost of labor and equipment to install products.
 - 1. Provide cost data for the following products:
 - a. Products with recycled material content.
 - b. Local and regional products.

1.9 WARRANTY

- A. Provide manufacturer's warranty under provisions of Section 01740 Warranties.
- B. Warranty: Include one year warranty that products are free from defects in materials and workmanship.

1.10 EXTRA MATERIALS

- A. Section 01700 - Contract Closeout: Spare parts and maintenance products.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufactures offering products that may be incorporated into the Work include, but are not limited to the following:
- B. Approved Manufacturers:
 - 1. Amtico
 - 2. Armstrong
 - 3. Johnsonite
 - 4. Mannington
- C. Substitutions: Under provisions of Section 01631.
- D. Basis-of-Design Product: The design is based on the products named in the Material Schedule. Subject to compliance with requirements, provide either the named products or comparable products by one of the manufactures specified. Comparable products are subject to review and approval through the submittal process specified.

2.2 MATERIALS - BASE

- A. As specified in Section 09678 - Resilient Base and Accessories.

2.3 ACCESSORIES

- A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.
- B. Primers and Adhesives: Waterproof; types recommended by flooring manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that concrete subfloors on or below grade are installed over a suitable moisture retardant membrane.
- B. Ensure concrete floors are dry and exhibit neutral alkalinity, carbonization, or dusting. Maximum Moisture Emission: Three lb./1,000 sq ft/24 hours.

- C. Ensure floor surfaces are smooth and flat with maximum variation of 1/8 inch in 10 feet.
- D. Ensure floor surfaces are clean and free from dust, paint, oil, grease, curing agents, parting compounds, surface hardeners, sealers, solvents, old adhesives, and other extraneous substances.
- E. Ensure contact wall surfaces to 1/2 inch below top of base are clean and free from dirt, paint, oil, grease, wall covering, old adhesives, and other extraneous substances.
- F. Beginning of installation means acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Remove subfloor ridges and humps. Fill low spots, cracks, joints, holes, and other defects with subfloor filler.
- B. Clean floor; apply, trowel, and float filler to leave smooth, flat, hard surface. Prohibit traffic until filler is cured.

3.3 INSTALLATION - FLOORING

- A. Install flooring in accordance with manufacturer's printed instructions.
- B. Use adhesive recommended by floor tile manufacturer.
- C. Clean substrate. Spread adhesive evenly in quantity recommended by flooring material manufacturer to ensure adhesion over entire area of installation. Use recommended notched trowel.
- D. Set flooring in place, roll and cross roll with 150 lb. sectional roller while adhesive is still wet to ensure full adhesion.
- E. Lay flooring with joints and seams parallel to building lines to produce symmetrical tile pattern.
- F. Terminate resilient flooring at center line of door openings where adjacent floor finish is dissimilar.
- G. Install reducer strips at unprotected or exposed edges where flooring terminates.
- H. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.
- I. Continue flooring through areas to receiver moveable type partitions without interrupting floor pattern.

3.4 INSTALLATION - BASE

- A. As specified in Section 09678 - Resilient Base and Accessories.

3.5 PROTECTION

- A. Prohibit traffic on finished floor for 48 hours after installation.

3.6 CLEANING

- A. Remove excess adhesive from floor, base, and wall surfaces without damage, while adhesive is still wet.
- B. Clean floor and base surfaces in accordance with manufacturer's instructions.

3.7 SCHEDULE

- A. Refer to Room Finish Schedule for a listing of rooms requiring work of this section.

END OF SECTION 09650

**NEW PASSENGER TERMINAL
DULUTH INTERNATIONAL AIRPORT
DULUTH, MN**

**SECTION 09678 - RESILIENT
BASE & ACCESSORIES**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Resilient base.

1.3 SUBMITTALS

- A. Submit under provisions of Section 01300 - Submittals.
- B. Product Data: Provide data on specified products, describing physical characteristics; sizes, patterns and colors available.
- C. Submit samples of base material.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Section 01631 – Products and Substitutions.
- B. Protect materials from damage.

1.5 ENVIRONMENTAL REQUIREMENTS

- A. Store materials for three days prior to installation in area of installation to achieve temperature stability.
- B. Maintain ambient temperature required by adhesive manufacturer three days prior to, during, and 24 hours after installation of materials.

1.6 SUSTAINABLE DESIGN SUBMITTALS

- A. Section 01361 - Sustainable Design Requirements: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.

1. Materials Resources Certificates:
 - a. Certify recycled material content for recycled content products.
 - b. Certify source for local and regional materials and distance from Project site.
 2. Indoor Air Quality Certificates:
 - a. Certify volatile organic compound content for each interior adhesive and sealant and related primer.
- C. Product Cost Data: Submit cost of products to verify compliance with Project sustainable design requirements. Exclude cost of labor and equipment to install products.
1. Provide cost data for the following products:
 - a. Products with recycled material content.
 - b. Local and regional products.

1.7 EXTRA MATERIALS

- A. Section 01700 - Contract Closeout: Spare parts and maintenance products.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufactures: Subject to compliance with requirements, manufactures offering products that may be incorporated into the Work include, but are not limited to the following:
- B. Approved Manufacturers:
1. Johnsonite
 2. Roppe
 3. Mannington
 4. Armstrong Flooring
- C. Substitutions: Under provisions of Section 01631.
- D. Basis-of-Design Product: The design is based on the products named in the Material Schedule. Subject to compliance with requirements, provide either the named products or comparable products by one of the manufactures specified. Comparable products are subject to review and approval through the submittal process specified.

2.2 MATERIALS

- A. Resilient base at **carpet areas** to be **flat base**.
- B. Resilient base at **hard surface floors** to be **coved base**

- C. Adhesive: As recommended by the base manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION - BASE

- A. Fit joints tight and vertical. Maintain minimum measurement of 18 inches between joints.
- B. Miter internal corners. At external corners, 'V' cut back of base strip to 2/3 of its thickness and fold. At exposed ends, use premolded units.
- C. Install base on solid backing. Bond tight to wall and floor surfaces.
- D. Scribe and fit to door frames and other interruptions.

3.2 CLEANING

- A. Clean work under provisions of 01710 – Cleaning Up.
- B. Remove excess adhesive from base, and wall surfaces without damage.

3.3 SCHEDULE

- A. Refer to Room Finish Schedule for a listing of rooms requiring work of this section.

END OF SECTION 09678

**NEW PASSENGER TERMINAL
DULUTH INTERNATIONAL AIRPORT
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**SECTION 09720 - WALL
COVERING**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SCOPE

- A. Provide wallcovering as shown and specified and in accordance with the Contract Documents.

1.3 SUBMITTALS

- A. Samples: Submit sample of each type and color to be installed for the Architect's approval.
- B. Certification of Compliance: Submit certificate from manufacturer that wallcovering used meets architectural specification requirements.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver all materials in manufacturer's cartons, properly labeled and identified.
- B. Store wallcovering in undamaged condition as packaged by manufacturer.
- C. Take care to prevent damage during delivery, handling and storage.
- D. Store all materials flat in a clean, dry storage area where temperature shall be maintained above 40 degrees F with normal humidity. Do not store materials in an upright position.

1.5 JOB CONDITIONS

- A. Areas to receive wallcovering shall have a constant temperature of at least 55 degrees F for three days before and all during application period.

1.6 SUSTAINABLE DESIGN SUBMITTALS

- A. Section 01361 - Sustainable Design Requirements: Requirements for sustainable design submittals.

- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
 - 1. Materials Resources Certificates:
 - a. Certify recycled material content for recycled content products.
 - b. Certify source for local and regional materials and distance from Project site.
 - 2. Indoor Air Quality Certificates:
 - a. Certify volatile organic compound content for each interior adhesive and sealant and related primer.
- C. Product Cost Data: Submit cost of products to verify compliance with Project sustainable design requirements. Exclude cost of labor and equipment to install products.
 - 1. Provide cost data for the following products:
 - a. Products with recycled material content.
 - b. Local and regional products.

1.7 GENERAL WARRANTY

- A. All products shall be guaranteed against manufacturing defects for a period of five years. If defects become evident during this period, manufacturer shall replace and assume installation cost.

1.8 EXTRA MATERIALS

- A. Section 01700 – Contract Closeout: Spare parts and maintenance products.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufactures offering products that may be incorporated into the Work include, but are not limited to the following:
- B. Approved Manufacturers:
 - 1. MDC Wall coverings
 - 2. National Wall Coverings
 - 3. Maharam
 - 4. Wolf Gordin
- C. Substitutions: Under provisions of Section 01631.
- D. Basis-of-Design Product: The design is based on the products named in the Material Schedule. Subject to compliance with requirements, provide either the named products or comparable products by one of the

manufactures specified. Comparable products are subject to review and approval through the submittal process specified.

2.2 ACCESSORIES

- A. Adhesive: As recommended by manufacturer with mildewcide.
- B. Primer: As recommended by manufacturer.
- C. Wall Liner: Nonwoven, synthetic underlayment and adhesive as recommended by wall covering manufacturer.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Examine all surfaces to receive wallcovering before beginning work to determine that they are sound, dry, clean and ready to receive final finish.
- B. Correct defects that could affect quality of finished work.
- C. Plaster and masonry surfaces shall not contain more than 5.5 percent moisture.
- D. Starting wallcovering work shall be construed as evidence of acceptance of conditions under which work will be done.

3.2 SURFACE PREPARATION

- A. Remove all loose paint and other wallcoverings.
- B. For new drywall construction, a coat of Genon Wall Prep shall be applied to the surface before application of wallcovering, for ease of subsequent removal.
- C. Glossy surfaces shall either be sanded to dull the surface or an application of Genon Right Arm Primer shall be applied prior to the installation of wallcovering.
- D. Remove mildew from walls and treat surface to inhibit further mildew growth.
- E. Surfaces which are in question as to condition shall have three test strips installed to ascertain any remedial work to be performed.
- F. Gypsum wallboard shall have all nails and screws recessed with all joints and depressions taped and spackled, sanded and primed with one coat of primer.

3.3 INSTALLATION

- A. Follow manufacturer's directions for mixing and applying adhesive and primer.
- B. Before cutting, examine pattern and color and determine that they match approved samples. Examine patterned material for repeat in design.
- C. Mix paste thoroughly. Apply paste on back of material with brush or roller in a thin, even coat over entire panel.
- D. Use panels in exact order as they are cut from roll.
- E. Trim on selvage of each panel deep enough to ensure color conformity using a straight edge on a cutting table or use the wall cutting procedures (without scoring the substrate) acceptable to the Architect.
- F. Install panels on the hanging surface, reversing every other panel of non-match patterns unless otherwise instructed by the manufacturer.
- G. Fill in over doors and windows with panels cut in consecutive order from the roll.
- H. Smooth fabric to hanging surface with stiff-bristled sweep brush or a flexible broad-knife to eliminate air bubbles and ensure adhesion.
- I. Vertical joints shall not occur less than six inches from outside or inside corners.
- J. Where applicable, install wallcovering before installation of plumbing, casing, bases, cabinets, etc.
- K. Remove excess paste from seam before making next seam. Use sponge or cloth dampened with clean water; wipe clean with dry towel.
- L. Any variation in color and/or pattern match shall be immediately communicated to the manufacturer's representative for his inspection before proceeding further with installation.

3.4 CLEAN-UP

- A. Upon completion of the work, remove surplus materials, rubbish and debris resulting from the operations under this Section, including equipment and implements of service and leave the entire structure and site insofar as the work of this Section is concerned in a neat, clean and acceptable condition.

3.5 SCHEDULE

- A. Refer to Room Finish Schedule for a listing of rooms requiring work of this section.

END OF SECTION 09720

**NEW PASSENGER TERMINAL
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DULUTH, MN**

**SECTION 09770 – SPECIAL
WALL SURFACING**

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Fiberglass reinforced plastic wall panels.

1.2 SUBMITTALS

- A. Shop Drawings: Required.
- B. Product Data: Required.
- C. Samples: Required.
- D. Test Reports: Required.
- E. Manufacturer's Installation Instructions: Required.

1.3 SUSTAINABLE DESIGN SUBMITTALS

- A. Manufacturer's Certificate: Required.
 - 1. Recycled material content for recycled content products.
 - 2. Source for local and regional materials and distance from Project site.
 - 3. Volatile organic compound content for each interior adhesive and sealant and related primer.
 - 4. Volatile organic compound content for each interior paint and coating.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: Required.

1.5 MOCKUP

- A. Construct mockup including wall covering, and joint seaming technique.

PART 2 PRODUCTS

2.1 COMPONENTS

- A. Type: Fiberglass reinforced plastic wall panels.
- B. Location: As shown on drawings

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install wall panels in accordance with the manufacturer's instructions.

END OF SECTION

**NEW PASSENGER TERMINAL
DULUTH INTERNATIONAL AIRPORT
DULUTH, MINNESOTA**

SECTION 09900 - PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.

1.2 SUMMARY

- A. This section includes surface preparation, painting, and finishing of exposed interior and exterior items and surfaces.
 - 1. Surface preparation, and finish coats specified in this section are in addition to surface treatment specified under other sections. This contractor to clean and prep for finish coats; only finish coats included in
 - 2. "Paint" as used herein means all coating systems materials, including primers, emulsions, enamels, stains, sealers and fillers, and other applied materials whether used as prime, intermediate or finish coats.
- B. Paint exposed surfaces whether or not colors are designated in schedules, except where a surface or material is specifically indicated not to be painted or is to remain natural. Where an item or surface is not specifically mentioned, paint the same as similar adjacent materials or surfaces. If color or finish is not designated, the Architect will select from standard colors or finishes available.
 - 1. Painting includes field-painting exposed bare and concealed pipes and ducts (including color coding), hangers, exposed steel and iron work, and primed metal surfaces of mechanical and electrical equipment.
- C. Shop Priming: Unless otherwise specified, shop priming of ferrous metal items is included under various sections for structural steel, miscellaneous metals, hollow metal doors and frames and similar items.
- D. Painting is not required on prefinished items, finished metal surfaces, concealed surfaces, operating parts, and labels.
 - 1. Prefinished or factory-finished items not to be painted include (but are not limited to) acoustic materials, architectural woodwork and casework, elevator entrance doors and frames, finished mechanical and electrical equipment, light fixtures, switchgear, and distribution cabinets.
 - 2. Concealed surfaces not to be painted include wall or ceiling surfaces in generally inaccessible areas such as furred areas, elevator shafts and pipe spaces.
 - a. Finished metal surfaces of anodized aluminum, stainless steel, chromium plate, copper, bronze, and brass are not to be painted, unless otherwise indicated.

3. Operating parts not to be painted include moving parts of operating equipment, such as valve and damper operators, linkages, sensing devices, motor and fan shafts, and sprinkler heads.
4. Labels: Do not paint over Underwriters Laboratories, Factory Mutual or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

1.3 ACTION SUBMITTALS

- A. Product data for each paint system specified, including block fillers and primers.
 1. Provide the manufacturer's technical information including label analysis and instructions for handling, storage, and application of each material proposed for use.
 2. List each material and cross-reference the specific coating, finish system, and application. Identify each material by the manufacturer's catalog number and general classification.
 3. Certification by the manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs).
- B. LEED Submittals:
 1. Product Data for Credit EQ 4.2: For paints and coatings, including printed statement of VOC content.
- C. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.
 1. Submit Samples on rigid backing, 8 inches (200 mm) square.
 2. Step coats on Samples to show each coat required for system.
 3. Label each coat of each Sample.
 4. Label each Sample for location and application area.
- D. Manufacturer's Instructions: Submit manufacturer's instructions including technical data sheets, material safety data sheets, mixing instructions, application requirements, special procedures, and conditions requiring special attention.
- E. Product List: For each product indicated, include the following:
 1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
 2. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.
 3. VOC content.
- F. Mock-Ups: Prior to application of the exterior work, prepare a mock-up for the finish and application required to verify selection made under sample submittals and to demonstrate aesthetic effects as well as qualities of materials and execution. Prepare mock-up to comply with the following requirements, using materials indicated for final unit of work. Locate mock-ups on site in location as directed by the Architect. Demonstrate the proposed range of aesthetic effects

and workmanship to be expected in the completed work. Obtain the Architect's acceptance of mock-up before start of final unit of work.

1. Retain and maintain mock-up during construction in undisturbed condition as a standard for judging completed unit of work.

1.3 QUALITY ASSURANCE

- A. Applicator Qualifications: Engage an experienced applicator who has completed painting system applications similar in material and extent to those indicated for the Project that have resulted in a construction record of successful in-service performance.
- B. Single-Source Responsibility: Provide primers and undercoat paint produced by the same manufacturer as the finish coats.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to the job site in the manufacturer's original, unopened packages and containers bearing manufacturer's name and label, and the following information:
 1. Product name or title of material.
 2. Product description (generic classification or binder type).
 3. Manufacturer's stock number and date of manufacture.
 4. Contents by volume, for pigment and vehicle constituents.
 5. Thinning instructions.
 6. Application instructions.
 7. Color name and number.
- B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 degrees F. Maintain containers used in storage in a clean condition, free of foreign materials and residue.
 1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

1.5 JOB CONDITIONS

- A. Apply water-based paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 50 degrees F and 90 degrees F.
- B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 45 degrees F and 95 degrees F.
- C. Do not apply paint in snow, rain, fog, or mist; or when the relative humidity exceeds 85 percent; or at temperatures less than 5 degrees F above the dew point; or to damp or wet surfaces.

1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by the manufacturer during application and drying periods.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturer: Subject to compliance with requirements, provide products of the following:
 1. Benjamin Moore and Co.
 2. Edison Coatings, Inc.
 3. Glidden Professional division of Azko Nobel Paints, LLC.
 4. Keim Mineral Coatings of America, Inc.
 5. M.A.B. Paints.
 6. Pratt & Lambert.
 7. Sherwin-Williams Company.
 8. Silicote USA LLC.

2.2 PAINT MATERIALS, GENERAL

- A. Material Compatibility:
 1. Provide block fillers, primers, finish coat materials, and related materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by the manufacturer based on testing and field experience.
 2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- B. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction and, for interior paints and coatings applied at Project site, the following VOC limits, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 1. Flat Paints and Coatings: 50 g/L.
 2. Nonflat Paints and Coatings: 150 g/L.
 3. Dry-Fog Coatings: 400 g/L.
 4. Primers, Sealers, and Undercoaters: 200 g/L.
 5. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L.
 6. Zinc-Rich Industrial Maintenance Primers: 340 g/L.
 7. Pretreatment Wash Primers: 420 g/L.
 8. Floor Coatings: 100 g/L.
 9. Shellacs, Clear: 730 g/L.
 10. Shellacs, Pigmented: 550 g/L.
- C. Material Quality: Provide the manufacturer's best-quality trade sale paint material of the various coating types specified. Paint material containers not displaying manufacturer's product identification will not be acceptable.

1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish the manufacturer's material data and certificates of performance for proposed substitutions.
- D. Colors: Provide color selections made by the Architect from the manufacturer's full range of standard colors.
- E. No lead or mercury is permitted in any coating used on this project.

2.4 PRIMERS

- A. Primers: Provide the manufacturer's recommended factory-formulated coating material that is compatible with the other specified system components indicated in the painting schedules included at the end of this specification section.

2.3 UNDERCOAT MATERIALS

- A. Undercoat Materials: Provide the manufacturer's recommended factory-formulated coating material that is compatible with the other specified system components indicated in the painting schedules included at the end of this specification section.

2.4 FINISH PAINT MATERIAL

- A. Finish Paint: Provide the manufacturer's recommended factory-formulated coating material that is equivalent to the specified finish paint material indicated in the painting schedules included at the end of this specification section.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions under which painting will be performed for compliance with paint application requirements. Notify Owner and Architect in writing of conditions detrimental to proper and timely completion of the work. Surfaces receiving paint must be thoroughly dry before paint is applied.
 1. Do not begin to apply paint until unsatisfactory conditions have been corrected.
 2. Start of painting will be construed as the Applicator's acceptance of surfaces and conditions within a particular area.
- B. Coordination of Work: Review other sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
 1. Notify the Architect about anticipated problems using the materials specified over substrates primed by others.

3.2 PREPARATION

- A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted, or provide surface-applied protection prior to surface preparation and painting. Remove these items, if necessary, to completely paint the items and adjacent surfaces. Following completion of painting operations in each space or area, have items reinstalled by workers skilled in the trades involved.
- B. Cleaning: Before applying paint or other surface treatments, clean the substrates of substances that could impair the bond of the various coatings. Remove oil and grease prior to cleaning. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.
- C. Surface Preparation: Clean and prepare surfaces to be painted according to the manufacturer's instructions for each particular substrate condition and as specified.
 - 1. Provide barrier coats over incompatible primers or remove and reprime. Notify Architect in writing about anticipated problems using the specified finish-coat material with substrates primed by others.
 - 2. Cementitious Materials: Prepare concrete, concrete block and cement plaster surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen, as required, to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.
 - a. Use abrasive blast-cleaning methods if recommended by the paint manufacturer.
 - b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not paint surfaces where moisture content exceeds that permitted in manufacturer's printed directions.
 - c. Clean concrete floors to be painted with a 5 percent solution of muriatic acid or other etching cleaner. Flush the floor with clean water to remove acid, neutralize with ammonia, rinse, allow to dry, and vacuum before painting.
 - 3. Ferrous Metals: Clean ungalvanized ferrous metal surfaces that have not been shop-coated and previously painted metal surfaces; remove oil, grease, dirt, loose mill scale, rust and other foreign substances. Use solvent or mechanical cleaning methods that comply with recommendations of the Steel Structures Painting Council (SSPC).
 - a. Blast steel surfaces clean as recommended by the paint system manufacturer and according to requirements of SSPC specification SSPC-SP 10.
 - b. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
 - c. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by the paint manufacturer, and touch up with the same primer as the shop coat.

- d. On previously painted surfaces, remove existing paint and smooth edges sufficient to obtain a uniform surface upon repainting.
- 4. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so that the surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.
- D. Materials Preparation: Carefully mix and prepare paint materials according to manufacturer's directions.
 - 1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue. Store materials not in actual use in tightly covered containers.
 - 2. Stir material before application to produce a mixture of uniform density; stir as required during application. Do not stir surface film into material. Remove film and, if necessary, strain material before using.
 - 3. Use only thinners approved by the paint manufacturer and only within recommended limits.

3.3 APPLICATION

- A. General: Apply paint according to manufacturer's directions. Use applicators and techniques best suited for substrate and type of material being applied.
- B. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
 - 1. Paint colors, surface treatments, and finishes are to match or blend with existing adjacent surfaces.
 - 2. Provide finish coats that are compatible with primers used.
 - 3. The number of coats and the film thickness required are the same regardless of the application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer. Sand between applications where sanding is required to produce a smooth even surface according to the manufacturer's directions.
 - 4. Apply additional coats if undercoats, stains, or other conditions show through final coat of paint until paint film is of uniform finish, color, and appearance. Give special attention to ensure that surfaces, including edges, corners, crevices, welds, and exposed fasteners, receive a dry film thickness equivalent to that of flat surfaces.
 - 5. The term exposed surfaces includes areas visible when permanent or built-in fixtures, convector covers, covers for finned tube radiation, grilles, and similar components are in place. Extend coatings in these areas, as required, to maintain the system integrity and provide desired protection.
 - 6. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before the final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 - 7. Paint interior surfaces of ducts, where visible through registers or grilles, with a flat, nonspecular black paint.
 - 8. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.

9. Finish exterior doors on tops, bottoms, and side edges same as exterior faces.
 10. Sand lightly between each succeeding enamel or varnish coat.
 11. Omit primer on metal surfaces that have been shop-primed and touch-up painted, unless otherwise indicated.
- C. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
1. Allow sufficient time between successive coats to permit proper drying. Do not recoat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and where application of another coat of paint does not cause the undercoat to lift or lose adhesion.
- D. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to the manufacturer's directions.
1. Brushes: Use brushes best suited for the material applied.
 2. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by the manufacturer for the material and texture required.
 3. Spray Equipment: Use airless spray equipment with orifice size as recommended by the manufacturer for the material and texture required.
- E. Minimum Coating Thickness: Apply materials no thinner than the manufacturers recommended spreading rate. Provide the total dry film thickness of the entire system as recommended by the manufacturer.
- F. Mechanical and Electrical Work: Painting mechanical and electrical work is limited to items exposed in mechanical equipment rooms and in occupied spaces.
- G. Mechanical items to be painted include, but are not limited to, the following:
1. Piping, pipe hangers, and supports, including exposed, uninsulated piping.
 2. Heat exchangers.
 3. Tanks.
 4. Ductwork.
 5. Insulation.
 6. Supports.
 7. Motors and mechanical equipment.
 8. Accessory items.
- H. Electrical items to be painted include, but are not limited to, the following:
1. Conduit and fittings.
 2. Switchgear (if not factory finished).
- I. Prime Coats: Before applying finish coats, apply a prime coat of material, as recommended by the manufacturer, to material that is required to be painted or finished and that has not been prime-coated by others. Recoat primed and

sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.

- J. Pigmented (Opaque) Finishes: Completely cover to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.
- K. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with specified requirements.

3.4 CLEANING

- A. Cleanup: At the end of each work day, remove empty cans, rags, rubbish, and other discarded paint materials from the site.
 - 1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping. Be careful not to scratch or damage adjacent finished surfaces.

3.5 PROTECTION

- A. Protect work of other trades, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as acceptable to Architect.
- B. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.
 - 1. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 EXTERIOR PAINT SCHEDULE

- A. General: Provide the following paint systems for the various substrates indicated.
- B. Concrete: System based on the products of Keim Mineral Coatings of America, Inc.
 - 1. Concrete Cleaner: Silicic acid based cleaner diluted with water. Basis of Design: "KEIM Concrete Cleaner".
 - 2. Water Repellent: Solvent-free silane based water repellent with 100% active ingredients. Basis of Design: "KEIM Silan 100".
 - 3. Silicate Stain, Base Coat: Sol silicate based mineral stain with less than 1g/l VOC. ASTM E 96 Vapor Permeability – 77 perms, ASTM G 154 Accelerated Weathering – no fading, cracking, peeling, ASTM E 514 62-MPH Wind-Driven Rain Test – no water penetration. Basis of Design: "KEIM Concretal Lasur".
 - 4. Silicate Stain, Top Coat: Sol silicate based mineral stain with less than 1g/l VOC. ASTM E 96 Vapor Permeability – 77 perms, ASTM G 154

Accelerated Weathering – no fading, cracking, peeling, ASTM E 514 62-MPH Wind-Driven Rain Test – no water penetration. Basis of Design: “KEIM Concretal Lasur”.

5. Dilution for Silicate Stain: Sol silicate dilution designed for the sol silicate stain system. Less than 1g/l VOC. Basis of Design: “KEIM Concretal Dilution”

3.7 INTERIOR PAINT SCHEDULE

- A. General: Provide the following paint systems for the various substrates, as indicated.
- B. Gypsum Drywall Partitions: System based on the products of Glidden Professional Division of AzkoNobel Paints.
 1. Satin / Eggshell Acrylic Latex: Latex primer and two satin / eggshell latex based acrylic enamel finish coats.
 - a. Primer: 1030 ULTRA-HIDE PVA Interior Primer Sealer.
 - b. Finish: 1412 ULTRA-HIDE Acrylic Latex Eggshell Enamel.
 - c. Gloss Range: Satin / Eggshell finish shall have gloss range of 20-30 percent specular light reflection when tested in accordance with ASTM D523. Designation may be satin with some manufacturers.
 2. Epoxy Coating: Primer and two gloss epoxy polyamide finish coats.
 - a. Primer: 3210 ULTRA-HIDE Aquacrylic GRIPPER Stain Killer Primer Sealer.
 - b. Finish: 4508 TRU-GLAZE Epoxy Polyamide Gloss Epoxy.
- C. Concrete Masonry: System based on the products of Glidden Professional Division of Azko Nobel Paints.
 1. Satin / Eggshell Acrylic Latex: Acrylic latex filler coat and two satin / eggshell latex based acrylic enamel finish coats.
 - a. Filler: 3010 ULTRA-HIDE Acrylic Latex Block Filler.
 - b. Finish: 1412 ULTRA-HIDE Acrylic Latex Eggshell Enamel.
 2. Epoxy Coating: 100% acrylic block filler and two gloss epoxy polyamide finish coats.
 - a. Filler: 4000 BLOXFIL Heavy Duty Acrylic Block Filler.
 - b. Finish: 4508 TRU-GLAZE Epoxy Polyamide Gloss Epoxy.
- D. Concrete: System based on the products of Keim Mineral Coatings of America, Inc.
 1. Concrete Cleaner: Silicic acid based cleaner diluted with water. Basis of Design: “KEIM Concrete Cleaner”.
 2. Water Repellent: Solvent-free silane based water repellent with 100% active ingredients. Basis of Design: “KEIM Silan 100”.
 3. Silicate Stain, Base Coat: Sol silicate based mineral stain with less than 1g/l VOC. ASTM E 96 Vapor Permeability – 77 perms, ASTM G 154 Accelerated Weathering – no fading, cracking, peeling, ASTM E 514

62-MPH Wind-Driven Rain Test – no water penetration. Basis of Design: “KEIM Concretal Lasur”.

4. Silicate Stain, Top Coat: Sol silicate based mineral stain with less than 1g/l VOC. ASTM E 96 Vapor Permeability – 77 perms, ASTM G 154 Accelerated Weathering – no fading, cracking, peeling, ASTM E 514 62-MPH Wind-Driven Rain Test – no water penetration. Basis of Design: “KEIM Concretal Lasur”.
5. Dilution for Silicate Stain: Sol silicate dilution designed for the sol silicate stain system. Less than 1g/l VOC. Basis of Design: “KEIM Concretal Dilution”

E. Steel, Galvanized or Non-galvanized:

1. Primer coat - recommended by the finish coat manufacturer.
2. Second and third coats – semi-gloss latex paint, 100% acrylic, non-blocking, pencil hardness of H or harder per ASTM D 3363:
 - a. “Pitt-Tech 474 Series” (PPG)
 - b. “M29 DTM” (Moore)
 - c. “Pro Classic Waterborne B31 Series” (S-W)

F. Aluminum:

1. Primer coat - recommended by the finish coat manufacturer.
2. Second and third coats – flat latex paint, 100% acrylic, non-blocking, pencil hardness of H or harder per ASTM D 3363:
 - a. “Pitt-Tech 712 Series” (PPG)
 - b. “M29 DTM” (Moore)
 - c. “Pro Classic Waterborne B31 Series” (S-W)

END OF SECTION 09900

**NEW PASSENGER TERMINAL
DULUTH INTERNATIONAL AIRPORT
DULUTH, MINNESOTA**

**SECTION 09960 – HIGH-PERFORMANCE
COATINGS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes surface preparation and application of high-performance coating systems on the following substrates:
 - 1. Exterior Substrates:
 - a. Steel.
 - 2. Interior Substrates:
 - a. Steel.
- B. Related Requirements:
 - 1. Division 5 Sections for shop priming of metal substrates with primers specified in this Section.

1.3 DEFINITIONS

- A. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
- B. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- C. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
- D. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
- E. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
- F. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include preparation requirements and application instructions. Include certifications and test results necessary to show compliance with the Contract Documents.
- B. LEED Submittals:
 - 1. Product Data for Credit EQ 4.2: For interior coatings, documentation including printed statement of VOC content.
- C. Samples for Initial Selection: For each type of topcoat product indicated in the form of manufacturer's color charts.
- D. Samples for Verification: For each type of coating system and in each color and gloss of topcoat indicated.
 - 1. Submit (3) three Samples on representative samples of the actual substrate:
 - a. For steel, on 16 ga. Sheet metal, 4 inch x 12 inch.
 - 2. Step coats on Samples to show each coat required for system.
 - 3. Label each coat of each Sample.
 - 4. Label each Sample for location and application area.
- E. Product List: For each product indicated, include the following:
 - 1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
 - 2. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.
 - 3. VOC content.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Coatings: 5 percent, but not less than 1 gal. of each material and color applied.

1.6 QUALITY ASSURANCE

- A. Mockups: Apply mockups of each coating system indicated to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Architect will select one surface to represent surfaces and conditions for application of each coating system.
 - a. Wall Surfaces: Provide sample of at least 100 sq. ft.
 - b. Other Items: Architect will designate items or areas required.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- B. Applicator Qualifications: Installation of high performance coatings shall be performed only by a qualified Applicator. The term qualified means experienced in performing the Work required by this section. The Applicator shall have experience on Projects similar in size and scope to this Project. The Applicator shall submit evidence of such qualifications upon request.
 - C. Before starting the work, arrange a pre-construction meeting in accordance with General Conditions. Items for discussion shall include construction procedures and scheduling, surface readiness, application requirements, material storage, and protection.
 - D. Material compatibility: provide fillers, primers, finish coat materials, and related materials that are compatible with one another and the indicated substrates under conditions of service and application, as demonstrated by the manufacturer based on testing and field experience.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
 1. Maintain containers in clean condition, free of foreign materials and residue.
 2. Remove rags and waste from storage areas daily.

1.8 FIELD CONDITIONS

- A. Apply coatings only when temperature of surfaces to be coated and surrounding air temperatures are between 50 and 95 deg F unless otherwise allowed by the manufacturer's written guidelines for application.
- B. Do not apply coatings when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.
- C. Do not apply exterior coatings in snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

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1. Benjamin Moore & Co.
2. Columbia Paint & Coatings.
3. DuPont de Nemours & Co.
4. ICI Paints.
5. PPG Architectural Finishes, Inc.
6. Sherwin-Williams Company (The).
7. Tnemec Company, Inc.

- B. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, products listed in other Part 2 articles for the paint category indicated.

2.2 HIGH-PERFORMANCE COATINGS, GENERAL

- A. Material Compatibility:
1. Provide materials for use within each coating system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 2. For each coat in a coating system, provide products recommended in writing by manufacturers of topcoat for use in coating system and on substrate indicated.
 3. Provide products of same manufacturer for each coat in a coating system.
- B. VOC Content:
1. Products shall comply with VOC limits of authorities having jurisdiction.
 2. For interior coatings applied at project site, the following VOC limits, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - a. Nonflat Paints and Coatings: 150 g/L.
 - b. Primers, Sealers, and Undercoaters: 200 g/L.
 - c. Anti-Corrosive and Anti-Rust Paints Applied to Ferrous Metals: 250 g/L.
 - d. Zinc-Rich Primers: 340 g/L.
- C. Colors: As selected by Architect from manufacturer's full range.

2.3 METAL PRIMERS

- A. Primer, Zinc-Rich, Epoxy:
1. "Amercoat 68" (PPG Architectural Finishes, Inc.)
 2. "90/97 Tneme-Zinc" (Tnemec Company, Inc.)

2.4 EPOXY COATINGS

- A. Epoxy, High-Build, Low Gloss:
1. "Amercoat 385" (PPG Architectural Finishes, Inc.)
 2. "Series 66 High Build Epoxoline" (Tnemec Company, Inc.).

2.5 POLYURETHANE COATINGS

- A. Polyurethane, Two-Component, Pigmented, Gloss (Gloss Level 5):
 - 1. "Amercoat 450 S MIO" (PPG Architectural Finishes, Inc.).
 - 2. "Enduralume 1077" (Tnemec Company, Inc.)

2.6 SHOP FINISHING REQUIREMENTS:

- A. Shop paint exposed structural steel surfaces as indicated, except the following:
 - 1. Surfaces to receive stud shear connectors.
 - 2. Contact surfaces of welded or high strength bolted connections.
- B. Prepare exposed structural steel surfaces in accordance with SSPC SP1 and SSPC SP6.
- C. Apply high performance coatings in accordance with high performance coating manufacturer's written instructions.
- D. Surfaces within 2" of any field weld location shall be free of materials that would prevent proper welding or produce objectionable fumes while welding is being done.
 - 1. If shop painted, surfaces to be welded shall be wire brushed in the field before welding, to reduce paint film to a minimum.
 - 2. After welding all abrasions shall be touched up.
- E. Apply shop primer before rust bloom occurs (maximum 4 hours after blast cleaning).
- F. Shop prime and intermediate coat new architecturally exposed structural steel surfaces for a total dry film thickness of not less than 8.5 mils.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for conditions affecting performance of the Work.
- B. Proceed with coating application only after unsatisfactory conditions have been corrected.
 - 1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.

- B. Clean substrates of substances that could impair bond of coatings, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce coating systems indicated.
- C. Steel Substrates: Remove rust, loose mill scale, and incompatible shop primer if any. Clean using methods recommended in writing by paint manufacturer.
 - 1. SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
- D. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

3.3 APPLICATION

- A. Apply high-performance coatings according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."
 - 1. Use applicators and techniques suited for coating and substrate indicated.
 - 2. Items to receive HPC-1 shall receive a finish coat for a total dry film thickness of not less than 11.5 mils.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of the same material are to be applied. Tint undercoats to match color of finish coat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance.
- D. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Produce sharp glass lines and color breaks.

3.4 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner will engage the services of a qualified testing and inspecting agency to inspect and test coatings for dry film thickness.
 - 1. Contractor shall touch up and restore coated surfaces damaged by testing.
 - 2. If test results show that dry film thickness of applied coating does not comply with coating manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with coating manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from coating operation. Correct damage by cleaning, repairing, replacing, and recoating, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.

3.6 EXTERIOR HIGH-PERFORMANCE COATING SCHEDULE

- A. Steel Substrates-Exterior:
 - 1. Pigmented Polyurethane over Epoxy Zinc-Rich Primer and High-Build Epoxy System:
 - a. Prime Coat: Primer, zinc-rich, epoxy, (MPI #20 or equal) at minimum dry film thickness of 2.5 to 3.5 mils.
 - b. Intermediate Coat: Epoxy, high-build, low gloss, (MPI #108 or equal) at a minimum dry film thickness of 5.0 to 6.0 mils.
 - c. Topcoat: Polyurethane, two-component, pigmented, gloss (Gloss Level 5), at a minimum dry film thickness of 2.5 to 3.5 mils.

END OF SECTION 09960

**NEW PASSENGER TERMINAL
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**SECTION 10262 - WALL
PROTECTION**

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 WORK INCLUDED

- A. Furnish and install complete Wall Protection systems.
- B. Full height stainless steel corner guards.

1.3 REFERENCES

- A. Publications listed herein are part of this specification to the extent referenced. The criteria established in the specifications shall take precedence over the standards referenced herein. (Sample reference standards are given below.)
 - 1. American Society for Testing and Materials (ASTM):
 - a. ASTM B 221 Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes and Tubes
 - b. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials

1.4 SYSTEM DESCRIPTION

- A. Corner Guards shall be flush mounted. Flush-mounted corner guards shall be standard.
 - 1. P.V.C. covers shall be textured, high-impact snap on cover having a maximum nominal wall thickness of 0.078", and shall have an ASTM D-256 impact resistance of 27.9 ft/lbs. per inch-notch.
 - 2. P.V.C. covers shall have an ASTM E-84, U.L.-723 and NFPA 255 flame spread of less than 25, and shall be self-extinguishing in accordance with ASTM D-635.

1.5 QUALITY ASSURANCE

- A. Manufacturer: Furnish assemblies from one (1) manufacturer with a minimum of ten (10) years of experience in the fabrication of wall protection systems.

- B. Installer: Firm with not less than three (3) years of successful experience in the installation of systems similar to those required by this project and acceptable to the manufacturer of the system.

1.6 SUSTAINABLE DESIGN SUBMITTALS

- A. Section 01361 - Sustainable Design Requirements: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
 - 1. Materials Resources Certificates:
 - a. Certify recycled material content for recycled content products.
 - b. Certify source for local and regional materials and distance from Project site.
 - 2. Indoor Air Quality Certificates:
 - a. Certify volatile organic compound content for each interior adhesive and sealant and related primer.
- C. Product Cost Data: Submit cost of products to verify compliance with Project sustainable design requirements. Exclude cost of labor and equipment to install products.
 - 1. Provide cost data for the following products:
 - a. Products with recycled material content.
 - b. Local and regional products.

1.7 SUBMITTALS

- A. Submit manufacturer's specifications and technical data, including Material Safety Data Sheets, installation instructions, as required, and catalog cuts and templates where required to explain construction and to provide for incorporation into the project.
- B. Submit certificates, copies of specified independent test reports or research reports showing compliance with fire resistance rating, flame and smoke development requirements and other specified performance requirements.
- C. Submit shop drawings showing complete fabrication details for wall protection, including required anchorage to surrounding construction.
- D. Submit three (3) 6" samples of the specified system.

1.8 DELIVERY, STORAGE AND HANDLING

- A. Provide temporary protective cover on finished surfaces.

- B. Deliver joint covers to job site in new, clean, unopened crates of sufficient size and strength to protect materials during transit.
- C. Store components in original containers in a clean, dry location.

1.9 WARRANTY

- A. Submit manufacturer's warranty that materials furnished will perform as specified for a period of not less than one (1) year when installed in accordance with manufacturer's recommendations.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufactures: Subject to compliance with requirements, manufactures offering products that may be incorporated into the Work include, but are not limited to the following:
- B. Approved Manufacturers:
 - 1. Construction Specialties Inc
 - 2. InPro Corporation
 - 3. Arden Architectural Specialties
- C. Substitutions: Under provisions of Section 01631.
- D. Basis-of-Design Product: The design is based on the products named in the Material Schedule. Subject to compliance with requirements, provide either the named products or comparable products by one of the manufactures specified. Comparable products are subject to review and approval through the submittal process specified.

2.2 MATERIALS

- A. P.V.C. shall be rigid, high-impact type. P.V.C. sheet shall be flexible.
- B. Aluminum shall be ASTM B 221, alloy 6061-T6 for extrusions ASTM B 209, alloy 6061-T6 for plate.
- C. Galvanized sheet shall be ASTM A 525, G90 steel
- D. Paint Grip Steel shall be phosphatized, sheet.
- E. Stainless Steel shall be ASTM A 666, type 304.
- F. Fasteners, accessories and other materials required for complete installation to manufacturer's instructions.

2.3 FABRICATION

- A. Fabricate corner guards and wall protection materials as detailed. Provide anchors and accessories necessary for complete installation. Mounting Brackets and End Returns shall be injected molded.
- B. Shop assemble components and package with anchors and fittings.
- C. Provide components in single lengths where possible; minimize site splicing.
 - 1. Corner guards shall be provided in 4'0", standard lengths.
 - 2. Wall protection materials shall be provided cut to length.

2.4 FINISHES

- A. Stainless Steel: shall be provided with a satin finish.
- B. Phosphatized Steel (Paintloc): shall be ready to paint.
- C. P.V.C. shall be provided with an embossed Finish. Color shall be as selected from manufacturer's standard colors.
- D. Aluminum shall be clear anodized.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Install corner guards and wall protection in accordance with the governing regulations, the industry standards applicable to the work and the manufacturer's written installation instructions.
- B. Manufacturer shall provide location drawings identifying placement of materials, shall use a mark system for correlating materials to drawings.
- C. Work shall be aligned plumb, level, and, as required, flush with adjacent surfaces.
- D. Work shall be rigidly anchored to substrate.
 - 1. Fasteners for corner guard retainers shall be spaced as recommended by the manufacturer in the details and in the installation instructions and shall be installed using hardware suitable for the conditions, which shall be provided by the manufacturer.
 - 2. The P.V.C. corner guard covers shall be snapped into place.
 - 3. Retainers for P.V.C. handrails, and bumper and crash rails shall be installed using hardware suitable for the conditions, which shall be provided by the manufacturer.

4. Flush mount systems retainers shall fasten directly to the metal stud through the unexposed extruded aluminum retainer only. Fastening retainer through the outside flange and drywall shall not be acceptable.
5. The void between flush mount corner guards and the wall shall be filled with grout.
6. Installed fasteners for handrail mounting brackets and end returns shall be concealed.

3.2 ADJUSTING AND PROTECTION

- A. Inspect system components for proper fit.
- B. Adjust, repair or replace components not conforming to requirements. Repair or replacement of an individual unit shall be as approved by the Architect.
- C. Advise contractor of procedures required to protect installation from damage by work of other Sections.
- D. Finished units shall be without damage. Units damaged during shipping or construction shall be repaired by the contractor at the expense of the party damaging the material, in accordance with the contract requirements.

3.3 SCHEDULE

- A. Refer to Drawings for locations.

END OF DOCUMENT 10262

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SECTION 10350 – FLAGPOLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Flagpoles.
- B. Related Sections:
 - 1. Division 2 Section 02930, "Plants".

1.3 DEFINITIONS

- A. Finish Grade: Elevation of finished surface.

1.4 ACTION SUBMITTALS

- A. Product Data: For each product indicated. Provide manufacturers literature.
- B. Shop Drawings: Indicate Custom fabricated items and their installation details.
- C. Samples: Submit two, illustrating color and type of material.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to project site in manufacturer's original packaging with labels intact and seals unbroken.

PART 2 - PRODUCTS

2.1 FLAGPOLE

- A. Flagpole – 30'.
 - 1. Manufacturer: Eder Flag, Model ECA30 IH, Earl Anderson Company.
 - 2. Finish: Aluminum ALLOY 6063T6T6.
 - 3. Provide concrete footing. See detail.
- B. Flagpole – 35'.
 - 1. Manufacturer: Eder Flag, Model ECA35 IH, Earl Anderson Company.
 - 2. Finish: Aluminum ALLOY 6063T6T6.
 - 3. Provide concrete footing. See detail.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Install footing clear of any debris.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with landscape plans.

3.8 CLEANING AND PROTECTION

- A. Clean completely of dirt and grease.
- B. Protect from other construction operations as needed.

END OF SECTION 10350

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**SECTION 10435 – EXTERIOR
SIGNAGE**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

1. Exterior Wayfinding Roadway Signs.
2. Roadway Sign Support Structures and Foundations.
3. Electrical work and lighting for illuminated signs.
4. Regulatory Signage.

- B. Related Requirements:

1. Section 01500 "Temporary Facilities and Controls" for temporary Project identification signs and for temporary information and directional signs.
2. Section 02220 "Building Earthwork"
3. Section 03200 "Concrete Reinforcement"
4. Section 03300 "Cast-in-Place Concrete"
5. Section 05120 "Structural Steel"
6. Section 10430 "Panel Signage" for terminal building signs.
7. Division 16 - Electrical

- C. The Drawings show design intent are not intended to cover every detail of materials, parts, construction, mounting or installation. Furnish all required engineering, materials, parts, construction, mounting, and installation necessary to complete the entire work, whether or not said details are shown or specified, at no additional cost to the Project.

- D. These contract documents are for design intent compliance and should only be used as a guide to produce the finished size, appearance, and function shown. Nothing contained in these contract documents shall be construed as a design for any engineered element.

- E. The Manufacturer shall provide all required structural and electrical engineering drawings. Drawings shall be stamped and signed by the respective structural and electrical engineers currently registered in the State of Minnesota.

- F. All applicable national, state and local codes, ordinances and safety standards shall take precedence over these contract documents and it shall be the

responsibility of the Manufacturer or his Subcontractor(s) to make certain that these codes, ordinances and safety standards are in compliance.

1.3 DEFINITIONS

- A. Accessible: In accordance with the accessibility standard.

1.4 REFERENCES

- A. U.S. Access Board's "Americans with Disabilities Act and Architectural Barriers Act Accessibility Guidelines", 2004 Edition.
- B. Federal Aviation Administration Advisory Circular 150/5360-12E "Airport Signing and Graphics".
- C. AASHTO (American Association of State Highway and Transportation Officials) "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, 5th Edition", with 2010 and 2011 Interim Revisions.
- D. Minnesota Department of Transportation's "2011 Standard Signs Summary"
- E. Minnesota Department of Transportation's "Minnesota Manual on Uniform Traffic Control Devices", 2011 Edition.
- F. U.S. Department of Transportation's "Manual on Uniform Traffic Control Devices", 2009 Edition.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings:
 - 1. Include fabrication and installation details.
 - 2. Show sign mounting heights and accessories.
 - 3. Provide location plans for all signs.
 - 4. Show message list, typestyles, graphic elements, and scaled graphic layouts for each sign at least one-eighth full size.
- C. Samples:
 - 1. Materials:
 - a. Aluminum sheet, with specified finishes, 12" x 12".
 - b. Sign face color samples on specified material, 4" x 4".
 - c. Paint sample for finish of sign structures, 4" x 4"..
 - d. Stone facing, three (3) samples with specified finish, 8" x 8".
 - 2. Wayfinding Signs:
 - a. One (1) full-size field sample of Sign Type E.2. When approved, sign may be installed.

- b. One (1) full-size field sample of Sign Type E.5. When approved, sign may be installed.
- 3. Regulatory Signs: One (1) full-size field sample of each of the following sign types:
 - a. R1-1
 - b. R3-2
 - c. R5-1A
 - d. R7-C
 - e. R7-108
 - f. R7-201
 - g. R8-3
- 4. Stone Veneer: Three (3) samples, 2 inches thick, 8 inches square in size, indicating complete range of color and texture.
- D. Stone Veneer Mockup: Build mockup to demonstrate aesthetic effects and to set quality standards for materials and execution.
 - 1. Build mockups approximately **72 inches** long by **48 inches** high by full thickness, including face and backup wythes and accessories.
- E. Sign Schedule: Use same designations specified or indicated on Drawings or in a sign schedule.
- F. Delegated-Design Submittal:
 - 1. Include complete structural drawings and supporting calculations signed and sealed by a qualified structural engineer licensed in the State of Minnesota.
 - 2. Include complete electrical drawings for roadway sign lighting signed and sealed by a qualified professional engineer licensed in the State of Minnesota.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: Manufacturer and Installer.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For signs to include in maintenance manuals.

1.8 COORDINATION

- A. Coordinate sign installations with shop drawings and Manufacturer's data for other construction components that may affect or may be affected by the work.

1.9 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Minimum 5 years experience performing the Work required by this section on successful in-service Projects similar in size and scope to this Project.
- B. Installer Qualifications: Manufacturer of products or an entity that employs installers and supervisors who are trained and approved by manufacturer.
- C. Sole Suppliers: Sign products of similar types shall be supplied by one manufacturer.

1.10 DELIVERY, STORAGE AND HANDLING.

- A. Signs and materials shall be delivered to the Project tagged or labeled bearing Manufacturer's name with material or sign identification number and installation location as shown on the Drawings. Signs and materials shall be stored in strict accordance with the Manufacturer's written directions.
 - 1. Finished surfaces shall be adequately protected during all phases of the Work to prevent damage by scratches, stains, discoloration, or other causes. Damage to any surface during fabrication, handling, shipment, storage, and erection shall be remedied by the Contractor at his own expense.

1.11 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Deterioration of finishes beyond normal weathering.
 - b. Deterioration of embedded graphic image.
 - c. Separation or delamination of sheet materials and components.
 - 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer licensed in the State of Minnesota to design sign structures and anchorage for sign types E.1, E.2 and E.3.
- B. Loads: Signs shall withstand loads across the total sign area equivalent to 100 miles per hour in any direction:

- C. Thermal Movements: For exterior signs, allow for thermal movements from ambient and surface temperature changes.
 - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
- D. Accessibility Standard: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's "ADA-ABA Accessibility Guidelines for Buildings and Facilities" for signs.
- E. Color, finish, material and process shall match for all work.

2.2 SIGNS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Cummings Signs.
 - 2. Lakehead Sign Co.
 - 3. National Signs.
 - 4. Nordquist Sign Company, Inc.
 - 5. Poblocki Sign Company, LLC.
 - 6. Sign Source
 - 7. Summit Signs.
 - 8. Todd Signs.
 - 9. Western Remac Inc.
 - 10. White Way Signs.
- B. Wayfinding Signs: Provide smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:
 - 1. Solid-Sheet Sign and Back: Aluminum sheet with finish specified in "Surface Finish" Subparagraph below and as indicated.
 - 2. Graphics: Characters and symbols die cut from 3- to 3.5-mil thick, weather-resistant reflective pressure-sensitive vinyl film with release liner on the back and carrier film on the front for on-site alignment and application. Manufacturer to produce all pressure-sensitive vinyl graphics on digitally controlled cutting equipment
 - 3. Sign-Panel Perimeter: Finish edges smooth.
 - a. Edge Condition: Square cut.
 - b. Corner Condition in Elevation: Rounded.
 - 4. Surface Finish:
 - a. Baked-Enamel or Powder-Coat Finish protected by a clear coat in colors matching Architect's samples.
 - 5. Flatness Tolerance: Sign panel shall remain flat under installed conditions as indicated and within a tolerance of plus or minus 1/4 inch measured diagonally from corner to corner.

- C. Regulatory Signs: Provide smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:
1. Solid-Sheet Sign and Back: Aluminum sheet, 0.080 inch minimum thickness.
 2. Sign-Panel Perimeter: Finish edges smooth.
 - a. Edge Condition: Square cut.
 - b. Corner Condition in Elevation: Rounded.
 3. Flatness Tolerance: Sign panel shall remain flat under installed conditions as indicated and within a tolerance of plus or minus 1/4 inch measured diagonally from corner to corner.
 4. Unless otherwise indicated, provide in accordance with U.S. Department of Transportation's "Manual on Uniform Traffic Control Devices", 2009 Edition, and Minnesota Department of Transportation's "Minnesota Manual on Uniform Traffic Control Devices", 2011 Edition.

2.3 WAYFINDING SIGN AND SIGN SUPPORT MATERIALS

- A. Structural Steel Hollow Structural Sections: ASTM A 500, Grade B.
- B. Aluminum Sheet and Plate: ASTM B 209 alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
- C. Aluminum Extrusions: ASTM B 221 alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
- D. Aluminum Pipe: ASTM B 429 alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
- E. Vinyl Film: UV-resistant vinyl film of nominal thickness indicated, with pressure-sensitive, permanent adhesive on back; die cut to form characters or images as indicated and suitable for exterior applications.
- F. Paints and Coatings for Sheet Materials: Inks, dyes, and paints that are recommended by manufacturer for optimum adherence to surface and are UV and water resistant for colors and exposure indicated.
- G. Stone Veneer: Natural or Cast Sandstone
 1. Color and Texture: Provide units with fine texture and red-brown color resembling Lake Superior Sandstone on local buildings as identified by Architect.
 2. Cast Stone Manufacturers: Subject to compliance with requirements, provide products produced by a Producer Member of the Cast Stone Institute, manufactured in accordance with the Cast Stone Institute Technical Manual standards.
 3. Source Limitations: Obtain stone, if natural, from single quarry or, if cast, a single manufacturer. Obtain mortar ingredients of uniform quality for

each cementitious component from single manufacturer and each aggregate from single source or producer.

4. Veneer Anchors: Stainless Steel Wire, ASTM A 580, Type 316.

2.4 REGULATORY SIGN SUPPORT MATERIALS

- A. Posts: Galvanized Steel Pipe, ASTM A 53/A 53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.
- B. Bases: For installation on pavement: Cast iron, either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/1 47M

2.5 ACCESSORIES

- A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signage, noncorrosive and compatible with each material joined, and complying with the following:
 1. Furnish nonferrous-metal or stainless-steel devices unless otherwise indicated.
 2. Exposed Metal-Fastener Components, General:
 - a. Fabricated from same basic metal and finish of fastened metal unless otherwise indicated.
 - b. Fastener Heads: For nonstructural connections, use flathead screws and bolts with tamper-resistant Allen-head slots unless otherwise indicated.
- B. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.6 FABRICATION

- A. General: Provide sign assemblies according to requirements indicated.
 1. Preassemble signs and assemblies in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
 2. Form assemblies and joints exposed to weather to resist water penetration and retention.
 3. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.
 4. Provide rebates, lugs, and brackets necessary to assemble components. Drill and tap for required fasteners.
- B. Vinyl: Align vinyl film in final position and apply to surface. Firmly press film from the middle outward to obtain good bond without blisters or fishmouths.

- C. Brackets: Fabricate brackets, fittings, and hardware for bracket-mounted signs to suit sign construction and mounting conditions indicated.

2.7 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Directional Finishes: Run grain with long dimension of each piece and perpendicular to long dimension of finished trim or border surface unless otherwise indicated.
- D. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying contrasting polished finishes on raised features unless otherwise indicated.

2.8 ALUMINUM FINISHES

- A. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements and other conditions affecting performance of signage work.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
- B. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
- C. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

3.3 ADJUSTING AND CLEANING

- A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.
- B. Remove temporary protective coverings and strippable films as signs are installed.
- C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 10435

**NEW PASSENGER TERMINAL
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**SECTION 10530 - WALKWAY
COVERS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Pre-engineered, pre-finished metal walkway covers.
 - 2. Fabric walkway covers.
 - 3. Understructure.
- B. Related Requirements:
 - 1. Section 16060 "Pipe and Tube Railings" for connection and support of walkway cover understructure.

1.3 REFERENCES

- A. Aluminum Design Manual 2000, Specifications & Guidelines for Aluminum Structures.
- B. ASCE 7, Minimum Design Loads for Buildings and Other Structures.
- C. American Architectural Manufacturers Association (AAMA).
- D. American Society for Testing and Materials (ASTM).

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product, provide manufacturer's catalog data, detail sheets, and specifications.
- B. Shop Drawings: Include layout of walkway cover system and relationship to adjoining Work based on field-verified dimensions.
 - 1. Details and sections with descriptive notes indicating materials, finishes, fasteners, typical and special edge conditions, accessories, and understructures.

2. Layout and erection drawings showing roof framing, deck panels, cross sections, and trim details, clearly indicating proper assembly.
- C. Samples for Initial Selection: For each type of product and exposed finish.
- D. Samples for Verification: For the following products:
1. Deck: 12" x 12".
 2. Understructure members, each type: 12 inches in length.
 3. Fabric: 12" x 12.
- E. Structural Design Calculations: Prepare complete structural design calculations for canopy members. Provide reactions as required for supporting railing design by a registered professional engineer.
1. Submit written certification verifying that framing design will safely resist wind uplift as computed by ANSI A58.1, IV=150, Exposure C, as well as meet indicated loading requirements of the local Building Codes and wind loading requirements of ANSI/ASCE 7-98, live and dead loads and other load requirements.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Manufacturer's installation instructions.
- C. Manufacturer's recommended care and maintenance procedures.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Minimum five years experience in producing covers/canopies with welded bents and of the type specified.
- B. Installer Qualifications: An entity with a minimum two years experience in erecting covers/canopies of the type specified that employs installers and supervisors who are trained and approved by manufacturer.
- C. Field Measurements: Take field measurements prior to fabrication to insure proper fitting of work.
- D. Shop Assembly: Preassemble units in shop to greatest extent possible and disassemble as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- E. Coordination: Coordinate work of this section with work of other sections which interface with covered walkway system

1.7 PERFORMANCE REQUIREMENTS

- A. System Performance: Provide aluminum covered walkway system has been designed, produced, fabricated and installed to withstand normal temperature changes as well as live loading, dead loading and wind loading in compliance with Standard Building Code requirements for geographic area in which work is located and as follows:
1. Live Load: 30 p.s.f. minimum.
 2. Structural design for wind forces: Comply with ASCE 7.
 3. Design Wind Velocity: 110 m.p.h.
 4. Importance Factor: 1.1.
 5. Stability Criteria: Pursuant to Code.

1.8 WARRANTY

- A. Manufacturer shall warrant the entire system against defects in labor and materials for a period of five (5) years commencing on the date of Substantial Completion. Defects in labor and material may include but is not limited to, one or more of the following:
1. Moisture leaks.
 2. Metal failure including excessive deflection.
 3. Fastener failure.
 4. Finish failure.

PART 2 - PRODUCTS

2.1 METAL WALKWAY COVERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Austin Mohawk and Company, Utica, NY.
 2. AVAdek/Air-Vent, Houston, TX
 3. Dittmer Architectural Aluminum, Winter Springs, FL
 4. Eide Industries, Inc., Cerritos, CA
 5. Mapes Canopies, LLC, Lincoln, NE
 6. Perfection Architectural Systems, Inc., Orlando, FL.
 7. Tennessee Valley Metals, Inc., Birmingham, AL
 8. TFC Canopy Div. of Centurion Industries, Garrett, IN
- B. Materials:
1. Aluminum Extrusions: 6063 alloy, T-6 temper.
 2. Posts and beams: Manufacturer standard aluminum tubular extrusions as required by structural engineering design.
 - a. Clear Anodized: AA-M-10C-22A-21, Architectural Class II, comply with AAMA 607.1.

3. Deck: Extruded aluminum, self-flashing, interlocking sections.
 - a. Size and Profile: As required by structural engineering design.
 - b. Finish: Fluoropolymer Coating: 70 percent PVDF resin based fluoropolymer, AA-C-12C-42R-1, custom color as selected by architect, comply with AAMA 605.2.
 4. Fascia: Manufacturer's standard extruded aluminum fascia sections as required to complete the installation resulting in a neat finished appearance.
 - a. Include manufacturer's standard extruded aluminum gutters.
 - b. Finish: Fluoropolymer Coating: 70 percent PVDF resin based fluoropolymer, AA-C-12C-42R-1, custom color as selected by architect, comply with AAMA 605.2.
 5. Flashing: Aluminum sheet, thickness as recommended by manufacturer for specific condition.
- C. Accessories:
1. Fasteners:
 - a. Screws and bolts: Type 18-8 stainless steel, type recommended by manufacturer for specific condition.
 - b. Trim Rivets: Aluminum, size recommended by manufacturer for specific condition
- D. Fabrication:
1. Shop Assembly: Fabricate cross beams and columns for field assembled bolted connections.
- E. Source Limitations: Obtain walkway cover system from single source from single manufacturer.

2.2 FABRIC WALKWAY COVERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Acme Awning Company, Minneapolis, MN
 2. Advanced Design, Cloquet, MN
 3. Anchor Industries, Inc., Evansville, IN
 4. Canvas Craft, Rogers, MN
 5. Eide Industries, Inc., Cerritos, CA
 6. G & J Awning and Canvas, Sauk Rapids, MN
- B. Materials:
1. Aluminum Extrusions: 6063 alloy, T-6 temper.
 2. Posts and beams: Aluminum tubular extrusion as required by structural engineering design.

- a. Clear Anodized: AA-M-10C-22A-31, Architectural Class II, comply with AAMA 607.1.
 - 3. Fabric: 100% Acrylic "Sunbrella" fabric, as manufactured and recommended for its intended use by Glen Raven, Inc., Glen Raven, NC, or equal.
 - a. Color and Pattern: As selected by Architect from manufacturer's standard colors and patterns.
- C. Accessories:
 - 1. Fasteners:
 - a. Screws: Type 18-8 stainless steel, type recommended by manufacturer for specific condition.
 - b. Trim Rivets: Aluminum, size recommended by manufacturer for specific condition
- D. Fabrication:
 - 1. Shop Assembly: Fabricate cross beams and columns for field assembled bolted connections.
- E. Source Limitations: Obtain walkway cover system from single source from single manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine building components to which canopy will connect, with Installer and manufacturer's representative present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Commencement of work by installer is acceptance of existing conditions.

3.2 INSTALLATION

- A. Install walkway cover system and accessories under supervision of walkway cover manufacturer's authorized representative to produce a rigid, firm installation that complies with performance requirements.
- B. Erect protective covers in accordance with manufacturer's installation instructions.
- C. Set posts and beams plumb, straight, and true to line.

- D. Keep aluminum surfaces from direct contact with ferrous metal or other incompatible materials by applying one coat of clear acrylic coating
 - 1. In lieu of aluminum paint, one coat of high-build bituminous paint applied to 1/16 inch thickness may be used.

3.3 CLEANING

- A. Clean surfaces soiled by work as recommended by manufacturer.
- B. Remove surplus materials and debris from the site.

3.4 PROTECTION

- A. Protect finished aluminum surfaces from damage due to subsequent construction operations.

END OF SECTION 10530

**NEW PASSENGER TERMINAL
DULUTH INTERNATIONAL AIRPORT
DULUTH, MINNESOTA**

**SECTION 11400 – FOODSERVICE
EQUIPMENT**

PART 1 GENERAL

RELATED DOCUMENTS: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

- 1.01 WORK INCLUDED: Provide labor, equipment, appliances and materials, and perform all operations in connection with the execution of the Work as stated and as represented in the drawings and specifications including that which is reasonably inferred; install and coordinate all equipment in Section 11400.
- A. Equipment: Fabricate, deliver, unload, uncrate, assemble, set in place and level ready for final connection by mechanical and electrical trades.
 - B. Coordination: Coordinate mechanical and electrical rough in services, manufactured equipment and fabricated equipment construction, equipment bases, curbs, ceiling heights, depressed areas, sleeves, wall openings, refrigeration lines, service access, existing building conditions that affect equipment, and all other building conditions required to accommodate the Section 11400 equipment including new, existing, Owner furnished and future equipment with other trades; cut holes in equipment to accommodate pipes, drains, electrical conduit and outlets as required.
 - C. Schedule: Perform work in a timely manner consistent with the construction schedule, submit written notice of any manufacturer or construction related problems that are causing a delay in the equipment delivery or installation; substitutions for failure to order equipment in a timely manner are not acceptable.
 - D. Permits, Licenses and Inspections: Secure and pay for tests, permits and inspections required by authorized regulatory agencies and directly related to the construction and installation of the Section 11400 foodservice equipment work.
 - E. Document Inconsistencies: When drawings and specifications contain conflicting requirements, request written clarification; provide the better quality or greater quantity of work or material; costs incurred by failure to clarify conflicting requirements are the equipment contractor's responsibility.
 - F. Model Number Changes and Manufacturer Sales or Bankruptcies: When equipment specified is no longer available, the Owner reserves the right to accept the manufacturer's replacement or equipment from a manufacturer specified as equal; the Owner reserves the right to reject equipment when a specified manufacturer is sold, when sale is pending, when filing for Chapter 7 or 11 status, and receive equipment from a specified equal manufacturer.
 - G. FSEC Qualifications: Must be able to provide references for two projects of similar size and complexity within the past five years. These must be consultant specified projects successfully completed to the Owner's satisfaction.

1.02 RELATED WORK SPECIFIED IN MECHANICAL AND ELECTRICAL SECTIONS:

- A. Services and Connections: Extending utility lines from rough in locations to connection points on the equipment and final connections, including indirect wastes to floor drains and installation of faucets and backflow prevention devices, unless otherwise specified.
- B. Interconnections: Between equipment and remote components.
- C. Disconnection: Existing equipment that is relocated or removed.

1.03 DEFINITIONS

- A. Equal: Must be comparable in critical dimensions, capacity, features, utilities and operation; if equal is submitted, pay all costs required to modify work of any trade affected to accommodate equal.
- B. Exposed: All visible surfaces — includes surfaces behind cabinet doors when the doors are open.
- C. Foodservice Equipment Contractor (FSEC): Person or organization identified as such in the Agreement as providing the Section 11400 equipment
- D. Fabricated Equipment: Equipment that is not a standard catalog item and must be constructed by a singular authorized fabricator from Article 2.01, Paragraph B at their shop or on the job site to conform to the Contract Documents.
- E. Manufactured Equipment: Equipment offered as a catalog item but which is built to size for each project and generally requires a shop drawing
- F. Buy-out Equipment: Equipment offered as a catalog item by a manufacturer, including items requiring minor modifications.

1.04 REGULATORY REQUIREMENTS

- A. Laws and Ordinances: Comply with laws, ordinances, rules, codes and regulations relating to the performance of the Work; rulings and interpretations of the enforcing agencies are considered a part of the regulations; no extra charge will be paid for furnishing items required by the enforcing agency.
- B. Minimum Standards: Notify the Owner's Representative prior to equipment purchase and/or installation of any item that does not comply with the applicable regulations, including but not limited to the following:
 1. National Sanitation Foundation (NSF): Equipment and installation; affix the NSF label to each equipment item
 2. Underwriters Laboratory (UL): Electrical equipment and/or components
 3. American Gas Association (AGA): Gas fired equipment and installation
 4. American Institute of Electrical and Electronics Engineers: Electrical wiring and devices included with the equipment
 5. American Society of Heating, Refrigeration and Air Conditioning Engineers, Inc. (ASHRAE): Refrigeration systems
 6. American Society of Mechanical Engineers (ASME): Boilers

7. National Electrical Code (NEC): Electrical wiring and devices included with the equipment
8. National Fire Protection Association (NFPA): Exhaust hood and fire protection systems
9. American Society of Tested Materials (ASTM): Metals
10. American National Standards Institute (ANSI): Materials
11. Occupational Safety and Health Agency (OSHA): Equipment and installation
12. Sheet Metal and Air Conditioning Contractors National Association (SMACNA): Equipment and installation where required
13. American Disabilities Act (ADA): Equipment and installation where required
14. Uniform Building Code (UBC), Basic Building Code (BOCA), and Standard Building Code (SBCC): Equipment and installation where required
15. Intertek Testing Services (ETL)
16. Safe Drinking Water Act: Lead-free plumbing fittings, faucets and fixtures or more stringent state/local codes where applicable
17. US Energy Independence Act 2007: Walk-in Refrigerator and Freezers and Refrigeration Systems

1.05 SUBMITTALS

- A. General: Manufacturer or fabricator changes are not acceptable after submittal review and acceptance without written authorization from Owner's Representative.
- B. Schedule: Submit within thirty (30) days from award of Contract; identify key dates and tasks that must be completed by others in order to meet the equipment installation schedule.
- C. Review: Stamp and sign each submittal indicating it has been checked for conformance to the specifications, field dimensions, compatibility with other equipment, and coordination with other trades and services.
- D. Revisions: Incorporate corrections noted by the Owner's Representative and resubmit new sets for review; repeat until corrections are incorporated.
- E. Routing: Submit one (1) complete package, copies as listed below, to the designated Owner's Representative; after final review, furnish revised copies as required up to 10 sets.
- F. Drawings
 1. General
 - a. Match the contract drawings sheet size
 - b. Submit in roll form, not folded
 - c. Leave a 3" x 8" space for review stamps
 - d. Submit one (1) set of black and white prints
 - e. Lettering not less than 1/8" high
 2. Floor Plan and Schedule
 - a. Scale: 1/4" = 1' 0"
 - b. Number equipment and include a schedule on the same sheet
 - c. Use Architect's dimensioned plans to prepare plan drawing; verify field dimensions
 3. Rough in Plan

- a. General: Provide a utility symbol legend; list the utility requirements, along with the equipment item number on a line extending from the symbol; show exact rough in locations and heights; stub out of walls wherever possible; make allowances for valves, fittings and other required components specified under Mechanical and Electrical Sections; if utilities are already installed, field measure locations and indicate on plan, noting any objection to installed location.
- b. Scale: $\frac{1}{4}" = 1' 0"$
- c. Equipment Included: Show requirements for specified, Owner furnished, existing and future equipment; include equipment layout on drawing
- d. Format: Provide separate drawings for mechanical and electrical rough-in plans and schedules.
- e. Dimensioning: Dimension utility rough ins installed under floor from either existing walls, exterior walls or from column line centers; dimension other rough ins from new walls
- f. Code Compliance: See Article 1.04
- g. Coordination: Refer to the architectural, electrical and mechanical engineering drawings for this submission; verify that the correct utility services are available for equipment ordered; verify existing building conditions; coordinate any changes required to accommodate equipment provided
- h. Interconnections: Include connection diagrams for equipment where one or more items are interconnected by Mechanical and Electrical Trades
- i. Sleeves and Conduits: Include requirements for beverage lines, refrigeration lines and any other equipment interconnections
4. Special Conditions (building details): Show finished dimensions of bases, depressions, curbs, special height walls and wall openings for equipment; $\frac{1}{4}" = 1' 0"$ scale; coordinate with other trades; include equipment layout on drawing
5. Equipment Shop Drawings
 - a. Scale: Detail fabricated and manufactured equipment in plan, elevation and end view at $\frac{3}{4}" = 1' 0"$ or larger; show sections at $1 \frac{1}{2}" = 1' 0"$ or larger
 - b. Detail: Show fabricated equipment dimensions and materials, manufacturer and type of hardware, and other pertinent data as specified and as required for construction; where fabricated equipment adjoins other equipment, indicate partial plans and elevations to illustrate the junction condition; show quartz surfacing dimensions, locations, dimensions of cutouts, and countertop seam locations, required locations of support and blocking members, edge profiles, and installation details and methods; identify colors and finishes
 - c. Organization: Indicate equipment by item number and arrange on sheets in numerical sequence
 - d. Built-in and Counter-mounted Equipment: Show on fabricated equipment elevation and section drawings; dot in countertop equipment on plans; detail built-in/drop-in equipment supports and relationship to quartz top
 - e. Field Dimensions: Equipment dimensions are subject to adjustments required by field dimensions and understructure components; take measurements and coordinate with finished building conditions; circle any dimensional changes on initial and subsequent submissions
 - f. Hood Fire Protection System: Submit complete detailed shop drawings including system description, configuration and system component locations; after review by design team, incorporate comments and submit

to fire authorities having jurisdiction for system approval prior to fabrication

- g. Walk-ins: Show ceiling panel lay-outs and all control and switch locations

G. Written Materials

1. Itemized Bid: If not required during bid submittal, provide itemized bid within 10 days of bid award date; include freight and installation within each item.
2. General: Submit two (2) bound copies for review; if submitted electronically, they are to follow the same format as the hard copy.
3. Equipment Brochure
 - a. Equipment List: Include item number, quantity and manufacturer
 - b. Cover Sheet: Submit a typewritten sheet — copies of project specification are not acceptable — for each item with item number and equipment description to include: model number, quantity, optional features, special construction, installation and utility service requirements for manufacturer provided; include Owner furnished, existing and future equipment
 - c. Manufacturer's Catalog Sheet: Circle relevant utility requirements, dimensions and accessories for each item; do not include advertising or sales sheets; mark item number and quantity required; mark out equipment not being supplied
 - d. Organization: Arrange sheets in numerical sequence; tab every 25th item
4. Operation and Maintenance Manual – submit prior to equipment demonstrations
 - a. Service Agents: List manufacturers alphabetically with tabs; list equipment type; identify local service agent; list the name, address and telephone number authorized to service the equipment; list FSEC when there is no other service agent
 - b. Parts Catalog, Operating and Maintenance Instructions: Include manufacturer's original instructions for buy-out and manufactured equipment; organize alphabetically by manufacturer
 - c. Certificate of Warranty: Provide for each piece of refrigeration equipment per Article 1.07 C & D

1.06 SUBSTITUTIONS

- A. Procedure: Submit a written request to the Owner's Representative for approval not less than ten (10) days prior to the bid date; include a description of the proposed substitute, drawings, equipment cutsheets, performance test data and any other data or information necessary for complete evaluation; list separately construction and performance features that do not meet or exceed the specified item.
- B. Approval: Approval or rejection of a proposed substitution is vested in the Owner's Representative whose decision is final and binding; determination may or may not express the reason for the decision; approval by Addendum or Change Order only; verbal approval is not binding.
- C. Responsibility: If proposed substitution is approved, pay all costs required to modify work of any trade affected to accommodate substitution.

1.07 WARRANTY/CORRECTION PERIOD

- A. General: Warranty equipment and installation with full parts and labor for one (1) calendar year from date of acceptance by Owner's Representative; Owner's acceptance is defined by first date of foodservice facility operation; inoperable equipment is not considered "accepted"; inoperable equipment includes, but is not limited to, inadequate training and demonstration, defective materials and improper installation.
- B. Replacement Parts: Provide one calendar year warranty for equipment and installation on any warranty replaced part.
- C. Walk-in Refrigeration and Freezer Systems: One year full system parts and labor warranty to cover all components and installation; five (5) year compressor/condenser and coil warranty to cover parts and materials only; service available 24 hours per day, seven (7) days per week; contract begins on date of acceptance by Owner's Representative.
- D. Other Equipment: Compressors/Condensers and Coils: Five (5) year warranty; first year to include labor and materials without charge to Owner.
- E. Fire Protection System: One (1) year warranty; provide materials without charge to Owner.
- F. Correction Period: When the complete breakdown of a piece of equipment occurs, perform service within 24 hours; make other repairs within one week.
- G. Service Agreement: Service agents listed in the Operation and Maintenance Manual must perform service as described above; repairs and/or replacements not made within the specified time will be corrected by other means and the Section 11400 contractor is responsible for reasonable costs incurred.
- H. Defective Equipment: If within the first year of operation the piece of equipment has not been fully operational for 6 continuous months, the manufacturer will replace the unit at their expense.

PART 2 PRODUCTS

2.01 QUALIFIED FABRICATORS

- A. Qualifications: Minimum (five) 5 years experience in similar work; produce custom fabricated equipment in one shop.
- B. Authorized Equipment Fabricators: The following companies are approved custom stainless steel equipment fabricators; request for substitutions can be made per Article 1.06.

Albers Commercial Kitchen Services
(651) 265-0603

IEI Institutional Equipment Inc.
(630) 771-0990

Two Rivers Enterprises
(320) 746-3156

- C. Authorized Quartz Surface Fabricators: Minimum five years experience fabricating quartz surface materials or granite using water-cooled cutting tools; certified fabricator/installer, certified in writing by the manufacturer.

2.02 MATERIALS

- A. General: Furnish new materials free from faults and defects in materials and workmanship
- B. Metals
1. Gauges: U.S. Standard Gauge; not more than 5% plus or minus from thickness indicated below:

Gauge	Thickness	Gauge	Thickness
10	0.1406	16	0.0625
12	0.1094	18	0.0500
14	0.0781	20	0.0375
 2. Stainless Steel: ANSI Type 304, number 4 finish, 180 grit, extra low carbon, non magnetic, 18% chrome, 8% nickel, corrosion resistant alloy steel; flat, first grade and free of buckles and surface imperfections
 3. Galvanized Sheet Steel: Zinc coating, smooth, free of runs, blisters, excess spelter and uncoated spots or patches; recoat welded or damaged members; finish with two coats of epoxy based gray Hammertone paint
 4. Aluminum Sheet Metal: ASTM sheet and plate; ASTM extrusions; 0.40 mil clear anodized finish unless otherwise specified
 5. Stainless Steel Tubing: Type 304, number 4 finish 180 grit; seamless or welded; 16 gauge; annealed, ground smooth and polished; heat treated and properly quenched to eliminate precipitation; drawn true to size and roundness and polished with concentric grain
 6. Black Iron Angle: Ductile in quality; free of hard spots, runs, checks, cracks and other surface defects; clean and properly prime with rust inhibiting primer; finish with two coats of epoxy based gray Hammertone paint
- C. Sealant:
1. General: Dow Corning, Silastic or G.E. RTV 108 silver color; Type S Grade NS, Class 25; comply with Food and Drug Administration Regulation 21 CFR 177.2600 for food contact areas
 2. Walk-in Penetrations: Dow Corning 999A silicone glazing sealant
- D. Glass: Tempered 3/8" thick, unless noted otherwise
- E. Plastics: Polycarbonate or acrylic as specified; 1/4" thick
- F. Cutting Board: Richlite, 1/2" thick; size as specified; 1" diameter finger hole when used below drawers
- G. Bolts, Screws and Nuts: Unacceptable on exposed surfaces; use same composition as the metal to which they are applied; space to insure suitable fastening and to prevent bulging of the metals fastened; cap threads with a zinc plated combination hexnut-lockwasher; cap screw threads that are not visible or readily accessible with a standard lock washer and nut; wherever bolts or screws

are welded to the underside of trim or tops, neatly finish the reverse side; depressions at these points are not acceptable

- H. Rivets: Unacceptable as a method of fastening
- I. Sound Deadening
 - 1. Tape Sealant: Schnee Morehead, Inc., Model S-M 5196; install between all tops and underbracing members before mounting the underbracing; trim flush with bracing
 - 2. Spray- On: Sink bottoms only; do not coat beyond sink front cove

2.03 FABRICATION - GENERAL

- A. Final Coordination: After approved shop drawings are issued, communicate subsequent changes to the Owner's representative before fabrication begins.
- B. Quality Standards: Include necessary reinforcing, bracing, welding, number and spacing of uprights and crossmembers for adequate strength; construct tops, shelves, exterior panels, doors and drainboards of a single metal sheet when possible; except where removable, secure flat surfaces to vertical and horizontal bracing members by welding or other approved means to eliminate buckle, warp, rattle and wobble; equipment subject to rattle or wobble is not acceptable; overlapping materials are not acceptable; unless specified, exposed joints on countertops, cabinet bases and overselves are not acceptable.
- C. Welding: Heliarc method; same composition as materials welded; complete welds, strong and ductile, with excess metal ground off and joints finished smooth to match adjoining surfaces; free of mechanical imperfections such as gas holes, pits, runs and cracks; same finish as adjoining surfaces.
 - 1. Spot Welds: 3" maximum spacing
 - 2. Tack Welds: Minimum 1/4" welding material at 3" maximum spacing
- D. Butt Joints: Unacceptable as a method of fastening on fabricated and manufactured equipment
- E. Tops: 14 gauge seamless stainless steel; fully weld with edges as specified; pitch drainboards 1/4" per foot; 1" maximum pitch
 - 1. Edges: Detail SD-1 and as specified
 - 2. Backsplash: Detail SD-2; form of same piece as the top; secure to wall with stainless steel "Z" clips; seal top to wall or adjacent equipment; continuously weld rolled edges abutting splashes; close exposed ends
- F. Sinks: Detail SD-9 & SD-10; 14 gauge stainless steel fully coved and continuously welded, ground and polished; pitch sink bottoms to drain openings; die form drain opening and depress below the sink bottom; provide holes for faucets and overflows; continuously weld sinks to drainless or fixture tops; measure sink depth from adjoining work surface; 16 gauge stainless steel twist handle waste support.
 - 1. Standard Construction: Construct multiple compartment sinks from one large sink; weld in double wall partitions; 1" separation between partitions to form fully coved sink; fully welded flush front with no indentations
 - 2. When Specified: Construct multiple compartment sinks from individually formed bowls; close off front, bottom and rear of spaces between with 18 gauge stainless steel sink banding.

- G. Grain of Polishing: Run in the same direction on all horizontal and on all vertical surfaces; where table or sink tops join at right angles, terminate the finish in a mitered edge; polish grain consistent in direction throughout the length of the backsplash and sink compartment.
- H. Framework
 - 1. Drintables and Worktables: Detail SD-3, 14 gauge stainless steel; stud bolt to the underside of tabletops at the following spacing:
 - a. Angles: 30" maximum spacing
 - b. Channels: "U" and hat channels 5' 0" maximum spacing; weld exposed ends closed
 - 2. Serving Counters and Cabinet Bases: Detail SD7a & 8 and SD-71 or 72; stud bolt to underside of countertop with either method below:
 - a. Angle: Perimeter angles with crossmembers 30" on center
 - b. Uni Body: Form cabinet body into perimeter channels; crossmembers 30" on center
- I. Counter/Table Construction
 - 1. Legs: Detail SD-4; 1 5/8" O.D. 16 gauge stainless steel tubing; fit at the top to stainless steel gussets; weld gussets to underside of table framework
 - 2. Feet: Component Hardware Model A10-0852-C; stainless steel; round foot
 - 3. Flange Foot: Component Hardware Model A10-0854-C; stainless steel with screw holes
 - 4. Gusset: Component Hardware Model A18 0206; stainless steel with set screw
 - 5. Crossrails: Detail SD-4; same material as legs; fully weld, grind and polish; mount at 10" above finished floor
 - 6. Undershelves: 16 gauge stainless steel
 - a. Welded: Detail SD-5
 - b. Removable: Detail SD-6
- J. Cabinet Construction: Flush 18 gauge stainless steel construction; inaccessible open areas are not acceptable; solid metal partitions furnished at all mullions; conceal utility lines; dual wall construction at exposed ends; no exposed shelf standard screws
 - 1. Standard Construction: Detail SD-7, 26 & 28; continuously weld joints on cabinet faces for one piece construction
 - 2. Piece Construction: When specified, Detail SD-7a, 8 & 27; form cabinet face by returning mullion rails and tack weld unexposed returned edges
 - 3. General
 - a. Legs: Component Hardware, Model A72 0811; stainless steel, adjustable foot
 - b. Shelving: 16 gauge stainless steel; turn down front edge as detailed; turn up rear and ends a minimum of 1 1/2" with a 1/4" cove; weld corners, grind and polish; tack welds and paint are not acceptable
 - c. Sink Enclosure: Per detail SD-12 & 13; coordinate and cut openings in stainless steel back panel or bottom shelf with utility rough ins; chrome escutcheon at water and waste lines; visible holes cut in back panel or bottom shelf for access to plumbing are not acceptable
 - d. Utility Curb: Per detail SD-30; conceal utility lines; provide service access
 - e. Channel Base: Detail SD-77; 14 gauge galvanized channel set in place and secured to floor slab prior to installation of finished floor; sand fill and concrete not in Section 11400; set equipment into bed of sealant and

level; coordinate channel base with height of specified base covering; coordinate recessed areas in bases; inaccessible open areas are not acceptable

- f. Access Panels: Detail SD-29; locate as shown on drawings and where service access is required

K. Doors

1. Hinged Solid: Detail SD-17 or 18; door face flush with cabinet body; rigid polystyrene insulation
 - a. Hinges: Component Hardware, Model M75-1002; stainless steel; lift off lag type; weld in place
 - b. Catches: Either of below is acceptable
 - (1) Magnetic: Component Hardware Model M30-2400; heavy duty; self aligning
 - (2) Non Magnetic: Component Hardware Model M22-2420; adjustable tension
 - c. Pulls: As detailed
 - (1) Recessed stainless steel: Component Hardware Model P62-1010
 - (2) Surface mounted stainless steel: Component Hardware Model P46-1012
2. Sliding: Per detail SD-21; 18 gauge stainless steel front; rigid polystyrene insulation; 20 gauge stainless steel back; weld corner joints; removable for cleaning
 - a. Track and Sheaves
 - (1) Track: Component Hardware Model B57 Series aluminum, length as required
 - (2) Front Door Sheave: Component Hardware Model B58-5513
 - (3) Rear Door Sheave: Component Hardware Model B58-5523
 - b. Guides: Component Hardware Model B56-1096
 - c. Pulls: Component Hardware Model P62-1010
3. Hinged Louvered: Detail SD-19 or 20; door face flush with cabinet body.
 - a. Hinges: Component Hardware, Model M75-1002; stainless steel; lift-off lag type; weld in place
 - b. Catches: The following are acceptable
 - (1) Magnetic: Component Hardware Model M30-2400; heavy duty; self-aligning
 - (2) Non-Magnetic: Component Hardware Model M22-2420; adjustable tension
4. Hinged Perforated Panel: Detail SD-19-ALT; door flush with cabinet body; fully welded frame; width of door not to exceed height; maximum height 24"
 - a. Hinges: Component Hardware, Model M75-1002; stainless steel; lift-off lag type; weld in place
 - b. Catches: The following are acceptable
 - (1) Magnetic: Component Hardware Model M30-2400; heavy duty; self aligning
 - (2) Non-Magnetic: Component Hardware Model M22-2420; adjustable tension
 - c. Perforated Stainless Steel Panel: Brown Campbell Company (800/356-3636); Type 304 stainless steel; 16 gauge minimum; #4 satin finish; 1/4" round hole at 3/8" O.C. in a 60° staggered pattern; 40% open; align horizontal holes on adjacent panels; powdercoat finish on all sides if indicated on drawings

- L. Drawers: Detail SD 14, 15 or 16; mount slides so that drawer is self closing
 - 1. Pan
 - a. Stainless Steel: 15"x20"x 5" Component Hardware Model S81-1520
 - b. Stainless Steel: 20"x20"x 5" Component Hardware Model S81-2020
 - c. Stainless Steel: 12"x20"x 4" Vollrath, Model 2004 0
 - d. Thermoplastic: 15"x20"x 5" Component Hardware Model S80-1520
 - e. Thermoplastic: 20"x20"x 5" Component Hardware Model S80-2020
 - 2. Slides: Refer to drawer detail
 - a. Heavy Duty: Component Hardware Model 52 Series, 200 lb load capacity, stainless steel; length as required
 - b. Medium Duty: Knappe Vogt, Model 16000
 - 3. Pulls: When detailed, Component Hardware Model P63-1012
 - 4. Cash Drawer Assembly without tray: Component Hardware Model S95-Y001

- M. Elevated Shelves: 16 gauge stainless steel; edge as specified; close free ends; stud bolt stainless steel reinforcing members to the underside of shelves.
 - 1. Wall Shelves: Detail SD-25; stud bolt 14 gauge stainless steel cantilever brackets to reinforcing members and secure to the wall on not more than 5' 0" centers; coordinate wall backing requirements
 - 2. Table Mounted Shelves: Detail SD-22, 23 and 24

- N. Protector Shelves: Custom fabricate per elevations, sections and details; provide shop drawings showing location of uprights on countertops.
 - 1. Features:
 - a. Stainless steel finish unless otherwise specified.
 - b. Secure to counter framework; seal at countertop; fully weld, grind and polish at joints.
 - c. Slide out glass on top heat lamps to facilitate cleaning.
 - d. Enclose open ends of sneezeguard with glass.
 - e. Construct per NSF standards or per health department approval.
 - 2. Powder Coating (When Specified): All stainless steel or brass coated with minimum 2 mil NSF listed, high temperature, thermoset powder coating; coating free of bubbles, dust, flux and orange peel, coating must be clean and maintain color; parent material buffed to high polish and treated for proper adhesion prior to coating; finish to be resistant to fingerprints; color per Architect; provide sample to Architect for approval.
 - 3. Lights and Food Warmers: Provide covers with finish to match uprights for lights and food warmers; for stainless steel uprights, provide satin aluminum light cover; all wiring concealed in uprights; fluorescent lights with remote ballast and shatterproof lamp per Article 2.11C; conceal light so customer cannot see from any angle; maximize length of fixtures between uprights.

- O. Built In Equipment: Install per manufacturer's recommendations, Article 2.11 and project details.
 - 1. General: Coordinate to provide adequate ventilation, service access and support structure; submit written notification of any design conditions that are likely to prevent proper operation or that void equipment warranty; provide supplemental fans if required for proper operation; equipment contractor is responsible for proper operation of equipment
 - 2. Food Wells: Connect drainlines to ¾" diameter manifold and extend to a ball valve; provide chrome plated handle for drain valve and locate in stainless steel recessed cup in counter mullion; countertop temperature greater than 175°F within 2" of well opening is not acceptable

- P. Counter Mounted Equipment: Ferrule openings to accommodate cords, wiring, and/or piping.

2.04 FABRICATION – REFRIGERATION

2.05 HARDWARE COMPONENTS

- A. Cap Nuts: Component Hardware Model Q32-1024; zinc plated steel; combination hexnut lockwasher
- B. Casters: 5" diameter polyurethane tire swivel casters; grey tire; 300# capacity; NSF approved; Jarvis & Jarvis models as follows.
 - 1. Stem Caster: Model 5-405-213G-19A
 - 2. Stem Caster with Brake: Model 5-405-213G-19A with Vertilok brake
 - 3. Plate Caster: Model 5-305-213G-2
 - 4. Plate Caster with Brake: Model 5-305-213G-2 with Vertilok brake
- C. Drain Valve Recessed Cup: American Permanent Ware, Model APW111
- D. Drain Valve Handle: Chicago, Model 634; 3" diameter, four arm metal cross handle.
- E. Glass Capping: Component Hardware Model B70-1001; stainless steel.
- F. Kick Plate Spring Clamp: Component Hardware Model A76-4460; zinc plated steel.
- G. Locks: Component Hardware Model P30 Series; stainless steel faced; master keyed as specified.
- H. Pot Rack Hooks: Component Hardware, Model J79-4115, single prong; Model J77-4401, double prong; stainless steel.
- I. Shelf Standards and Supports:
 - 1. Standards: Component Hardware Model T22, length as required; stainless steel; thumbscrew mounting; NSF listed
 - 2. Supports: Component Hardware Model T30-5030; Type A, snap in stainless steel
- J. Switch/Receptacle Housing
 - 1. Recessed: Component Hardware Model R73 1210; stainless steel
 - 2. Pedestal: Chicago series 1300; polished aluminum or equal by Component Hardware

2.06 MILLWORK

- A. Materials
 - 1. Core Material: Medex exterior resin medium density fiberboard; conform to ANSI A208.2.3.3.4, as manufactured by MEDITE Corporation (Ph: 503/773-2522) or equal by Norbord MDF-MR (Ph: 800/367-6338)
 - 2. Plastic Laminate: NEMA LD3 1/16" Type I general purpose, Grade 10, color-through and high pressure; color, pattern, and finish as specified

3. Backing Sheets: NEMA LD .020" thick, Type V, Grade 91 plastic laminate; apply on all surfaces not covered with plastic laminate; coordinate color with exposed surface color; comply with NSF Standard 35
 4. Adhesive: Formica 100 or 150
 5. Grain/Pattern: Coordinate on all equipment furnished under this section so that grain/pattern runs in same direction throughout project
 6. Wood Frames and Counter Edges
 - a. Exposed: Species, grade and finish per item specification or detail
 - b. Unexposed: Solid, choice white pine free from knots and defects
 7. Edge Banding: 3mm thickness with beveled edge.
- B. Construction: Detail SD 171,172,173 and 174; 1977 AWI Premium Grade Standards; factory assemble parts and prefinish; flush type fronts and overlapping ends; ¾" core material base cabinet, ends and dividers with corner joints between frame members fully lock jointed, glued and screwed; dado and glue cabinet backs into sides and bottom; scribe countertops and backsplashes; secure countertops to base cabinet from underside; fully cure surfaces prior to installation.
- C. Hardware
1. Hinges
 - a. Standard: Grass 1200, 176° opening concealed casework hinges or equal by Blum or Amerock
 - b. When Specified: Component Hardware Model M75-5003
 2. Catches: Only required with Component Hardware hinge, either is acceptable
 - a. Non Magnetic: Component Hardware Model M22-2420; adjustable tension
 - b. Magnetic: Component Hardware Model M30-2400; heavy duty; self aligning
 3. Pulls: EPCO, Model MC 4023.5 anodized clear or as specified
 4. Locks: Component Hardware Model P30 Series; stainless faced; master keyed as specified
- D. Trayslide and Counterfront: See project detail.
1. Panels: Easily removable without the use of tools; finish edges to match front surface
 2. Louvered Panel and Door: Horizontal hardwood slats mounted inside panel frame; slats canted at 45° angle; space slats ¾" apart; cover front and exposed top with finish material; cover unexposed areas with the specified backing sheet
 3. Hinged Access Door: Locate where shown; finish edges to match front surface
- E. Solid Surface Materials
1. Solid Surface: DuPont Corian; thickness as detailed; grade, color, finish and edges as indicated on elevations and details
 2. Joint Adhesive: DuPont Joint Adhesive, to match surfacing color
 3. Sealant: Silicone Sealant for DuPont Corian, to match surfacing color
 4. Substructure Mounting Adhesive: Provide silicone, epoxy or polyester adhesive of type recommended by manufacturer for application and conditions of use
 5. Support/Backing: As detailed and per manufacturers recommendations

F. Solid Surface Fabrication and Installation

1. Fabricate using sheets of maximum width and length in accordance with manufacturer's recommendations; provide soft seam at a minimum of every sheet length and where recommended by manufacturer; verify dimensions by field measurement prior to fabrication; inspect material for defects prior to fabrication; materials throughout project to be from same manufacturer batch number; variation in distribution of aggregates which are within manufacturer's tolerances is not a defect
2. Seams/Joints: joints to be flush, tight fitting, level and neat; indicate seam locations on shop drawings; apply joint adhesive and sealants in accordance with specified manufacturer's recommendations; provide appropriate seam reinforcement where exposed to loads; flexible expansion joint between hot and cold wells as recommended by manufacturer
3. Cutouts: Corner radius as recommended by manufacturer; minimum expansion gap between cutout and drop-in equipment as recommended by manufacturer; cutout support as recommended by manufacturer so weight of drop-in equipment is not supported by countertop material; use Nomex insulation and aluminum foil tape as required by manufacturer at hot and cold cutouts
4. Drop-in Equipment: drop-in/built-in equipment to be supported from cabinet framework
5. Mounting Sneezeguards: Mount sneezeguards to cabinet framework in accordance with manufacturer's recommendations; allow at least 1/4" gap between countertop and upright perimeter; provide escutcheon cover to match finish on upright
6. Trayslides: Provide adequate support and reinforcement in accordance with manufacturer's recommendations
7. Edge Details: Fabricate in accordance with manufacturer's recommendations; indicate edge profile and installation details on shop drawings
8. Backsplash: integral coved; set-on pieces not acceptable
9. Installation: field install all quartz surfaces ; install materials in accordance to manufacturer's recommendations; verify that substrates supporting solid surfaces are plumb, level, and flat and that necessary supports and blocking are in place
10. Cleaning and Protection: remove masking and excess adhesives and sealants; clean exposed surfaces; protect surfacing from damage by other Sections
11. Warranty and Care: Provide manufacturer warranty statement and maintenance instructions with the Operations and Maintenance Manual in Section 1.05G
12. Authorized Fabricators: fabrication/installation by manufacturer's certified fabricator with minimum of five years experience fabricating solid polymer materials; contact manufacturer for authorized fabricators and installers

G. Quartz Composite Materials

1. Quartz Composite: Zodiaq Quartz Surfacing, Cambria Quartz Surfacing, or Silestone Engineered Stone as detailed; NSF/ANSI 51 Certified for food contact; 3 cm thickness; color, finish and edges as indicated on elevations and details;

2. Joint Adhesive: As recommended by manufacturer; apply epoxy-type joint adhesive such as Akemi North America in accordance with specified quartz manufacturer recommendations; tinted to match quartz surfacing; silicone joint seaming is not acceptable
3. Substructure Mounting Adhesive: Provide flexible silicone, epoxy or polyester adhesive of type recommended by manufacturer for application and conditions of use
4. Support/Backing: As detailed and per manufacturer's recommendations

H. Quartz Composite Fabrication and Installation

1. Fabricate using sheets of maximum width and length in accordance with manufacturer's fabrication recommendations; verify dimensions by field measurement prior to fabrication; inspect material for defects prior to fabrication; materials throughout project to be from same manufacturer batch number; variation in distribution of aggregates which are within manufacturer's tolerances is not a defect
2. Seams/Joints: joints to be flush, tight fitting, level and neat; indicate seam locations on shop drawings; provide appropriate seam reinforcement where exposed to loads; indicate required locations of support and blocking members on shop drawings; flexible expansion joint between hot and cold wells as recommended by manufacturer
3. Cutouts: Corner radius as recommended by manufacturer; minimum expansion gap between cutout and drop-in equipment as recommended by manufacturer; cutout support as recommended by manufacturer so weight of drop-in equipment is not supported by countertop; use Nomex insulation and aluminum foil tape as required by manufacturer at hot and cold cutouts; indicate locations and dimensions of cutouts on shop drawings
4. Mounting Sneezeguards: Mount sneezeguards to cabinet framework in accordance with manufacturer's recommendations; allow at least 1/4" gap between countertop and upright perimeter; provide escutcheon cover to match finish on upright
5. Trayslides: Flat or with riser material to be pre-machined quartz composite or stainless steel rods as specified; mount riser material to surface with epoxy adhesive or silicone sealant as recommended by manufacturer
6. Edge Details: Fabricate in accordance with manufacturer's recommendations; minimize visible seams; indicate edge profile and installation details on shop drawings
7. Installation: field install all quartz surfaces; install materials in accordance to manufacturer's recommendations; verify that substrates supporting quartz surfaces are plumb, level, and flat and that necessary supports and blocking are in place; seal front top edge of the cabinet to underside of quartz surface with 1/16" to 1/8" diameter bead of clear flexible adhesive around perimeter
8. Cleaning and Protection: remove masking and excess adhesives and sealants; clean exposed surfaces; protect surfacing from damage by other Sections
9. Warranty and Care: Provide manufacturer warranty statement and maintenance instructions with the Operations and Maintenance Manual in Section 1.05G
10. Authorized Fabricators: fabrication/installation by manufacturer's certified fabricator with minimum of five years experience fabricating quartz or granite; contact manufacturer for authorized fabricators and installers.

I. Quartz Composite Contacts

1. Zodiac Ph. 877.229.3935 www.zodiac.com
Cambria Ph. 866.226.2742 www.cambriausa.com
Silestone Ph 800.291.1311 www.silestoneusa.com

2.07 REFRIGERATION

A. Walk In Refrigerator & Freezer Construction

1. Size: Per plan; 8'-10" minimum finished interior height; interior dimensions must accommodate shelving shown on plan
2. General:
 - a. Wall and Ceiling Panels: 4" thick modular panels joined by not less than three (3), cam lock devices; cam locks accessed from inside walk in; cover access holes with gray plastic caps or white plastic to match white walls or ceiling; gasket to seal between panels; foamed in place CFC reduced urethane insulation, self extinguishing UL classified according to ASTM and U B C 52.3 with flame spread of 25 or less and smoke development of 450 or less; R 25 or greater for refrigerators; R 32 or greater for freezers
 - b. Ceiling Panels: Span shortest distance; utilize over-partition joined panels to minimize suspended ceilings; use 5" thick ceiling panels on spans greater than 15'-0"; maximum unsupported span of 17'-4"; suspended ceiling seams siliconed and tar taped.
 - c. Finishes:
 - (1) Exterior Finishes: 22 gauge, Type 304 smooth stainless steel per Article 2.02B, where exposed; vertical grooves in panels are not acceptable; 22 gauge galvanized steel on unexposed surfaces
 - (2) Interior Finishes
 - (a) Wall Panels: .04" (before embossing) stucco embossed aluminum
 - (b) Ceiling Panels: .032" smooth aluminum with two coats of white, baked polyester enamel
3. Wall Protectors (If Specified): Not Used
4. Diamond Tread Wall Overlay (If Specified): Provide 1/8" thick, 48" diamond-tread plate aluminum on exposed exterior; secure with oval countersunk head stainless steel screws and seal joints with silicone; install after stainless steel coved base and overlap stainless steel coved by 1/2".
5. Floor: See item specifications for conditions that apply to this project; prefabricated freezer floor panels must have R-28 rating or greater; verify that building is transit level prior to installing walk ins; notify Owner and Architect if sub floor ventilation or heating is required for walk in freezers; FSEC to verify that sub-floor installation conditions are acceptable prior to installing floor and box; identify any discrepancy in writing to Owner's Representative prior to installation
 - a. Exposed Prefabricated Floor: Per Detail SD-185, 4" thick floor with urethane insulation as described in Article 2.07, para. A.2; 16 gauge stainless with coved interior where exposed; 5/8" marine plywood reinforcing below top; 600 lbs. per square foot rated load; 30" long interior ramp; non skid strips on ramp and traffic aisles
6. Stainless Steel Coved Base: 22 gauge stainless steel; 4" minimum height, 8'0" minimum length; 3/4" diameter cove; secure without exposed fasteners; overlap seams 1", miter joints at corners
7. Door: R-25 or greater for refrigerators; R-32 or greater for freezers; In fitting, flush mounted, not less than 34" x 78" clear opening; 22 gauge smooth stainless steel with no exposed fasteners; replaceable magnetic gasketing on

- top and sides; replaceable double sweep gasket at bottom; door jamb with replaceable heater wires; stainless steel reinforced heated threshold flush with finished floor; frame-mounted door heater control switch, label control switch as "door heater adjustment" with incremental temperature level indicator control markings (high, medium, low)
- a. Vision Panel: Not less than 150 square inches; heated; triple pane glass
 - b. Hinges: Three, Kason 1256, or equal by Dent, cam-lift spring- assisted self-closing hinges with 7-9/16" long strap; use Kason load chart to verify hinge model selection for specific door weight and width
 - c. Handle: Kason 1236 with steel reinforced plate inside door panel or equal by Dent, lever action door handle with cylinder lock, padlock hole and interior safety release; provide common key for all walk-in doors
 - d. Door Closer: Kason 1092
 - e. Kickplate: 1/8" thick diamond tread plate aluminum on both sides of door and frame; extend from door bottom to door handle; secure with counter sunk oval head stainless steel screws; seal perimeter with silicone
 - f. Incandescent Light: Delete lamp holder, bulb and shield entirely from door panel
 - g. Electrical: Wire in conduit concealed in door panel to junction box top of ceiling per Detail SD-191
8. Thermometer: See item specification for thermometers required for this project; -40°F to 99°F; flush-mount in door panel on latch side, 60" above floor; conceal wire through door panel to junction box on top of walk-in; provide 24 volt transformer; wire from display through door panel, and extend sensor a minimum of 6'-0" from the door, in multiple walk-in compartment application with interior door, locate display for inner compartment in outer compartment door panel below display for outer compartment
 - a. Digital Thermometer with Alarm and Building Alarm Interface: Control Products, Inc. #TAL-2000D-24
 9. Pressure Relief Port: Provide heated relief port in freezers and non-heated in refrigerators; locate in exposed wall
 10. Lights: See item specification for lights required for this project
 - a. Fluorescent: Provide American Fluorescent or equal by Kason, Model VTP-240 in refrigerators; Model VTP-248 HO in freezers; 48" long vapor proof fixture with light spreading lens; two lamps per fixture; locate as shown on plan, not less than one fixture per 100 square feet ceiling area
 11. Enclosure Panels & Trim Strips: Secure with no exposed fasteners; close space between walk in and ceiling with enclosure panels, maximize panel width and minimize panel height; if access is required, supply only two 36" wide removable panels; close vertical space between walk in panels and building walls with trim strips; enclosure and trim same material as wall panels per Detail SD-193.
 12. Exterior Bumpers: Not Used
 13. Penetrations and Seams: Seal completely with Dow Corning 999A silicone glazing sealant to prevent condensation; tar tape on ceiling joints
 14. Receptacle for Heater Tape: Provide weather tight receptacle for freezer coil drainline heater
 15. Electrical: Prewire lights, alarm, door, window and port heaters, and receptacle for heater tape in 1/2" OD PVC conduit above walk in to junction box; ready for final connection by Electrical Trades per Detail SD-191; conduit within walk in is not acceptable
 16. Sprinkler Heads: When required, cut holes for sprinkler heads; provide stainless steel trim cap and seal holes per Article 2.07, para. 10

17. Installation: Factory representative supervision

- B. Refrigeration System: Complete operating system consisting of a Copeland semi-hermetic compressor and a Heatcraft or Carrier Commercial Refrigeration evaporator coil charged with R-404a refrigerant;
1. Condensing Unit: See item specification for condensing unit types required for this project.
 - a. General: Hermetic compressor for units $\frac{3}{4}$ h.p. and under, semi-hermetic for units above $\frac{3}{4}$ h.p. to 2 h.p. and scroll compressor for units 2 h.p. and above (3 h.p. and above for water-cooled units) with internal starting contactors and thermal overload protection; condenser fan motors of under 1 h.p. must use electronically commutated (EC) motors or permanent split capacitor-type (PSP) motors; splash lubrication system using Mobil EAL Arctic 22 polyolester synthetic refrigeration oil; oil sight glass; removable oil drain plug; label indicating oil used; high/low pressure control; suction line filter; suction and discharge service valves and copper/brass vibration isolators; receiver with fusible plug or relief valve; liquid line shut off valve; sight glass; molecular sieve filter dryer; main power supply fused disconnect switch
 - b. Air-Cooled: Air-cooled condenser with ball bearing permanently lubricated fan motor
 - c. Outdoor: Enamel painted weather proof housing; crankcase heater and low ambient temperature controls required to insure proper and efficient operation; fan cycling controls where ambient temperatures do not fall below 15° F; head master valve and oversized, heated, insulated receiver and lines where ambient temperatures fall below 15° F
 2. Evaporator: Forced convection style; match to condensing unit and suspend with air discharged parallel to the ceiling; lifetime sealed motors with inherent motor protection; evaporator fan motors of under 1 h.p. and less than 460 volts must use electronically commutated (EC) motors; enclose coil section and fans within aluminum housing
 - a. Refrigerator: Air defrost
 - b. Freezer: Electric heater and controls for positive automatic defrost
 - c. Installation: Hang coils per manufacturer's recommendations using plastic or nylon threaded rod; spread coil weight evenly over ceiling panels; support long span ceiling panels as required
 - d. Refrigerator Drainline: Run copper drainline from evaporator to building floor drain; exit walk in as close to floor as possible; trap below coil inside of walk in; paint drainline with non toxic paint, color to match wall panels; secure to walk-in wall
 - e. Freezer Drainline: Trap outside of walk in; wrap with Froxtex heater tape, manufactured by Chemlex and wired for continuous "on" operation; insulate with $\frac{1}{2}$ " thick Armaflex, Type AP insulation; secure to walk-in wall
 3. Refrigeration Lines: Interconnect evaporator to condensing unit; pipe between components as required with refrigeration grade, degreased, sealed, Type L-ACR, hard drawn copper tubing; slope horizontal runs toward condensing unit one-half inch per 10'-0" of length so that refrigerant or oil cannot drain back into evaporator from suction line; trap suction line as it exits evaporator coil; trap bottom of vertical runs of 5'-0" or more; if vertical run is 15'-0" or more, provide additional trap every 10'-0"; isolate refrigerant piping connected to compressors using copper/brass vibration isolators properly mounted at both ends; entire system cannot be exposed to atmosphere for more than (15) minutes; remove piping end caps just prior to

soldering; braze all connections with Sil-Fos-15 solder; pass a continuous flow of nitrogen gas through the area being brazed or soldered; dismantle valves during soldering; clean pipe by pulling a clean cloth through its entire length; blow out piping prior to testing and insulating using dry nitrogen gas and pull a vacuum through the lines; insulate refrigeration lines with Armaflex, Type AP insulation or equal by Rubatex, 1/2" thick for refrigerators and 3/4" thick for freezers and low temperature refrigerators; verify acceptability of Armaflex or Rubatex with local codes; if refrigeration lines pass through a return air plenum, use Pittsburgh Corning Foamglass, 2" thick insulation when Armaflex is unacceptable; install sections of insulation with 10" long metal guards at hanger points; support piping at intervals of 8'-0" or less based on pipe size and code requirements, using Uni-Strut channel hangers; secure piping to channel hangers using galvanized clamps with neoprene grommets separating the piping from the clamps; seal all joints and seams with Armstrong 520 adhesive; for outdoor use, cover insulation with VentureClad, 1577CW-W, white, VentureClad tape (www.venturetape.com) insulate and heat trace outdoor lines where temperatures fall below -15°F

4. Refrigeration Controls
 - a. Walk-in Refrigerator: Provide off-cycle defrost with time clock for refrigerator evaporators, time clock mounted on back of coil without exposed conduit, label as "defrost time clock"; liquid line solenoid valve and thermostatic expansion valve for each evaporator
 - b. Walk-in Freezer: Provide time clock for evaporator electric defrost heaters; time clock mounted on exterior face of walk-in near an exterior door without exposed conduit, label as "defrost time clock"; heater block-out relay to prevent heater from operating while compressor is running; heat exchanger and accumulator
5. System Operation: Complete system capable of maintaining the interior temperature specified
 - a. Refrigerators: 35° F operating temperature $\pm 2^\circ$ with a 16 18 hour running time; design to operate at 100° F ambient temperature; size evaporator for 10° TD maximum
 - b. Freezers: 10° F operating temperature $\pm 2^\circ$ with an 18 hour running time; design to operate at 100° F ambient temperature; size evaporator for 10° TD maximum
6. Installation - see item specification condition that applies to this project
 - a. Exterior: Install and bolt down condensing units in location specified; coordinate requirements for mounting with Owner's Representative; roof curbs and penetrations are not in Section 11400
 - b. Ventilation: Notify the Owner's Representative prior to installation if ventilation is not adequate
 - c. Diagrams: Furnish four (4) copies of refrigeration system control wiring and piping diagrams; frame one copy in plexiglass and mount near refrigeration system location; chain one copy of operational maintenance manuals to system rack

C. Buyout Equipment:

1. General: Coordinate adequate ventilation around all refrigeration/freezer compressors; submit written notification of any design conditions that prevent proper operation or void equipment warranty; provide supplemental fans if required for proper operation; Equipment Contractor is responsible for proper operation of equipment

2. Remote Compressor: All components, interconnections and controls to provide complete operating system; condensing unit and lines per Article 2.07, para. B; coordinate refrigerant with buyout equipment; operator accessible on/off switch with pilot light; counter mounted compressor on slide-out channel frame; system to maintain code approved temperatures

2.08 EXHAUST HOODS

- A. Construction: Fully welded; all 18 gauge Type 304 stainless steel per Article 2.02, para. B stainless steel; #4 finish including exposed rear; exterior corners fully welded, ground and polished; length and depth per plan; provide duct collar; conceal plumbing and wiring; heat sensors installed at each hood duct collar to automatically activate the exhaust fan whenever cooking operations occur.
- B. Exhaust and Supply Requirements: Design for use and function at project engineered volume. Manufacturer's approved representative to measure volumes at each hood duct collar and provide documentation to the consultant indicating both the measured air volumes and the design air volume at each duct collar.
- C. Code Compliance: See Article 1.04.
- D. Fire Damper (When Specified): Fusible link activated; Underwriters Laboratories listed; microswitch on duct collar for interwiring by Electrical Trades to shut down exhaust fan when damper is closed
- E. Lights: Prewire in conduit to junction box on top of exhaust hood; recessed vapor proof fixtures; tempered glass diffuser; wall mounted light and fan switches provided by others.
 1. Fluorescent: 2'-0" or 4' 0" long fixture; two, T-8 lamps with electronic ballast per fixture; not less than one 4'-0" fixture per six feet of hood; maximize number of lights per hood section
- F. Design: See item specification for designs required for this project.
 1. Filter Hoods: Underwriters Laboratory classified stainless steel self draining removable baffle filters; full length concealed self draining trough pitched to built in recessed stainless steel grease cup; one filter removal tool per project
- G. Hood Installation
 1. Mounting: Height as shown, not to exceed 7' 0" above finished floor; free from vibration and distortion; coordinate with ceiling construction and ceiling heights; provide stainless steel hanger brackets, mounting angles and steel hanger rods
 2. Trim: Conceal fasten 18 gauge stainless steel trim or enclosure panels from top of hood to ceiling
 3. Interconnections: Make all plumbing and electric interconnections between adjacent sections, ready for singular final electrical and plumbing connections by respective trades

2.09 FIRE PROTECTION SYSTEMS

- A. General: The piping and detection lines built into the hood at time of fabrication include all piping, elbows, tee's, U.L. grease seals, conduit and corner pulleys for

the protection of the hood plenum(s) and exhaust duct(s); fire system and components supplied by a local authorized fire protection company.

- B. Code Compliance: See Article 1.04; comply with NFPA 13, 17 and 96, local codes and Underwriters Laboratory; submit shop drawings to code authorities and secure approval prior to system fabrication.
 - C. Systems: See item specification for system required for this project.
 - 1. Wet Chemical: Automatic and remote manual actuation; stainless steel control cabinet; cable and conduit; manual reset relay when applicable; installation and certification by factory trained personnel; mount control cabinets at the ceiling where shown on plan without exposed piping and conduit; minimum of one remote flush mounted manual pull station per system; coordinate location with local fire authorities and Electrical Trades
 - D. Piping: Schedule 40 black pipe and fittings; all exposed under the hood piping chrome plated with no exposed threads.
 - E. Nozzles at Fire Dampers: On wet chemical and dual agent systems, if hoods have fire dampers at duct collars, provide nozzles above and below fire damper; provide welded 3/8" diameter schedule 40 black iron sleeve in ductwork for nozzle above damper.
 - F. Nozzles at Tilt Skillet/Braising Pans: Not Used.
 - G. Gas Shut-off Valve: Automatic electrically or mechanically activated per item specifications; installed by Mechanical Trades; equip electrical gas shut-off valve with 15-second power interruption.
 - H. Follow-up Inspection: Include two semi-annual maintenance checkouts of the system by factory authorized personnel conforming to the recommendations as outlined in the manufacturer's specifications and manuals; include permits, drawings, and testing by authorized fire protection company as required by authority having jurisdiction
 - I. Warranty: See Article 1.07, para. E.
- 2.10 CONVEYORS - Not Used
- 2.11 UTILITY SERVICE REQUIREMENTS
- A. General
 - 1. Interconnections: Interconnect equipment utility lines between equipment sections to single connection point; materials consistent with specifications
 - 2. Performance: Install heated and motor operated equipment as required for efficient and stable operation; provide additional vents, guards, deflectors and other accessories as necessary whether or not such items are called for on the drawings or specifications; show additional modifications on the Shop Drawings; notify the Owner's representative in writing if design prevents proper operation prior to installation
 - 3. All plumbing components must be lead-free to conform to Safe Water Drinking Act or more stringent state/local codes where applicable

4. Coordination: Verify incoming water pressure and temperature prior to equipment installation; provide written communication to Owner's Representative if conditions will adversely affect equipment operation

B. Plumbing

1. Fabricated/Manufactured Equipment

- a. Connection Access: Provide access openings for mechanical connections
- b. Piping: Install horizontal piping at the highest possible elevation and not less than 6" above floor; conceal piping; no tool marks or more than one visible thread at exposed fittings; bright polished chrome plate exposed piping and fittings
- c. Faucets: Available through Standard Plumbing Suppliers
 - (1) Vegetable prep sink: Chicago 540-LDL8E1CP
 - (2) General use sink - backsplash: Chicago 540-LD-GN8-E3CP
 - (3) General use sink - deck: Chicago 201-ACP
 - (4) Hand sink (Splash Mounted): Chicago 631CP
 - (5) Hand sink (Deck Mounted Elkay): Chicago 786-E3CP
 - (6) Disposer spray rinse: Component Hardware KN53-1000BR with wall bracket or equal by T&S Model B-0133-CR-BC
 - (7) Food well fill faucet: Chicago 349 E1HOT, with "hot" water handle
 - (8) Pot and Pan Sink: Chicago 540LDL12-1-159-3/4CP
- d. Wastes: Adjust handle length when required
 - (1) 14" and 16" Deep sinks: Rotary handle commercial waste drain; Chicago 1367-NF, 2" waste or equal by Fisher or Component Hardware
 - (2) Other sinks: Rotary handle commercial waste drain; Chicago 1367-NF, 1-1/2" waste or equal by Fisher or Component Hardware
 - (3) All sink wastes except mobile soak sink to have drain overflow: Chicago 1344-001KJKRCF head with Chicago 1344-002JKRCF elbow tube or equal by Fisher or Component Hardware
- e. Accessories/Components: Chrome plate exposed fittings
 - (1) Water Inlets: Locate above the positive water level to prevent siphoning
 - (2) Backflow Prevention: Where conditions require a submerged inlet, provide a code approved check valve or backflow prevention device with the fixture to prevent siphoning; provide with T & S B-0461 angle flanges where plumbing penetrates backsplash; set flanges so top of vacuum breaker is 4" above splash
- f. Water Filters: Furnish Everpure or Cuno complete filter assemblies for new and existing beverage and ice making equipment, steamers, combi ovens and rack ovens; individual filters for vendor furnished equipment provided by vendor; furnish one additional set of filter cartridges with each filter system; install in accessible location and indicate on rough in drawings; meet peak water flow requirements of equipment being furnished; test water quality at site and adjust filter system to meet the equipment manufacturer requirements; if manufacturers quality requirement cannot be met, provide documentation to foodservice consultant; provide permanent label on filter system, indicating equipment name of item served.
- g. Gas Quick Disconnect: Dormont, Series BPQ-2SR or equal by T&S Brass; 5'-0" long with suitable length restraint to facilitate cleaning; mount

restraint to prevent it lying on floor; sized to accommodate connection on equipment

- h. Water Quick Disconnect: Dormont, Series BP or equal by T&S Brass Series HW; 5'-0" long or required length; sized to accommodate connection on equipment; one hose per connection.
- i. Gas Pressure Reducing Valves: Furnish appropriate models in 5" to 15" water column pressure limits for installation by Mechanical Trades if not factory installed
- j. Gas Fired Ranges: Provide rear gas connection and stainless steel manifold end caps unless otherwise specified
- k. Indirect Wastes: Extend the following indirect wastes/drainline: condensate hood, hot and/or cold well, fabricated counter/equipment, countertop ice machines, and specified beverage equipment

C. Electrical

- 1. General: Underwriters' Laboratories (UL) listed and comply with National Electrical Code, Standards of National Electrical Manufacturers' Association and American Institute of Electrical and Electronics Engineers; wire, wind or construct equipment to conform to available electrical services; furnish wiring and connection diagrams with equipment; provide equipment rigid and free from objectionable vibration and noise
- 2. Plug in Equipment: Furnish with cords attached; match plugs to receptacles; coordinating cords and plugs are the FSEC's responsibility; modify cord to a suitable length; on mobile equipment; provide suitable length restraint to facilitate cleaning; mount restraint to prevent it lying on floor.
- 3. Fabricated Equipment: Wire internally; furnish and install electric outlets and receptacles; run lines to a junction box, load center panel, starter, or disconnect switch; neatly tag wires showing item number, voltage characteristics and load information; furnish transformers for equipment unavailable in building electrical characteristics
 - a. Built In Equipment: Install and interconnect electric controls, switches, receptacles or other units furnished separately; wire in concealed conduit to accessible junction point
 - b. Motor Driven Appliances and Electric Heating Units: UL listed control switch or starter; exposed fused disconnect at motors larger than ½ hp or per code requirements; furnish line switches, fittings and connections when not part of the equipment for installation by Electrical Trades
 - c. Motors: Drip-proof, splash-proof or totally enclosed type, having a continuous-duty cycle; ball bearings except small motors which may have sleeve bearings; windings impregnated to resist moisture; enclose when exposed to dust, lint, water or other matter; mount on vibration elimination pads
 - d. Conduit: Code approved; conceal from view
 - e. Switches and Controls: Internally wire equipment to a thermostatic control and/or on/off switch with red indicator light; locate where shown; label function with plastic nameplates with not less than ¼" high white recessed lettering, and glue to adjacent surface
 - f. Cover Plates: Stainless steel
 - g. Outlets and Receptacles: Hubbell GF-15 and GF-20 ground fault interrupt outlets mounted where shown; wire to separate j-box; Hubbell #5251S and #5252S blue colored, surge suppression receptacles for point of sale equipment

- h. Fluorescent Light Fixtures: Provide ballasts and 3500° Kelvin lamps at 82 CRI (Color Rendering Index); install non breakable sleeves or coated lamps over food areas
 - (1) Protector Shelves: Bartco Lighting model BFL917 with "TG" tube guards to cover entire length of fixture and #EC921 solid end caps; remote ballast, finish on cover to match protector shelf uprights
 - (2) Wall Cabinet: Alkco, Series SS HP-100/200 Series/RSW

PART 3 EXECUTION

3.01 SITE INSPECTION

- A. Field Measurements: Field measure foodservice space prior to equipment construction; conform to finished building conditions; submit written notification to Owners Representative if building conditions prevent equipment from functioning properly.
- B. Site Conditions: Verify that surfaces, prepared openings, finished building dimensions, and roughed in utilities are ready for equipment; coordinate equipment with building openings and dimensions; construct and deliver equipment in sections sized to site limitations.
- C. Utilities: Verify that voltages, air volumes, water temperature and water, steam, and gas pressures are as required for equipment; coordinate changes to ensure that equipment operates properly
- D. Acceptance: Beginning of installation means acceptance of site conditions.
- E. Responsibility: Assume the expense of changes to equipment and/or cutting and patching walls, partitions, ceilings and floors necessary to receive and successfully operate equipment, caused by failure to coordinate with site conditions.

3.02 INSTALLATION

- A. Qualifications: Minimum (five) 5 years experience in similar work, including field welding.
- B. Code Compliance: Conform to current Standards and Revisions established by the National Sanitation Foundation, Ann Arbor, Michigan, and to prevailing local codes and regulations.
- C. Sealing: Seal equipment that abuts a wall or other fixed equipment with silicone sealant per Article 2.02, para. C; ¼" maximum width.
- D. Trim: Material to match equipment surface; trim equipment in wall openings, recesses or abutting a wall that cannot be effectively sealed with silicone; exposed fasteners are not acceptable; unacceptable as a substitute for accuracy and neatness.
- E. Schedule: Comply with the Owner's construction schedule; notify the Owner's Representative in writing, not less than thirty (30) days prior to the scheduled deadline if there is a reason the schedule cannot be met.

- F. Cutting and Patching: Cut and drill tops, backs, or other elements for service outlets, fixtures, and fittings; cut and patch foodservice equipment as required for equipment installation or service
- G. Protection: Protect equipment from damage.
- H. Damage and/or Loss: Replace or repair items that are lost or damaged prior to Owner acceptance
- I. Factory Supervision: Provide factory authorized service agent supervision for installation of job-site assembled conveyors, flight-type dishmachines and pulpers; include a thorough check of utility connections, pressures and overall installation.

3.03 EXISTING EQUIPMENT

- A. Disconnection: By appropriate trade; specified in other sections of these specifications.
- B. Reused: Disassemble, if required, remove and store equipment until ready for installation; reassemble and set existing equipment in place ready for final connection; install in the same working order as when removed from service; prepare and submit a packing list identifying each piece of equipment removed and any attachments or accessories removed with it; equipment that is not in good working order should be noted; submit packing list signed by the Owner's Representative and the Section 11400 Contractor.
- C. Not Reused: Owner's Representative has the option to retain existing equipment; authorized demolition contractor will remove and dispose; obtain written authorization from Owner's Representative to remove equipment from site.

3.04 CLEANING

- A. Remove masking or protective covering from stainless steel and other finished surfaces; wash, clean and polish equipment; polish glass, plastic, hardware, accessories, fixtures and fittings prior to the inspection and acceptance of the Work. Install existing equipment in the same state as when it was removed from service.

3.05 DEMONSTRATION AND TESTING

- A. Demonstration: Schedule times with the Owner's Representative to provide instruction on the maintenance and use of each item; conveyor authorized service agent to demonstrate adjustment and maintenance procedures to Owner's maintenance staff and dishroom supervisor and demonstrate pump adjustment to detergent supplier; demonstrate operation to appropriate inspectors if required; verify that copies of all instructional, operational, maintenance manuals, charts and audio and video media have been provided at least two weeks prior to demonstration as required in Article 1.05, para. G.3.
- B. Testing: Test, regulate and put into proper operating condition; calibrate controls, including thermostats; coordinate dishmachine testing with detergent supplier; properly activate water filters per manufacturer's recommendations.

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- C. Chart of Completion: Provide separate charts for demonstration and testing; include item number, description of equipment, date, person/firm responsible, and Owner's initials; provide charts to Owner, Owner's Representative, and Consultant prior to Owner's acceptance.

3.06 ITEM SPECIFICATIONS

NOTE: Provide like equipment items (upright refrigeration, display cases and range match cooking equipment) and items that directly interface (hoods, fire protection systems/hood control panels) from same manufacturer. Provide common on all equipment from same manufacturer.

- 1 SERVING COUNTER
One
Fabricate; construct per plan, Part 2-Products, Elevation 1/FS201 and Standard Details; top material color per interiors.
- 2 SERVING COUNTER
One
Fabricate; construct per plan, Part 2-Products, Elevation 2/FS201 and Standard Details; top material color per interiors.
- 3 SELF SERVICE ORDER INTERFACE
One
This item is not in the Section 11400 Contract; include utility requirements on rough-in drawings.
- 4 MENU BOARD
One
This item is not in the Section 11400 Contract, include utility requirements on rough-in drawings
- 5 MOP HOLDER & DETERGENT SHELF
One
Advance Tabco Model K-246
Features: Stainless steel construction; length and width per plan; three mop hangers and four hooks welded to shelf.
- 6 MOP SINK
One
This item is by Mechanical and is not in the 11400 contract, include utility requirements on rough-in drawings.
- 7 ICE BIN
One
Existing; relocate to position shown on plan; include utility requirements on rough-in drawings.
- 8 WATER FILTER
One
Manitowoc Model AR-10000
Features: 1 micron particle reduction filter; .7 GPM flow rate; 14,000 gallon capacity; position as shown on plan in an operator accessible location.

- 9 OPEN NUMBER
- 10 ICE MAKER
One
Existing; relocate to position shown on plan; include utility requirements on rough-in drawings.
- 11 OPEN NUMBER
- 12 WALK-IN FREEZER
One
Kolpak or equal by American Panel, Norlake, Thermo-Kool, or Thermalrite
- A. Features: Complex size and shape shown on plan, constructed and equipped per Article 2.07; digital thermometer with alarm and building alarm interface; fluorescent lights per plan.
 - B. Floor: Per SD-185; FSEC to verify that floor conditions are approved prior to installing floor and box; provide any discrepancy in writing to Owner's Representative.
 - C. Finishes: White stucco-embossed aluminum exposed exterior; white baked enamel over smooth aluminum ceiling; stucco-embossed aluminum interior walls; galvanized steel on unexposed exterior surfaces; 1/8" thick diamond tread plate, 48" high on exposed exterior; secure with countersunk oval-head screws and seal joints and edges with silicone; install after stainless steel coved base and overlap base by 1/2".
 - D. Installation: Manufacturer authorized installer to install walk-in compartment.
 - E. Electrical: 120V, 1 phase.
- 13 FREEZER SYSTEM
One
RDT or equal by Cold Zone, Bohn or Omni Temp w/Copeland compressor; Heatcraft evaporator coil or equal by Carrier Commercial Refrigeration
- A. Features: Properly-sized, outdoor, air-cooled condensing unit, position as shown properly-sized evaporator coil; system equipped and installed per Article 2.07B; install coil as tight to ceiling as possible without affecting operation of coil; locate defrost time clock on front face of exterior door plug, centered above door at ceiling.
 - B. Electrical: 208V, 1 phase (Evaporator Coil)
208V, 3 phase (Condensing Unit)
- 14 REFRIGERATOR/FREEZER SHELVING
Two
Metro Industries Metroseal 3 Shelving.
- A. Features: Shelves width and length as shown on plan; four Metroseal 3 wire shelves per section; 63" high Metroseal 3 posts; 12-year rust warranty; 5" diameter polyurethane casters, delete donut bumpers.
 - B. Installation: Verify that units fit within finished wall dimensions; assemble with bottom shelf 10" above floor or per local code requirements.
- 15 REFRIGERATOR/FREEZER SHELVING
One
Existing; relocate to position shown on plan.

- 16 DRY STORAGE SHELVING
Three
Existing; relocate to position shown on plan.
- 17 DESK & CHAIR
One
This item is not in the Section 11400 Contract.
- 18 SAFE
One
This item is not in the Section 11400 Contract.
- 19 WALL CABINET
One
This item is not in the Section 11400 Contract.
- 20 OPEN NUMBER
- 21 OPEN NUMBER
- 22 REACH-IN REFRIGERATOR, 2-SEC.
One
True Model TR2R-4HS or equal by Traulsen or Victory
 - A. Features: Stainless steel exterior & interior; automatic hot gas condensate evaporator; built-in digital thermometer; self-closing half-height doors, hinged per plan; automatically activated interior lights; door locks; 4" diameter casters; five chrome-plated wire shelves per section; 1/2 HP.
 - B. Electrical: 120V, 1 phase; cord and plug.
- 23 PREP COUNTER W/SINKS
One
Fabricate; construct per plan, Part 2 - Products, Elevation 3/FS-201 and Standard Details.
- 24 DISPOSER W/SPRAY RINSE
One
Salvajor Model 200-SA-6-MRSS or equal by In-Sink-Erator SS-200-7
 - A. Features: Corrosion resistant aluminum alloy with smooth polished finish exterior; 2 HP motor; MRSS control with forward, stop and reverse buttons; sink assembly with 6-1/2" sink collar with stopper; vacuum breaker with angle flanges per Article 2.11B; time delay relay, solenoid valve, flow control valve; Component Hardware Spray Rinse Model Encore KN53-1000 or equal by T&S with wall bracket.
 - B. Electrical: 208V, 3 phase.
- 25 OPEN NUMBER
- 26 MOBILE TRASH BIN
One
Rubbermaid Model 2632 with 2631 Lid & 2640 Dolly
Features: 32 gallon capacity; dolly; gray color; with lid
- 27 WALL SHELF

Two

Fabricate, construct per plan, Part 2-Products, Elevation 3/FS-201 and SD-25a

28 MICROWAVE OVEN

One

Amana Model RFS12MP5B or equal by Panasonic

- A. Features: Stainless steel cabinet exterior and cavity interior; 1200 watt oven; 1.2 cubic foot capacity; 10 programmable control pads; five power levels; digital display; time entry option; defrost ability; cleanable air filter.
- B. Electrical: 120V, 1 phase; cord and plug.

29 EXHAUST HOOD

One

Captive Aire Model 4824 ND-2 or equal by Accurex, Gaylord or Halton EO Series

- A. Features: Filter-type hood; 24" high canopy; without fire damper; one filter removal tool per project; fluorescent lights in 4' lengths whenever possible; equipped per Article 2.08; heat sensors installed at each hood duct collar to automatically activate the exhaust fan whenever cooking operations occur (wiring to fan by Electrical Trades).
- B. Size: Per plan.
- C. Exhaust Requirements: The project was designed on the basis of the exhaust air volumes listed below:
- D. Exhaust: One duct collar measuring 10" x 14" at 1470 CFM at -0.407" static pressure.
- E. Hood must comply with code authority requirements, properly ventilate the cooking equipment beneath it and be compatible with the building ventilation systems; see mechanical engineer's drawings for further requirements; FSEC to provide stickers on all sides stating-
PENETRATION WITH ANY FASTENERS VIOLATES AGENCY LISTINGS.
- F. Fire Protection: See Item # 32
- G. Installation: Mount bottom edge of hood per Elevation.
- H. Electrical: 120V, 1 phase.

30 WALL SHELF

One

Metro Industries Super Erecta Shelving.

- A. Features: Chrome wire shelves and components; one shelf per section, length and width per plan; single-tier posts; post-type wall mounting; single and double shelf supports where necessary; adjustable shelf height.
- B. Installation: Coordinate support requirements with architectural trades; mounting height per Elevation 3/FS201.

31 OPEN NUMBER

32 FIRE PROTECTION SYSTEM

One

Existing; relocate; modify by connecting new hood, Item #29; provide additional tank capacity, if necessary, to meet UL 300 requirements.

33 4-BURNER RANGE W/STAND

One

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Southbend HDO-24 with Stainless Steel Stand or equal by Jade or Garland
 Features: Four-burner range; stainless steel front and sides; 24" overall width; cast iron top grates; natural gas operation; lift-off burners; 33 MBTU each; automatic pilot; removable tray under burners; provide optional stainless steel stand with casters, front two with brakes; rear gas connection; gas pressure regulator; gas quick disconnect hose with restraining chain per Article 2.11B; position as shown on plan.

34 HALF-SIZE CONVECTION OVEN

One

Blodgett Model DFG 50

- A. Features: One half-size oven section; natural gas operation; stainless steel front, top, and sides; door with dual pane thermal window; porcelain enamel interior; solid state digital control; cook and hold; PulsePlus; 1/3 HP motor; 24" stand with 6" casters, front two with brakes; rear gas connection; gas pressure regulator; gas quick disconnect hose with restraining chain per Article 2.11B; position as shown on plan.
- B. Electrical: 120V, 1 phase; cord and plug

35 MOBILE EQUIPMENT STAND

Included in Item #34

36 STAINLESS STEEL WALL PANEL

One

- A. Fabricate; construct per plan, Part 2-Products, Elevation 4/FS201 and SD-38.
- B. Features: 18 gauge continuous stainless steel panel; sheet to extend from 6" AFF (coordinate with floor covering) to bottom edge of hood; conceal fasten to wall and seal perimeter; neatly finish utility openings with escutcheon covers; maximize size of sheets used.

37 HAND SINK

One

Krowne Model HS-27 or equal by John Boos PBHS-W-1410-8OC or Advance Tabco Q72045

- A. Features: Stainless steel construction; 7" high integral backsplash; chrome P-trap; wall-mounting bracket; strainer type waste; stainless steel side supports; delete standard faucet; Chicago 631-E3 faucet; faucet holes on 8" centers; add side splash if required by code.
- B. Installation: Mount 34" above floor.

38 POT & PAN SINK

One

Existing; relocate to position shown on plan; modify by replacing all legs with stainless steel legs.

39 OPEN NUMBER

40 OPEN NUMBER

41 OPEN NUMBER

42 REFRIGERATED PREP TABLE

One

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- True Model TPP-60 or equal by Randell or Delfield
- A. Features: Self-contained; stainless steel exterior top, front and ends; stainless steel interior floor, white aluminum liner; rail to accommodate 1/3 size pans; Richlite cutting board; four adjustable coated wire shelves; stainless steel removable flat lid; exterior, round digital thermometer; 1/3 HP; self-closing hinged doors, snap in magnetic gasket; barrel door locks; electric condensate evaporator; 4" casters, front with brakes; provide full complement of third size pans and divider rails for raised rail compartment.
 - B. Electrical: 120V, 1 phase; cord and plug
- 43 WORKCOUNTER
One
Fabricate; construct per plan, Part 2 - Products, Elevation 5/FS201 and Standard Details.
- 44 CONVEYOR TOASTER
One
Hatco Model TQ-400.
- A. Features: 300 slices per hour capability; automatic loading; front or rear discharge; thermostatic toasting controls; conveyor speed knob; removable toast and crumb trays.
 - B. Electrical: 120V, 1 phase; cord and plug.
- 45 OPEN NUMBER
- 46 SANDWICH GRILL
One
Nuova Simonelli PL2 or equal by Lang Pane Bella, Star or Equipex
- A. Features: Griddle with two grooved upper and lower cast iron cooking surfaces; stainless steel base; independently controlled thermostat and timer; on/off switch; pilot lights; detachable front drip tray and scraper; cleaning tool for grooved cooking surface.
 - B. Electrical: 208V, 1 phase; cord and plug.
- 47 SOUP WELL
Two
Existing; relocate to position shown on plan; include utility requirements on rough-in drawings.
- 48 ICE MAKER, UNDERCOUNTER
One
Existing; relocate to position shown on plan; include utility requirements on rough-in drawings.
- 49 BLENDER
One
Existing; modify by providing new 32 ounce container with lid and blade assembly; include utility requirements on rough-in drawings.
- 50 OPEN NUMBER
- 51 OPEN NUMBER

- 52 COFFEE GRINDER
One
Existing; relocate to position shown on plan; include utility requirements on rough-in drawings.
- 53 AIRPOT BREWER
One
Existing; relocate to position shown on plan; include utility requirements on rough-in drawings.
- 54 OPEN NUMBER
- 55 WORKCOUNTER
One
Fabricate; construct per plan, Part 2 - Products, Elevation 10/FS201 and Standard Details.
- 56 WORKCOUNTER
One
Fabricate; construct per plan, Part 2 - Products, Elevation 6/FS201 and Standard Details.
- 57 SERVING COUNTER
One
A. Fabricate; construct per plan, Part 2-Products, Elevation 8/FS2011, 9/FS201, 11/FS201, 1/FS202; Section A/FS202, B/FS202 and Standard Details.
B. Electrical: 120V, 1 phase
208V, 1 phase
- 58A P.O.S. KEYBOARD
Three
This item is by Owner and is not in the 11400 Contract; include utility requirements on rough-in drawings.
- 58B P.O.S. PRINTER
Three
This item is by Owner and is not in the 11400 Contract; include utility requirements on rough-in drawings.
- 58C P.O.S. CASH DRAWER
Six
This item is by Owner and is not in the 11400 Contract; include utility requirements on rough-in drawings.
- 59 SYRUP BOTTLE RACK
One
Existing; relocate to position shown on plan.
- 60 BAKERY DISPLAY CASE
One
Structural Concepts Impulse Model DG3622

- A. Features: Non-refrigerated countertop case; black exterior, interior and trim; adjustable clear glass shelving with lights; clear glass rear sliding doors with lock; tilt-out curved front glass; glass panel ends.
 - B. Electrical : 120V, 1 phase; cord and plug
- 61 WORKCOUNTER W/SINK & HAND SINK
One
Fabricate; construct per plan, Part 2-Products, Elevation 7/FS-201 and Standard Details.
- 62 TRASH BIN
Two
Rubbermaid Model 3540
Features: 23 gallon capacity; 30" high; gray color
- 63 DIPPERWELL & FAUCET
One
Cecilware Model FW-510 Faucet & Dipperwell Assembly.
- A. Features: Stainless steel dipperwell with polished counter lip; machined brass faucet with chrome finish.
 - B. Installation: Mount in countertop as shown on plan.
- 64 ESPRESSO GRINDER
One
Existing; relocate to position shown on plan; include utility requirements on rough-in drawings.
- 65 OPEN NUMBER
- 66 UNDERCOUNTER REFRIGERATOR
One
Existing; modify by replacing casters, front two with brakes; ensure unit fits below counter, Item #57; include utility requirements on rough-in drawings.
- 67 ESPRESSO MACHINE
One
Existing; relocate to position shown on plan; include utility requirements on rough-in drawings.
- 68 DISPLAY REFRIGERATOR
One
Existing; relocate to position shown on plan; modify by removing light and existing panel and replacing with black panel; include utility requirements on rough-in drawings.
- 69 GIFT SHOP DISPLAY
Two
This item is not in the Section 11400 Contract.
- 70 CONDIMENT COUNTER
One
Fabricate; construct per plan, Part 2-Products, Elevation 12/FS201 and Standard Details.

- 71 OPEN NUMBER
- 72 OPEN NUMBER
- 73 OPEN NUMBER
- 74 OPEN NUMBER
- 75 OPEN NUMBER
- 76 BEER REFRIGERATOR
One
Kolpak or equal by American Panel, Norlake, Thermo-Kool, or Thermalrite
- A. Features: Complex size and shape shown on plan, constructed and equipped per Article 2.07; digital thermometer with alarm and building alarm interface; fluorescent lights per plan.
 - B. Floor: Per SD-185; FSEC to verify that floor conditions are approved prior to installing floor and box; provide any discrepancy in writing to Owner's Representative.
 - C. Finishes: White stucco-embossed aluminum exposed exterior; white baked enamel over smooth aluminum ceiling; stucco-embossed aluminum interior walls; galvanized steel on unexposed exterior surfaces; 1/8" thick diamond tread plate, 48" high on exposed exterior; secure with countersunk oval-head screws and seal joints and edges with silicone; install after stainless steel coved base and overlap base by 1/2".
 - D. Installation: Manufacturer's authorized agent to install walk-in compartment.
 - E. Electrical: 120V, 1 phase.
- 77 REFRIGERATION SYSTEM
One
RDT or equal by Cold Zone, Bohn or Omni Temp w/Copeland compressor; Heatcraft evaporator coil or equal by Carrier Commercial Refrigeration
- A. Features: Properly-sized, outdoor, air-cooled condensing unit, position as shown; properly-sized evaporator coil, system equipped and installed per Article 2.07B.
 - B. Electrical: 120V, 1 phase (Evaporator Coil)
208V, 3 phase (Condensing Unit)
- 78 KEG SHELVING
Two
New Age Keg Stacker Shelving
Features: Length and width as shown on plan; aluminum construction; three shelves; 76" high post height; capacity for six 1/2 barrels.
- 79 OPEN NUMBER
- 80 OPEN NUMBER
- 81 STORAGE CABINET, 2-SEC
Two
Glas Tender Model DS48-N
Features: Galvanized steel interior; black vinyl clad exterior; hinged per plan; unit without finished top; door locks; mount on curb.

- 82A SODA RACK
One
This item is by Owner's Soda Vendor and is not in the 11400 Contract.
- 82B SODA CARBONATOR
One
This item is by Owner's Soda Vendor and is not in the 11400 Contract; include utility requirements on rough-in drawings.
- 82C SODA GUN
Two
This item is by Owner's Soda Vendor and is not in the 11400 Contract; include utility requirements on rough-in drawings.
- 83A BEER SYSTEM
One
This item is by Owner's Beer Vendor and is not in the 11400 Contract; include utility requirements on rough-in drawings.
- 83B BEER SYSTEM - WALL SHELF
One
Features: Fabricate, construct per plan, Part 2-Products and SD-25a
- 83C BEER TOWER
One
This item is by Owner's Beer Vendor and is not in the 11400 Contract; include utility requirements on rough-in drawings.
- 84 BACK BAR REFRIGERATOR, 2-SEC
One
Glas Tender Model BB60-H
A. Features: Two section refrigerator; 35" high; 1/4 HP compressor; stainless steel interior; glass doors with stainless steel trim; compressor housing, position as shown; unit without top; automatic hot gas condensate evaporator; door locks; mount on curb.
B. Electrical: 120V, 1 phase; cord and plug.
- 85 OPEN NUMBER
- 86 BACK BAR TOP
One
Construct per plan, Part 2-Products, Elevation 5/FS202, Section and Standard Details; provide channel base per SD-77.
- 87 BACK BAR TOP
One
Construct per plan, Part 2-Products, Elevation 4/FS202, Section and Standard Details; provide channel base per SD-77.
- 88 DRAINBOARD
Three – One Future
Glas Tender Model DBA Series
Features: 19" deep; stainless steel construction; length shown on plan; adjustable stainless steel bullet feet; drip pan with separate perforated insert

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- 89 SPEED RAIL
 Four – Two Future
 Glas Tender Model SSR Series
 Features: Single speed rail; length per plan; locking cover; stainless steel construction

- 90 BAR TOP
 One
 Construct per plan, Part 2-Products, Elevation 2/FS202, 3/FS202, Section C/FS202 and Standard Details

- 91 STAINLESS STEEL DRINK RAIL
 Two
 Construct per plan, Part 2-Products, Elevation, Section C/FS202 and Standard Details

- 92 BACK BAR REFRIGERATOR, 3 SEC.
 One
 Glas Tender Model BB84
 A. Features: Three-section refrigerator; 35" high; 1/4 HP; black vinyl clad exterior; door finish per elevation; compressor housing, position as shown; unit without top; automatic hot gas condensate evaporator; door locks; mount on channel base per Elevation 5/FS202.
 B. Electric: 120V, 1 phase; cord and plug

- 93 LIQUOR STEP
 Perlick Model LMD2 or equal by Glas Tender or custom fabrication
 A. Features: Length per plan; stainless steel construction with acrylic step covers; two tiers, 4" deep; LED lights; on/off switch and power cord per plan.
 B. Electrical: 120V, 1 phase; cord and plug.

- 94 OPEN NUMBER

- 95 OPEN NUMBER

- 96 OPEN NUMBER

- 97 BLENDER
 One
 This item is by Owner and is not in the 11400 Contract; include utility requirements on rough-in drawings.

- 98 OPEN NUMBER

- 99 P.O.S. CABINET
 Two
 Fabricate; construct per plan, Part 2-Products and PD-6

- 100 OPEN NUMBER

- 101 OPEN NUMBER

- 102 ICE BIN W/INSULATED BOTTLE WELLS

- Two – One Future
 Glas Tender Model CBA-42L-CP10
 Features: 28" wide ice bin; 12" wide separate insulated bottle well section at left; sliding stainless steel cover; ice bin with 10 circuit cold plate; 19" deep; stainless steel legs with adjustable bullet feet.
- 103 OPEN NUMBER
- 104 SODA GUN TUBING CHASE
 Two – One Future
 Glas Tender Model SHA-6
 Features: Stainless steel construction; built-in soda gun cradle with hole for drip cup; removable cover for line access; clips for mounting between underbar components; integral backsplash, front rail and front skirt; position as shown on plan
- 105 OPEN NUMBER
- 106 GLASS WASHER
 One
 Glas Tender Model GT-24.
 A. Features: 24" rotary glass washer; direction of operation as shown on plan; 130 degreesF-150 degrees F wash tank; float control water level; three curtains; removable side panels; automatic stop when glassware reaches glass stop arm; separate conveyor stop button for peak usage times; low-water cut-off protection; water pressure regulator; 4000 watt heat source; digital temperature gauges; thermostat; metering pumps for detergent and sanitizer; chemical prime switches; automatic chemical sensor alert; recirculating water pumps
 B. Electrical: 120/208V, 1 phase
- 107 DUMP SINK W/ WASTE
 One
 Glas Tender Model SWB – 18 – DW
 Features: Stainless steel construction; 9-1/4" x 11-1/2" x 6" deep sink bowl; lift-out perforated plastic waste strainer; cabinet base with front hinged access door for access of trash container; stainless steel legs with adjustable bullet feet; provide Chicago Faucets Model 895 assembly, in lieu of standard faucet; faucet holes on 4" centers; provide one model DWC, stainless steel trash container.
- 108 HAND SINK
 One
 Glas Tender Model DHSB-18.
 Features: Stainless steel construction; adjustable stainless steel bullet feet; delete standard faucet and provide Chicago Faucets Model 895 gooseneck faucet with short wrist blade handles that do not interfere with adjacent equipment; built-in soap and towel dispenser

END OF SECTION 11400

**NEW PASSENGER TERMINAL
DULUTH INTERNATIONAL AIRPORT
DULUTH, MINNESOTA**

**SECTION 11911 – X-RAY
INSPECTION EQUIPMENT**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. X-Ray Inspection Equipment.
- B. Related Sections:
 - 1. Division 16 Sections for electrical systems and connections.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show layouts and types of X-ray machines. Include the following:
 - 1. Location of wiring connections.
 - 2. Accessories.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For X-ray machines to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of X-ray machine from single manufacturer. Obtain accessories, including necessary mounting hardware, from X-ray machine manufacturer.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Environmental Limitations: Do not deliver or install projection X-ray machines until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.7 COORDINATION

- A. Coordinate layout and installation of X-ray machines with adjacent construction.

PART 2 - PRODUCTS

2.1 X-RAY INSPECTION MACHINES

- A. General: Manufacturer's standard units, consisting of all components necessary for a complete installation.
 - 1. Basis of Design: "HI-SCAN 100100V" manufactured by Smiths Detection Inc., Morristown, NJ.
 - 2. Tunnel Dimensions: 35.8" wide x 30.3" high, minimum.
 - a. Capable of accommodating objects 35.4" wide x 29.9" high.
 - 3. Conveyor:
 - a. Speed: 7.875 in./sec. typical @ 50 Hz / 60 Hz, adjustable with frequency converter.
 - b. Load Capacity: 331 lbs., distributed evenly over the whole conveyor.
 - c. Height: 31.5 inches a.f.f.
 - 4. X-ray Generator:
 - a. Anode voltage, cooling: 140 kV cp., hermetically sealed oil bath.
 - b. Beam Direction: diagonal (from bottom to top).
 - 5. Performance Requirements:
 - a. Resolution (wire detectability): standard: 36 AWG, typical: 38 AWG.
 - b. Penetration (steel): standard: 25 mm, typical: 27 mm.
 - c. X-ray Dose / Inspection (typical): standard: 0.8 uSv, with HI-MAT: 1.6 uSv.
 - d. Film Safety: guaranteed up to ISO 1600.
 - e. Duty Cycle: 100%, no warm up procedure required.
 - 6. Image Generating System:
 - a. X-ray converter: L-shaped detector line.
 - b. Grey levels stored: 4096.
 - c. Image presentation: B/W, color.
 - d. Digital video memory: 1280 x 1024 / 24 bit.

- e. Image evaluation functions: Vari-MAT, O2, OS, HIGH electronic zooms: 2x to 16x.
- 7. Monitor: 17" color monitor.
- 8. Construction and Finishes: Steel construction with steel panels, mounted on roller casters.
 - a. X-ray leakage: meet all applicable laws and regulations.
 - b. CE-labeling: in compliance with guidelines 98 / 37 / EWG, 73 / 23 / EWG, 89 / 336 / EWG.
 - c. Sound pressure level: 70 dB (A).
 - d. Operating / storage temperature: 0-40 C / -20 C - +60 C.
 - e. Protection class Keyboard: IP 22.
 - f. Dimensions: 141.1" L x 50.4" W x 76.4 H.
 - g. Weight: approx. 2050 lbs.
- 9. Other Features:
 - a. Fading-in of date / time.
 - b. Luggage counter.
 - c. User id-number.
 - d. Luggage marking system (acoustic).
 - e. Display of operating mode.
 - f. Review-feature (to recall image areas no more visible).
 - g. Zoom – overview.
 - h. Free programmable keys.
 - i. HI-MAT (distinction of material groups) or equal
 - j. X-ACT or equal.
 - k. HI-TIP or equal.
 - l. HI-SPOT or equal.
 - m. SEN or equal.
 - n. Xplore or equal.
 - o. IMS (image management system) or equal.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine floor conditions for compliance with requirements for location, sizes, and other conditions affecting installation.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install X-ray machines at locations indicated to comply with X-ray machines manufacturer's written instructions.
 - 1. Test units to verify that controls and other operating components are in optimum functioning condition.

END OF SECTION 11911

**NEW PASSENGER TERMINAL
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**SECTION 12360 – QUARTZ
SURFACING COUNTERTOPS**

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 WORK INCLUDES

- A. Quartz surfacing countertops as shown on the Drawings and specified herein.

1.3 REFERENCES

- A. ASTM International:
 - 1. C97 Absorption and Bulk Specific Gravity of Dimension Stone.
 - 2. C99 Modulus of Rupture of Dimension Stone.
 - 3. C170 Compressive Strength of Dimension Stone.
 - 4. C370 Moisture Expansion.
 - 5. C501 Relative Resistance to Wear of Unglazed Tile to Taber Abraser.
 - 6. C482 Bond Strength of Ceramic Tile to Portland Cement.
 - 7. C484 Thermal Shock Resistance of Grazed Ceramic Tile.
 - 8. C531 Linear Shrinkage and Coefficient of Thermal Expansion of Chemical - Resistant Mortars, Grouts, Monolithic Surfacing and Polymer Concrete.
 - 9. C648 Breaking Strength of Ceramic Tile.
 - 10. C1026 Resistance of Ceramic Tile to Freeze Thaw Cycling.
 - 11. C1028 Static Coefficient of Friction of Ceramic Tile and Other Like Surfaces
 - 12. by the Horizontal Dynamometer Pull Meter Method.
 - 13. E84 Surface Burning Characteristics of Building Materials.
 - 14. E662 Smoke Density.
- B. American National Standards Institute (ANSI)
 - 1. ANSI Z124.6 Stain Resistance
 - 2. A108.5 Installation of Ceramic Tile with a Dry Set Portland Cement Mortar Latex Portland Cement Mortar.
 - 3. A108.10- Installation of Grout in Tile work.
 - 4. A118.4 - Latex-Portland Cement Mortar.
 - 5. A118.6- Ceramic Tile Grouts.
 - 6. A136.1- Lasers

1.4 SUBMITTALS

- A. Shop Drawings: Indicate dimensions, component sizes, fabrication details, attachment provisions and coordination requirements with adjacent work.
- B. Samples: Submit minimum 6"x6" samples. Indicate full range of color and pattern variation. Approved samples will be retained as a standard for work.
- C. Product Data: Indicate product description, fabrication information and compliance with specified performance requirements.
- D. Maintenance Data: Submit manufacturer's care and maintenance data, including repair and cleaning instructions. Include in project close-out documents.

1.5 QUALITY ASSURANCE

- A. Mockup:
 - 1. Construct mockup (if requested by Architect) 3'-0" feet wide, full depth with backsplash, skirt. In addition, include plumbing fixtures and trim.
 - 2. Approved mockup shall remain as part of the work.
- B. Delivery, Storage and Handling:
 - 1. Packaging, Shipping, Handling and Unloading; Observe manufacturer's recommendations and handle in a manner to prevent breakage. Brace parts if necessary. Transport in the near vertical position with finished face toward finished face. Do not allow finished surfaces to rub during shipping and handling.
- C. Storage and Protection:
 - 1. Store in racks in near vertical position. Prevent warpage and breakage. Store Inside away from direct exposure to sunlight. Store between 25 and 130 °F.
- D. LEED Credit Qualifications and Procedures: Provide materials compliant with the following requirements:
 - 1. Low Emitting Materials: Certify materials as necessary to achieve LEED EQ Credit Point 4.1, 4.2, 4.3 and 4.4.

1.6 WARRANTY

- A. Closeout Submittals:
 - 1. Provide manufacturer's completed warranty form.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufactures: Subject to compliance with requirements, manufactures offering products that may be incorporated into the Work include, but are not limited to the following:
- B. Approved Manufacturers:
 - 1. Cambria
 - 2. Viatera by LG Hausys America Inc.
- C. Substitutions: Under provisions of Section 01631.
- D. Basis-of-Design Product: The design is based on the products named in the Material Schedule. Subject to compliance with requirements, provide either the named products or comparable products by one of the manufactures specified. Comparable products are subject to review and approval through the submittal process specified.

2.2 MATERIALS

- A. Material:
 - 1. Homogeneous mixture containing 93% pure quartz with additions of high performance polyester resin, pigments and special effects.
- B. Thickness:
 - 1. As indicated on drawings.
- C. Identification:
 - 1. Material shall be labeled with manufacturer's identifying mark.
- D. Performance:
 - 1. Moisture Absorption: typical results 0.02%; ASTM C97
 - 2. Modulus of Rupture: typical results 6,800 psi; ASTM C99
 - 3. Compressive Strength: typical results 24,750 psi; ASTM C170
 - 4. Moisture Expansion: typical results <0.01; ASTM C370
 - 5. Abrasion Resistance: typical results 223; ASTM C501
 - 6. Bond Strength: typical results 205 psi; ASTM C482
 - 7. Thermal Shock: passes 5 cycles: ASTM 484
 - 8. Coefficient of Thermal Expansion: typical results 1.2×10^{-5} inch/°F; ASTM C531
 - 9. Breaking Strength of Tile: typical results 3,661 lbf; ASTM C648
 - 10. Resistance to Freeze Thaw Cycling: unaffected 15 cycles; ASTM C1026
 - 11. Coefficient of Friction Pull Method: .75 avg. dry / .55 avg. wet; ASTM C1028
 - 12. Surface Burning Characteristics: typical results 17; ASTM E84
 - 13. Smoke Density: flaming 196, non-flaming 69; ASTM E662
 - 14. Stain Resistance: Unaffected; ANSI Z124.6

2.3 ACCESSORIES

- A. Mounting Adhesive:
 - 1. Provide structural grade '50 year' silicone or epoxy adhesive.
 - 2. Acceptable silicone manufactures:
 - a. Dow Corning
 - b. GE Sealants
 - c. 3M
 - 3. Acceptable epoxy manufactures:
 - a. Cambria Two Part Acrylic Adhesive.
 - b. Akemi North America.
 - c. Bonstone Material Corporation.
 - d. Tenax USA.
- B. Quartz Surface Adhesive:
 - 1. Provide epoxy or polyester adhesive of a type recommended by manufacturer for application and conditions of use.
 - 2. Acceptable manufacturers:
 - a. Cambria Two Part Acrylic Adhesive.
 - b. Akemi North America.
 - c. Bonstone Material Corporation.
 - d. Tenax USA.
 - 3. Adhesive which will be visible in finished work shall be tinted to match quartz Surface.
- C. Fasteners as recommended by countertop manufacturer.
- D. Joint Sealant:
 - 1. Clear sealant of type recommended by manufacturer for application and use.
 - 2. Acceptable manufacturers:
 - a. Dow Corning.
 - b. GE Sealants.
 - c. 3M
- E. Solvent: Denatured alcohol for cleaning quartz surfacing to assure adhesion of adhesives and sealants.
- F. Cleaning Agents: Mild soap and water.

2.4 ACCESSORIES

- A. Fabricator:
 - 1. Fabricator shall be by a certified Fabricator, certified in writing by Manufacturer.

- B. Layout:
 - 1. Layout surface to minimize joints and avoid L-shaped pieces of quartz surfacing. Layout and fabricate with 'hairline' joints.
- C. Inspection of Materials:
 - 1. Inspect materials for defects prior to fabrication.
- D. Tools: Cut and polish with water cooled powered tools.
- E. Cutouts:
 - 1. Cutouts shall have a minimum of 3/8 inch (10mm) radius.
 - 2. Where edges of cutouts will be exposed in finished work; polish edges.
- F. Laminations:
 - 1. Laminate layers of quartz surfacing as required to create built up edges following procedures recommended by the manufacturer.

PART 3 EXECUTION

3.1 INSTALLER

- A. Installation shall be by a certified Installer, certified in writing by Manufacturer.

3.2 PRE-INSTALLATION EXAMINATION

- A. Site Verification:
 - 1. Verify dimensions by field measurements prior to installation.
 - 2. Verify that substrates supporting quartz surfaces are plumb, level and flat to within 1/8 inch in 10 feet and that all necessary supports and blocking are in place.
 - 3. Base Cabinets shall be secured to adjoining units and back wall.
- B. Inspection of Quartz Surfaces:
 - 1. Inspect materials for defects prior to installation.

3.3 PREPARATION

- A. Prepare Surface:
 - 1. Clean surfaces prior to installation.
- B. Protection of Quartz Surfaces:
 - 1. Protect finished surfaces from scratches. Apply masking where necessary.
 - 2. Take necessary precautions to prevent dirt grit dust and debris from other trades from contacting the surface.

3.4 INSTALLATION

- A. Install materials in accordance with manufacturer's instructions and approved shop drawings.
- B. Preliminary Installation:
 - 1. Position materials to verify the correct size.
 - 2. If size adjustments, or additional fabrication is necessary, use water cooled tools. Protect jobsite and surface from dust and water . Perform work away from installation site if possible.
 - 3. Allow gaps for expansion of not less than 1/8 inch(1.5mm) per ten feet when installed between walls or other fixed structure.
- C. Permanent Installation:
 - 1. After verification of fit and finish, clean substrate; remove loose and foreign matter which may interfere with adhesion. Clean quartz surface backside & joints with denatured alcohol.
 - 2. Horizontal surface: Apply continuous bead of mounting adhesive around perimeter of structural substrate and supports.
 - 3. Vertical surface: Apply continuous bead of mounting adhesive around perimeter. In addition, apply ¼ inch mounting adhesive bead every 8 inches on vertical center.
 - 4. Fasteners, Grout and Hardware – provide as required for installation.
 - 5. Install quartz surfacing plumb, level, square and flat to within 1/8 inch in ten Feet, non-cumulative.
 - 6. Align adjacent pieces in same plane.
- D. Joints:
 - 1. Joints Between Adjacent Pieces of Quartz Surfacing:
 - a. Joints shall be flush, tight fitting, level and neat.
 - b. Securely join adjacent pieces with Cambria Two Part Acrylic Adhesive.
 - c. Fill joints level to polished surface.
 - d. Secure adjacent quartz surfaces with vacuum clamps until adhesive hardens.
 - 2. Joints Between Quartz Surface and back splash
 - a. Seal joints with '50' year silicone sealant.

3.5 REPAIR

- A. Repair or replace damaged material in a satisfactory manner.

3.6 CLEANING

- A. Remove masking, excessive adhesive and sealants. Clean exposed surfaces with denatured alcohol.

3.7 PROTECTION

- A. Protect installed fabrications with non-staining sheet coverings.

3.8 SCHEDULES

- A. Refer to Millwork Finish Schedule for a listing of rooms requiring work of this section.

END OF SECTION 12360

**NEW PASSENGER TERMINAL
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**SECTION 12491 - HORIZONTAL
LOUVER BLINDS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Horizontal slat louver blinds.
- B. Operating hardware.

1.3 SYSTEM DESCRIPTION

- A. Horizontal metal slat louver blinds installed at window openings, manual control of raising and lowering by cord; blade angle adjustable by control wand.

1.4 SUBMITTALS

- A. Submit in accordance with Section 01300 - Submittals:
 - 1. List of proposed products and product data.
 - 2. Shop drawings showing window openings, dimensions, and attachment method.
 - a. Curved or sloped ceiling conditions: Include details for additional supports as necessary for mounting of blind brackets and hardware at sloped windows and/or curved ceiling condition.
 - 3. Samples for selection by Architect:
 - a. Slat Finish
 - b. Metal finishes.
 - 4. Window Schedule listing rooms, field verified window dimensions, quantities, type, and color.
 - 5. Manufacturer's installation and maintenance instructions.

1.5 SUSTAINABLE DESIGN SUBMITTALS

- A. Section 01361 - Sustainable Design Requirements: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.

1. Materials Resources Certificates:
 - a. Certify recycled material content for recycled content products.
 - b. Certify source for local and regional materials and distance from Project site.
 2. Indoor Air Quality Certificates:
 - a. Certify volatile organic compound content for each interior adhesive and sealant and related primer.
- C. Product Cost Data: Submit cost of products to verify compliance with Project sustainable design requirements. Exclude cost of labor and equipment to install products.
1. Provide cost data for the following products:
 - a. Products with recycled material content.
 - b. Local and regional products.

1.6 QUALITY ASSURANCE

- A. Manufacturer: Company specializing in manufacturing the products specified in this Section with three years documented experience.

1.7 EXTRA MATERIALS

- A. Section 01700 – Contract Closeout: Spare parts and maintenance products.
- B. Supply five percent (5%) of each size, color, and surface finish specified.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site under provisions of Section 01631 – Products and Substitutions.
- B. Deliver blinds wrapped and crated in a manner to prevent damage to components or marring of surfaces.
- C. Store and protect products under provisions of Section 01631 – Products and Substitutions.
- D. Store in a clean, dry area, laid flat and blocked off ground to prevent sagging, twisting, or warping.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
- B. Approved Manufacturers:
 - 1. Levolor
 - 2. Draper
 - 3. Hunter Douglas
- C. Substitutions: Under provisions of Section 01631.
- D. Size: Refer to Drawings for size and locations.

2.2 MATERIALS

- A. Riviera DustGuard 1" Blind manufactured by Levolor.
- B. Materials:
 - 1. Headrail: .025" thick Tomized steel. "U" shaped, 1" high x 1-9/16" wide. All hardware enclosed in the headrail.
 - 2. Guardian Tilter: .042" Tomized steel housing with a self-lubricating nylon, automatically disengaging worm and gear mechanism to eliminate overdrive.
 - 3. Tilt Wand: Transparent with a hexagonal cross section 5/16" across flats.
 - 4. Cord Lock: .042" thick Tomized steel. Crashproof.
 - 5. Drums and Cradles: Provided with each ladder. Drums shall be .031" thick Tomized steel. Cradles are .042" thick Tomized steel.
 - 6. Installation Brackets: .048" thick Tomized steel with a rivet-hinged safety locking front cover to permit removal of headrail without lateral movements.
 - 7. Ladders (slat supports): Distance between slats shall not exceed 19.5 mm.
 - 8. Slats: 5000 series magnesium aluminum alloy only, not to include reprocessed metals. Slats shall be nominally 1" wide and the thickness of the slats shall be nominally .0085".
 - a. Finish: DustGuard, color as selected by the Architect from the manufacturers standards finishes.
 - b. Slat Design: Unperforated.
 - 9. Bottomrail: .031" thick Tomized steel.
 - 10. Guide Cables or wires as required to enable blinds to follow window orientation on sloped windows.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that openings are ready to receive the work.
- B. Do not commence fabrication until field measurements are confirmed.
- C. Ensure structural supports are correctly placed.
- D. Beginning of installation means installer accepts existing substrate.

3.2 INSTALLATION

- A. Install blinds in accordance with manufacturer's instructions.
- B. Secure in place with concealed fasteners.

3.3 TOLERANCES

- A. Maximum Variation of Gap at Window Opening Perimeter: 1/4 inch.
- B. Maximum Offset From Level: 1/8 inch.

3.4 ADJUSTING

- A. Adjust work under provisions of Section 01700 – Contract Closeout.
- B. Adjust blinds for smooth operation.

3.5 CLEANING

- A. Clean work under provisions of 01710 – Clean Up.

3.6 SCHEDULE

- A. Refer to Room Finish Schedule and drawing set for a listing of rooms requiring work of this section.

END OF SECTION 12491

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**SECTION 12493 -
BLACKOUT SHADES**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes: Manually operated, roll-up, fabric opaque window shade system for complete blackout of window opening including side and bottom channels, headbox, opacity plates, manual operator, and mounting hardware.

1.3 SUBMITTALS

- A. Submit in accordance with Section 01300 - Submittals:
 - 1. List of proposed products and product data.
 - 2. Shop drawings showing window openings, dimensions, and attachment method.
 - a. Curved or sloped ceiling conditions: Include details for additional supports as necessary for mounting of shade brackets and hardware at sloped windows and/or curved ceiling condition.
 - 3. Samples for selection by Architect:
 - a. Fabrics.
 - b. Metal finishes.
 - 4. Window Shade Schedule listing rooms, field verified window dimensions, quantities, type of shade, fabric, and color.
 - 5. Manufacturer's installation and maintenance instructions.

1.4 SUSTAINABLE DESIGN SUBMITTALS

- A. Section 01361 - Sustainable Design Requirements: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
 - 1. Materials Resources Certificates:
 - a. Certify recycled material content for recycled content products.
 - b. Certify source for local and regional materials and distance from Project site.
 - 2. Indoor Air Quality Certificates:
 - a. Certify volatile organic compound content for each interior adhesive and sealant and related primer.

- C. Product Cost Data: Submit cost of products to verify compliance with Project sustainable design requirements. Exclude cost of labor and equipment to install products.
 - 1. Provide cost data for the following products:
 - a. Products with recycled material content.
 - b. Local and regional products.

1.5 QUALITY ASSURANCE

- A. Manufacturer: Company specializing in manufacturing the products specified in this Section with three years documented experience.

1.6 EXTRA MATERIALS

- A. Section 01700 – Contract Closeout: Spare parts and maintenance products.
- B. Supply five percent (5%) of each size, color, and surface finish specified.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver window shades until building is enclosed and construction within spaces where shades will be installed is substantially complete.
- B. Deliver products in manufacturer's original, unopened, undamaged containers with labels intact.
- C. Label containers and shades according to Window Shade Schedule.

1.8 WARRANTY

- A. Provide under provisions of Section 01700 - Contract Closeout: 5 years warranty against defects in materials and workmanship for clutch operating mechanism.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufactures: Subject to compliance with requirements, manufactures offering products that may be incorporated into the Work include, but are not limited to the following:
- B. Approved Manufacturers:
 - 1. MechoShade
 - 2. Draper
 - 3. Lutron

- C. Substitutions: Under provisions of Section 01631.
- D. Size: Refer to Drawings for size and locations.

2.2 OPAQUE WINDOW SHADE SYSTEM

- A. Type: Bead chain and clutch operated, roll-up, fabric, opaque window shade system; LightBloc FlexShade System as manufactured by Draper, Inc.
- B. Specialty sloped shades: Include side guide wires with roller tube (idler rollers) as required to map the movement of shades and precisely follow the window orientation on sloped windows. Refer to drawings for locations and slope angle.
- C. Method of installation: Mounted inside of window opening and extending from head to sill and jamb to jamb.
- D. Operation: Bead chain and clutch operating mechanism allowing shade to stop when chain is released. Designed never to need adjustment or lubrication. Provide preset limit stops to prevent shade from being raised or lowered too far.
 - 1. Clutch mechanism: Fabricated from high carbon steel and molded fiberglass reinforced polyester.
 - 2. Control loop: Stainless steel bead chain hanging at side of window.
 - 3. Chain location: Right hand side when facing window from interior.
- E. Roller: Fabricated from extruded aluminum or steel. Diameter, wall thickness, and material selected by manufacturer to accommodate shade size. Provide with roller idler assembly of molded nylon and zinc-plated steel pin. Sliding pin to allow easy installation and removal of roller.
- F. Headbox: Fabrication from 0.06 inch thick extruded aluminum sections with endcaps and opacity plates.
 - 1. Size: 4-1/8 inches high by 3-1/2 inches wide by length required for shade being provided.
 - 2. L-shaped removable front face and bottom cover and L-shaped back and top.
- G. Endcaps: Stamped steel with universal design suitable for mounting to ceiling, wall, and jamb. Provide size compatible with roller size and fasteners appropriate for installation conditions.
- H. Side Channels: Double chamber fabricated from 0.06 inch thick extruded aluminum sections. One chamber accepts fabric and contains groove for fabric retainer. Other chamber accepts fabric guide and channel locator.
- I. Sill channel: 0.06 inch thick extruded aluminum channel to receive slat bar and prevent light leakage.
- J. Slat bar: Extruded aluminum bar attached to bottom of shade. Bar does not retract into headbox.

- K. Channel locator: Injected molded nylon insert to align side and sill channels with headbox.
- L. Fabric guide: Plated steel transition for fabric rolling into side channel.
- M. Fabric retainer: System designed to prevent disengagement of fabric from side channels due to normal variations of air pressure caused by doors opening, HVAC systems, and temperature differences between room and window well. System consists of horizontal steel stays installed in shade, covered with fabric, and spaced at regular intervals. Grommets installed through stays are held within groove of side channel chamber.
- N. Opacity plates: Steel plates with rubber O rings installed on endcaps to eliminate light leakage.
- O. Exposed aluminum finish: White baked enamel paint.

2.3 FABRIC

- A. Material: Close woven fiberglass base textile with sun-resistant vinyl film bonded to each side, opaque with minimum tensile strength of 190 pounds for warp and 180 pounds for fill; SunBloc Series SB9000 as provided by Draper, Inc.
- B. Color and pattern: As selected by Architect from manufacturer's standard range.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Field verify window dimensions prior to fabrication.
- B. Coordinate requirements for blocking and structural supports to ensure adequate means for installation of window shades.

3.2 INSTALLATION

- A. Install window shades at locations indicated on Drawings and approved Window Shade Schedule.
- B. Comply with shade manufacturer's written instructions.
- C. Install headbox, side channels, and sill channel with sealant specified in Section 07920 - Joint Sealers to eliminate light leaks at perimeter of shade system.
- D. Position shades level, plumb, and at proper height relative to adjacent construction. Secure with fasteners recommended by manufacturer.

3.3 PROTECTING

- A. Clean shade assemblies and protect from damage from construction operations. If damage occurs, remove and replace damaged components or entire unit as required to provide units in their original, undamaged condition.

3.4 SCHEDULE

- A. Refer to Room Finish Schedule for a listing of rooms requiring work of this section.

END OF SECTION 12493

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**SECTION 12494 – MOTORIZED
ROLLER SHADES**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Motor-operated Roller Shades, Controls, Mounting Brackets and Hardware.
- B. Related Sections include the following:
 - 1. Division 16 - Electrical: Electric service for motors, motor controls, internal communication, low voltage wiring and data transfer, and connection to Internet.

1.3 ACTION SUBMITTALS

- A. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Styles, material descriptions, dimensions of individual components, profiles, features, finishes and operating instructions.
 - 3. Storage and handling requirements and recommendations.
 - 4. Mounting details and installation methods.
 - 5. Typical wiring diagrams including integration of motor controllers with building management system, audiovisual and lighting control systems as applicable.
- B. Shop Drawings: Show fabrication and installation details for roller shades, including shadeband materials, their orientation to rollers, and their seam and batten locations.
 - 1. Motor-Operated Shades: Include details of installation and diagrams for power, signal, and control wiring.
 - 2. Curved or sloped ceiling conditions: Include details for additional supports as necessary for mounting of shade brackets and hardware at sloped windows and curved ceiling condition.

- C. Samples for Initial Selection: For each finish product specified, one set of shade cloth options representing manufacturer's full range of available colors and patterns.
 - 1. Include Samples of accessories involving color selection.
- D. Samples for Verification: For each finish product specified, one complete set of shade components, unassembled, demonstrating compliance with specified requirements. Shadecloth sample and aluminum finish sample as selected. Mark face of material to indicate interior faces.
 - 1. Shadeband Material: Not less than 12 inches square. Mark inside face of material if applicable.
 - 2. Roller Shade: Full-size operating unit, not less than 16 inches wide by 36 inches long.
 - 3. Installation Accessories: Full-size unit, not less than 10 inches long.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For each type of shadeband material, for tests performed by a qualified testing agency.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For roller shades to include in maintenance manuals.
 - 1. Include methods for maintaining roller shades, precautions regarding cleaning materials and methods, instructions for operating hardware and controls.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Roller Shades: Full-size units equal to 5 percent of quantity installed for each size, color, and shadeband material indicated, but no fewer than two units.

1.7 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: Passes NFPA 701-99 small and large-scale vertical burn. Materials tested shall be identical to products proposed for use.
- B. Shadecloth Anti-Microbial Characteristics: 'No Growth' per ASTM G 21 results for fungi ATCC9642, ATCC 9644, and ATCC9645.

1.8 QUALITY ASSURANCE

- A. **Manufacturer Qualifications:** Obtain roller shades system through one source from a single manufacturer with a minimum of ten years experience in manufacturing products comparable to those specified in this section and minimum of five projects of similar scope and size.
- B. **Installer Qualifications:** Fabricator of products, or Installer trained and certified by the manufacturer with a minimum of ten years experience in installing products comparable to those specified in this section.
- C. **Requirements for Roller Shade Installer/Contractor:**
 - 1. Roller Shade Hardware, shade fabric, motor, and all related controls shall be furnished and installed as a complete two-way communicating system and assembly.
 - 2. Roller Shade Installer/Contractor shall list all components and systems included in their bid, including but not limited to, the prime manufacturer of the motor control and automated equipment and shall be financially responsible for any change orders and/or back charges required by the BMS, AV, or Lighting Control Systems contractors to interface with the automatic solar tracking system and the motorized roller shade system.
- D. **Mockup:** Prepare a mockup of one roller shade assembly for evaluation of mounting, appearance and accessories, and to set quality standards for materials and execution.
 - 1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
 - 3. Do not proceed with remaining work until mock-up is accepted by Architect

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roller shades in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

1.10 FIELD CONDITIONS

- A. **Environmental Limitations:** Do not install roller shades until construction and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. **Field Measurements:** Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements

before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.11 WARRANTY

- A. Manufacturer's Special Warranty: Manufacturer agrees to repair, restore, or replace shade system components that fail in materials or workmanship within specified warranty periods.
 - 1. Failures include, but are not limited to, operation or control system failure, including excessive malfunctions; excessive wear; unusual deterioration or aging of materials; the need for excessive maintenance; abnormal noise or vibration; and similar unusual, unexpected, and unsatisfactory conditions.
 - 2. Warranty Periods:
 - a. Motorized Roller Shade Hardware and Shadecloth: 15 years.
 - b. Roller Shade Motors and Motor Control Systems: 10 years.
 - c. Roller Shade Installation: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Draper Inc.
 - 2. Lutron Electronics Co., Inc.
 - 3. MechoShade Systems, Inc.
 - 4. Nysan Solar Control Inc.; Hunter Douglas Company.
- B. Source Limitations: Obtain roller shades from single source from single manufacturer.

2.2 MOTOR-OPERATED, SINGLE-ROLLER SHADES

- A. Motorized Operating System: Provide factory-assembled, shade-operator system of size and capacity and with features, characteristics, and accessories suitable for conditions indicated, complete with electric motor and factory-prewired motor controls, power disconnect switch, enclosures protecting controls and operating parts, and accessories required for reliable operation without malfunction. Include wiring from motor controls to motors. Coordinate operator wiring requirements and electrical characteristics with building electrical system.

1. Electrical Components: Listed and labeled as defined in NFPA 70, either UL or ETL or other testing agency acceptable to authorities having jurisdiction, marked for intended use, and tested as a system. Individual testing of components will not be acceptable in lieu of system testing.
2. Electric Motor: Tubular, asynchronous (non-synchronous) motors, with built-in reversible capacitor, temperature Class A, thermally protected, maintenance free with line voltage power supply equipped with locking disconnect plug assembly furnished with each motor enclosed in roller.
 - a. Electrical Characteristics: Single phase, 110 V, 60 Hz. Maximum current draw for each shade motor of 0.9 amps @ 110 V.
 - b. Use motors rated at the same nominal speed for all shades in the same room.
 - c. Total hanging weight of shade band shall not exceed 80 percent of the rated lifting capacity of the shade motor and tube assembly. Spring assisted lift systems shall not be accepted.
3. Motor Control System: Provide motor control system with the following performance capabilities:
 - a. Noise criteria: Maximum 50dBa measured at five feet from unit.
 - b. Upper and lower stopping points (operating limits) of shade bands shall be programmable into motors via a hand held removable program module / configurator.
 - c. Intermediate stopping positions for shades shall allow for up to three (3) repeatable and precise aligned positions.
 - d. Up to 103 available alignment points including 3-user programmable predefined intermediate positions, for a total of 5-defined and aligned positions. All shades on the same switch circuit with the same opening height shall align at each intermediate stopping position.
 - e. Two inherent methods of control:
 - 1) Cost effective, low voltage, hardwired dry-contact for local switch or 3rd party control operation.
 - 2) Expandable to 2-way communication network with IQ/485-NI to support whole building low-voltage control and integration.
 - f. Uniform or Regular Modes of Operation:
 - 1) Uniform mode shall allow for shades to only move to intermediate stop positions.
 - 2) Regular mode shall allow for shades to move to both intermediate stop positions, plus any position desired between the upper and lower limits as set by the installer.
 - g. Wall Switches:
 - 1) IQ-Switch: in 5 button, single gang, low voltage.
 - h. Expandable IQ-485-NI: Shall allow addressability of each motor or group of motors on a two-way addressable communication network for whole building or overlapping multi-level control. System Features include:
 - 1) 5 @ IQ, Local or Master ports
 - 2) 1 @ Photocell input for automated control of shades. One photocell per elevation.
 - 3) Software Addressable IQ Ports support Multi-Level control with 8 addresses per port

- 4) IQ-485 MS Bus, 485 shall allow up to 65000 addresses controlling up to 500,000 motors per network
 - 5) Shall allow for variety of switch and other user interface options including RF and Ethernet (IP)
 - 6) Shall support 3rd party control integration via RS232 and Ethernet (IP).
 - i. Capable of accepting input from building automation control system.
- B. Rollers: Extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without excessive deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.
- 1. Direction of Shadeband Roll: Reverse, from front of roller.
 - 2. Shadeband-to-Roller Attachment: Removable spline fitting integral channel in tube. Shade band shall be made removable / replaceable without having to remove shade roller from shade brackets. Any use of: adhesive, adhesive tapes, staples, and/or rivets shall not be accepted
- C. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.
- 1. Provide shade hardware constructed of minimum 1/8-inch (3.18 mm) thick plated steel, or heavier, thicker, as required to support 150 percent of the full weight of each shade. Plastic components without use of steel angle construction do not meet the intent of this specification and shall not be accepted.
 - 2. Provide shade hardware system that allows for field adjustment of motor or replacement of any operable hardware component without requiring removal of brackets, regardless of mounting position (inside, or outside mount).
 - 3. Provide and install steel mounting supports as necessary to allow plumb and level installation of shade hardware at sloped windows and curved roof condition. Shades on south elevation to be installed in 'stepped' configuration in order to conform with curved roof condition.
- D. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to join up to three inline rollers that are operated by one roller drive-end assembly.
- E. Shadebands:
- 1. Shadeband Material: Light-filtering fabric.
 - 2. Shadeband Bottom (Hem) Bar: Extruded aluminum, continuous for entire width of shade band and with the following characteristics:
 - a. Capability for use with guide cables as required.
 - b. Suitable for both vertical-drop and sloped shades in order to maintain uniform appearance of shades

2.3 SHADEBAND MATERIALS

- A. Shadeband Material Flame-Resistance Rating: Comply with NFPA 701. Testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- B. Light-Filtering Fabric: Visually Transparent Single-Fabric Shadecloth woven from opaque, non-raveling yarn, stain and fade resistant.
 - 1. Source: Roller-shade manufacturer.
 - 2. Type: Woven PVC-coated fiberglass and PVC-coated polyester.
 - 3. Weave: Basketweave.
 - 4. Thickness: 0.025 inch, minimum.
 - 5. Weight: 12.0 oz./sq. yd., minimum.
 - 6. Roll Width: as indicated on drawings.
 - 7. Openness Factor: 2 – 3 percent.
 - 8. Color: As selected by Architect from manufacturer's full range meeting specified requirements.

2.4 ROLLER-SHADE FABRICATION

- A. Product Safety Standard: Fabricate roller shades to comply with WCMA A 100.1, including requirements for flexible, chain-loop devices; lead content of components; and warning labels.
- B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F:
 - 1. Outside of Jamb Installation: Width and length as indicated, with terminations between shades of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.
- C. Shadeband Fabrication: Fabricate shadebands without battens or seams.

2.5 ACCESSORIES

- A. Static guide cables and idler cables (as needed) to enable shades to follow window orientation on sloped windows.
- B. Safety brackets to be used per manufacturer's recommendations where high-bay or monumental shade conditions exist.
- C. Photo cell per orientation, to be externally mounted and integrated with shade control system.

2.6 SCHEDULE

- A. Roller Shade Schedule: Refer to the Drawings for locations.

1. Shade Type WT-1: Motorized interior solar roller shades on South elevation as shown on referenced Drawings, and related motor control requirements systems. Shades shall have capability of being controlled by AV, BMS or Lighting System via RS-232, RS-485 or dry contact closures. Include the following as scheduled and as indicated on the Drawings:
 - a. Safety brackets where required per manufacturers guidelines for high-bay or monumental shade conditions.
 - b. Sun-activated controller (SAC) with externally-mounted photo cell to integrate with shade motor control system.
2. Shade Type WT-2: Motorized interior solar roller shades on East elevation as shown on Drawings, and related motor control systems. Shades shall have capability of being controlled by AV, BMS or Lighting System via RS-232, RS-485 or dry contact closures. Include the following as scheduled and as indicated on the Drawings:
 - a. Guide cables and idler rollers (as needed) for application to sloped windows.
 - b. Sun-activated controller (SAC) with externally-mounted photo cell to integrate with shade motor control system.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, accurate locations of connections to building electrical system, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 ROLLER-SHADE INSTALLATION

- A. Install roller shades level, plumb, square, and true according to manufacturer's written instructions, and located so shade band is not closer than 2 inches (50 mm) to interior face of glass. Allow proper clearances for window operation hardware.
- B. Electrical Connections: Connect motor-operated roller shades to building electrical system.

3.4 ADJUSTING

- A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.5 TESTING

- A. Test electrically operated shades for proper operation. Repair or replace units, which do not perform correctly.
- B. Test sun-activated control sensors for proper operation. Repair or replace units, which do not perform correctly.

3.6 CLEANING AND PROTECTION

- A. Clean roller-shade surfaces after installation, according to manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.
- C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

3.7 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain motor-operated roller shades.

END OF SECTION 12494

**NEW PASSENGER TERMINAL
DULUTH INTERNATIONAL AIRPORT
DULUTH, MN**

**SECTION 12500- PUBLIC
AREA FURNITURE**

PART 1 :GENERAL

1.1 DESCRIPTION

- A. This section includes loose Seating, Tables, and Miscellaneous Furniture and Accessories for the public portion of the new passenger terminal.
- B. Client is eligible for GSA pricing. However, all items do not need to be purchased under these contracts.
- C. All furniture with wood/ veneer components to be **FSC certified**.
- D. Products shall be furnished, delivered and installed. Refer to furniture plans for locations, quantities, and layouts.
- E. Products are to be standard catalogued items for which printed literature, specifications, and certified test results are available. If a product is custom/ or special – it must be accompanied by a detailed line drawing with dimensions.
- F. Products shall be new and in current production. Products shall not be made obsolete within 5 years after purchase, to be available to the Client for additional purchases during that time period.
- G. Used, refurbished, shopworn, demonstrator, prototype, modified, or discontinued products are not acceptable.
- H. Refer to the General Services Administration contract for additional details concerning procurement, processes and procedures as it relates to this package.
- I. Should technical specifications and drawings contradict, contractor shall provide the greater quantity and/or quality and refer questions to designer.
- J. Electronic drawings will be provided to the vendor upon signing of the appropriate file release form.
- K. Vendor to provide final estimate before ordering to allow Client to add or deduct product as necessary to meet given budget.

1.2 SUBMITTALS

- A. Product Data: Provide product data for all specified furniture.
- B. Samples: Submit samples of finish, color, and texture.
- C. Shop drawings: Provide installation drawings as required.

1.3 SUSTAINABLE DESIGN SUBMITTALS

- A. Section 01361 - Sustainable Design Requirements: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
 - 1. Materials Resources Certificates:
 - a. Certify recycled material content for recycled content products.
 - b. Certify source for local and regional materials and distance from Project site.
 - 2. Indoor Air Quality Certificates:
 - a. Certify volatile organic compound content for each interior adhesive and sealant and related primer.
- C. All wood and veneer components to be **FSC certified**- sufficient documentation must accompany submittal.
- D. Product Cost Data: Submit cost of products to verify compliance with project sustainable design requirements. Exclude cost of labor and equipment to install products.
 - 1. Provide cost data for the following products:
 - a. Products with recycled material content.
 - b. Local and regional products.

1.4 QUALITY ASSURANCE

- A. All products shall be standard manufacturer's products unless otherwise specified.

1.5 QUALIFICATIONS

- A. Manufacturer:
 - 1. The furniture manufacturer shall be a company specializing in the manufacture of commercial office furniture for a minimum of five (5) years.
 - 2. The systems furniture manufacturer shall provide to the Client certification that each member of the Vendor's workforce is fully qualified to install the furniture proposed.

- B. Vendor:
 1. The installing Vendor's local office shall have been established for a minimum of five (5) years.
 2. The Vendor shall be a company specializing in furnishing, delivering and installing commercial systems furniture, and shall have substantial experience with the manufacturer's products. Installation personnel shall be readily identifiable by uniform or other means acceptable to the Client.

1.6 REGULATORY REQUIREMENTS

- A. Fire Safety Characteristics: Provide material identical to that tested for the following fire performance characteristics, per test method indicated below, performed by UL or other testing and inspection organization acceptable to the Building Code Official. Identify components with appropriate markings of applicable testing and inspecting organizations placed out of general view (semi-concealed, but readily accessed without dismantling the component or assembly):
 1. Pass Critical Radiant Flux Test (Flame Spread Index) – Class 1 – NBS minimum 0.455 watts per cubic centimeter, per NFPA 258/ASTM E 648.
 2. Pass Smoke Chamber Test – 25 or less per UL 992.
 3. Pass Smoke Density no greater than 450 per NFPA 25/ASTM E 662.
- B. Electrical Components: UL Approved.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Products shall be new and shall be delivered in the manufacturer's original and unopened packaging or crating. Under certain pre-approved conditions, the Client may allow products to be delivered "blanket wrapped", if transported by manufacturer owned vehicles, and all products are clearly identified.
- B. Products shall be packaged to prevent damage during transit and storage.
- C. Vendor shall be responsible for the receipt, handling and storage of products and supplies necessary for a complete installation.
- D. Vendor shall comply with manufacturer's requirements for handling and shall take all necessary precautions to prevent damage.
- E. Vendor shall be fully responsible to completely remove all packaging, crating, and expended installation/cleaning supplies from property on a daily basis – none shall be allowed to accumulate on site. All expended materials shall be recycled or disposed of in a legal manner.

1.8 COORDINATION

- A. The Vendor and the Furniture manufacturer shall coordinate and cooperate with Client representatives and the Interior Designer.
- B. Vendor shall attend all project meetings as requested by the Client and/or Interior Designer.
- C. **All color and finish selections will be made post bid.** The finish and color selections will be issued as part of a master color document once all manufactures finish material submittals have been received and selected.

1.9 WARRANTY

- A. All products shall have a minimum of 10-year written non-prorated warranty, unless industry standards dictate otherwise, agreeing to replace without charge all defective materials, workmanship, and/or installation.
- B. Removal and replacement of defective or non-conforming product or installation shall be accomplished in a manner to minimize disturbance to Client functions.
- C. Each manufacturer must provide statement with bid describing and guaranteeing the warranties for all furniture products and components.

PART 2: SEATING

2.1 BENCH SEATING- GENERAL

- A. Acceptable Manufacturers and Products
 - 1. Cumberland: Alton Bench
 - 2. Substitutions: Under provisions of Section 01631.
- B. CH-1:
 - 1. Manufacturer: Cumberland
 - 2. Line: Alton Bench- 3 Seat
 - 3. Description: Bench w/ metal frame & upholstered seat
 - 4. Dimensions: 72" W x 18" D x 18"H
 - 5. Finishes: Metal Frame: Standard
Upholstered Seat: COM fabric \$40/yard

2.2 LOUNGE SEATING - PASSENGER WAITING

- A. Acceptable Manufacturers and Products
 - 1. Cumberland- Alia Metal Lounge Series
 - 2. Substitutions: Under provisions of Section 01631.

- B. CH-2:
1. Manufacturer: Cumberland
 2. Line: Alia Metal – w/ Wood Surround
 3. Description: Lounge chair
 4. Dimensions: 31" W x 32"D x 29"H
 5. Finishes: Metal Frame: Standard
Veneer Back: Standard-tbd
Upholstered Seat & Back: COM fabric \$45/ yard

2.3 LOUNGE SEATING- 3rd Floor

- A. Acceptable Manufacturers and Products
1. Davis- Palette Lounge Seating Series
 2. Substitutions: Under provisions of Section 01631.
- B. CH-3:
1. Manufacturer: Davis
 2. Line: Palette Lounge Seating
 3. Description: Set= Two module pallet with two armless seats +
Three Three module pallet with two armless seats and
one round tablet w/ mount.
 4. Dimensions: Layout as shown on drawing
 5. Finishes: Metal Legs: Standard
Veneer Platform: Standard-tbd
Table: wood top- tbd
Upholstered Seat & Back: COM fabric \$45/ yard
 6. Note: Ganging connectors as required

2.4 HOLD ROOM DINING CHAIR

- A. Acceptable Manufacturers and Products
1. Davis – Prime Chair Series
 2. Substitutions: Under provisions of Section 01631.
- B. CH-4:
1. Manufacturer: Davis
 2. Line: Prime Chair Series
 3. Description: Armless ribbed wood shell with upholstered seat,
liner, four legs
 4. Dimensions: 19" W x 21" D x 32" H SH:18"
 5. Finishes: Metal Legs: Standard
Wood Finish: Standard – tbd
Upholstered Seat: Grade 1
 6. Note: Include glides

PART 3: TABLES

3.1 OCCASIONAL TABLES- PUBLIC AREAS

- A. Acceptable Manufacturers and Products
 - 1. Cumberland – Circo
 - 2. Substitutions: Under provisions of Section 01631.
- B. T-1:
 - 1. Manufacturer: Cumberland
 - 2. Line: Circo
 - 3. Description: Chrome cylinder side table w/ stone top
 - 4. Dimensions: 24" Dia. x 20" H
 - 5. Finishes: Chrome Base
Stone Top: standard top

3.2 HOLD ROOM DINING TABLE

- A. Acceptable Manufacturers and Products
 - 1. Davis- Veer Table Series
 - 2. Substitutions: Under provisions of Section 01631.
- B. T-2:
 - 1. Manufacturer: Davis
 - 2. Line: Veer Table Series – Indoor
 - 3. Description: Circular laminate table w/ birch plywood edge with clear varnish & textured stainless steel column base
 - 4. Dimensions: 42" Dia. x 29" H
 - 5. Finishes: HPL Table Top: Standard - tbd
Metal Base: Standard- tbd

PART 4 :MISCELLANEOUS FURNITURE & ACCESSORIES

4.1 WASTE RECEPTACLES

- A. Acceptable Manufacturers and Products
 - 1. Landscapeforms Inc- Lakeside Waste Receptacle
 - 2. Substitutions: Under provisions of Section 01631.
- B. M-1:
 - 1. Manufacturer: Landscapeforms Inc.
 - 2. Line: Lakeside Waste Receptacle
 - 3. Description: Steel freestanding w/ top opening, Cut grass design pattern

4. Dimensions: 21" Dia. x 36" H (30 gallon capacity)
5. Finishes: Metal: Standard – tbd
6. Note: Includes removable black polyurethane liner

4.2 WASTE/ RECYCLING RECEPTACLES

A. Acceptable Manufacturers and Products

1. Magnuson Group Inc, - Valuta Modular Series
2. Substitutions: Under provisions of Section 01631.

B. M-2:

1. Manufacturer: Magnuson Group
2. Line: Valuta Modular Series
3. Description: Waste/ Recycling Receptacles- modular unit includes:
Waste (40 Gallon)
Paper (20 Gallon)
Cans/ Plastic/ Glass (20 Gallon)
4. Dimensions: 20 Gallon Unit: 9" W x18" D x 33" H
40 Gallon Unit: 18" W x18" D x 33" H
Total Configuration: 36" W x18" D x 33" H
5. Finishes: Powdercoat: Standard – tbd
6. Note: Includes internal bag holding system & lettering identifying receptacle type & connecting hardware as required for modular unit.

4.3 PLANTERS

A. Acceptable Manufacturers and Products

1. Landscapeforms Inc- Plaza Planter
2. Substitutions: Under provisions of Section 01631.

B. M-3:

1. Manufacturer: Landscapeforms Inc.
2. Line: Plaza Planter
3. Description: Freestanding wood slat panel planter w/
metal corners and adjustable stainless steel
glides
4. Dimensions: 48" Square x 32" H (Capacity 159 gallon)
5. Finishes: Wood: Standard-tbd
Metal Powdercoat Corners: Standard- tbd
6. Note: Include coordinating molded fiberglass liner w/
drain hole on metal grid bottom.

4.4 AIRPORT SECURITY STANCHIONS

- A. Acceptable Manufacturers and Products
 - 1. Lavi Industries
 - 2. Substitutions: Under provisions of Section 01631.

- B. M-4:
 - 1. Manufacturer: Lavi Industries
 - 2. Line: Beltrac 3000 Series
 - 3. Description: Security stanchion base, post, & slow retracting belt w/ standard 4- way connection point
 - 4. Dimensions: Base: 14" Dia x 40"H
Post Dia: 2-3/4"
Belt Length: 7'-0"
 - 5. Finishes: Belt: Standard Color selections
Base & Post: Aluminum: Standard - tbd
 - 6. Note: Provide layout/ quantity as shown in CBP Primary Processing Room #237

PART 5 : INSTALLATION & PROCEDURES

5.1 EXAMINATION

- A. Vendor shall perform field inspection of the project site to verify all conditions effecting the proposed installation.
- B. The vendor shall review the drawings, specifications, and other related documents.
- C. The vendor shall report any conditions that would adversely affect the installation. By proceeding with the installation the vendor is indicating acceptance of existing conditions.

5.2 PREPARATION

- A. The Prime Contractor shall pre-clean/prepare the work site floor surfaces prior to delivery of the systems furniture.
- B. Vendor shall verify appropriate cleaning procedures with the Prime Contractor; shall clean floor surfaces free of dust, debris, and loose particles immediately prior to installation of systems furniture, and shall maintain cleanliness throughout the entire installation.

5.3 INSTALLATION

- A. Vendor shall provide a written schedule indicating compliance with the project schedule.

- B. Vendor shall comply with all manufacturers' site preparation, handling, storage, and installation requirements.
- 5.4 PREPARTATION
- A. Vendor shall provide electrician to connect electrical on system panels, receptacles, etc. to building's electrical power and data.
- 5.5 CLEANING
- A. Vendor shall wipe down and inspect all components at time of installation, and immediately prior to acceptance inspection, to ensure the installation is complete and free from defects- ready for occupancy and in show room condition.
 - B. Vendor shall repair all defects in a manner suitable to the Client, or shall replace the defective/damaged components promptly at the sole discretion of the Client.
 - C. Vendor shall perform daily cleaning, inspection cleaning, final cleaning and other final procedures as required by the Client.
 - D. Vendor shall provide maintenance instructions to the Client.

END OF SECTION

**NEW PASSENGER TERMINAL
DULUTH INTERNATIONAL AIRPORT
DULUTH, MN**

**SECTION 12501
OFFICE FURNITURE**

PART 1 :GENERAL

1.1 DESCRIPTION

- A. This section includes all loose Seating, Tables, Office Furniture Systems, Desking Casegoods, and Miscellaneous Furniture and Accessories.
- B. Client is eligible for GSA pricing for furniture located on the 1st and 2nd floors. Third floor furniture is eligible for state contract pricing. However, all items do not need to be purchased under these contracts.
- C. All furniture with wood/ veneer components to be **FSC certified**.
- D. Products shall be furnished, delivered and installed. Refer to furniture plans for locations, quantities, and layouts.
- E. Products are to be standard catalogued items for which printed literature, specifications, and certified test results are available. If a product is custom/ or special – it must be accompanied by a detailed line drawing with dimensions.
- F. Products shall be new and in current production. Products shall not be made obsolete within 5 years after purchase, to be available to the Client for additional purchases during that time period.
- G. Used, refurbished, shopworn, demonstrator, prototype, modified, or discontinued products are not acceptable.
- H. Refer to the General Services Administration contract for additional details concerning procurement, processes and procedures as it relates to this package.
- I. Should technical specifications and drawings contradict, contractor shall provide the greater quantity and/or quality and refer questions to designer.
- J. Electronic drawings will be provided to the vendor upon signing of the appropriate file release form.
- K. Vendor to provide final estimate before ordering to allow Client to add or deduct product as necessary to meet given budget.

1.2 SUBMITTALS

- A. Product Data: Provide product data for all specified furniture.

- B. Samples: Submit samples of finish, color, and texture.
- C. Shop drawings: Provide installation drawings as required.

1.3 SUSTAINABLE DESIGN SUBMITTALS

- A. Section 01361 - Sustainable Design Requirements: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
 - 1. Materials Resources Certificates:
 - a. Certify recycled material content for recycled content products.
 - b. Certify source for local and regional materials and distance from Project site.
 - 2. Indoor Air Quality Certificates:
 - a. Certify volatile organic compound content for each interior adhesive and sealant and related primer.
- C. All wood and veneer components to be **FSC certified**- sufficient documentation must accompany submittal.
- D. Product Cost Data: Submit cost of products to verify compliance with project sustainable design requirements. Exclude cost of labor and equipment to install products.
 - 1. Provide cost data for the following products:
 - a. Products with recycled material content.
 - b. Local and regional products.

1.4 QUALITY ASSURANCE

- A. All products shall be standard manufacturer's products unless otherwise specified.

1.5 QUALIFICATIONS

- A. Manufacturer:
 - 1. The furniture manufacturer shall be a company specializing in the manufacture of commercial office furniture for a minimum of five (5) years.
 - 2. The systems furniture manufacturer shall provide to the Client certification that each member of the Vendor's workforce is fully qualified to install the furniture proposed.
- B. Vendor:
 - 1. The installing Vendor's local office shall have been established for a minimum of five (5) years.
 - 2. The Vendor shall be a company specializing in furnishing, delivering and installing commercial systems furniture, and shall

have substantial experience with the manufacturer's products. Installation personnel shall be readily identifiable by uniform or other means acceptable to the Client.

1.6 REGULATORY REQUIREMENTS

- A. Fire Safety Characteristics: Provide material identical to that tested for the following fire performance characteristics, per test method indicated below, performed by UL or other testing and inspection organization acceptable to the University Building Code Official. Identify components with appropriate markings of applicable testing and inspecting organizations placed out of general view (semi-concealed, but readily accessed without dismantling the component or assembly):
 - 1. Pass Critical Radiant Flux Test (Flame Spread Index) – Class 1 – NBS minimum 0.455 watts per cubic centimeter, per NFPA 258/ASTM E 648.
 - 2. Pass Smoke Chamber Test – 25 or less per UL 992.
 - 3. Pass Smoke Density no greater than 450 per NFPA 25/ASTM E 662.
- B. Electrical Components: UL Approved.

1.7 PREINSTALLATION CONFERENCE

- A. Convene one week prior to commencing work of this Section.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Products shall be new and shall be delivered in the manufacturer's original and unopened packaging or crating. Under certain pre-approved conditions, the Client may allow products to be delivered "blanket wrapped", if transported by manufacturer owned vehicles, and all products are clearly identified.
- B. Products shall be packaged to prevent damage during transit and storage.
- C. Vendor shall be responsible for the receipt, handling and storage of products and supplies necessary for a complete installation.
- D. Vendor shall comply with manufacturer's requirements for handling and shall take all necessary precautions to prevent damage.
- E. Vendor shall be fully responsible to completely remove all packaging, crating, and expended installation/cleaning supplies from property on a daily basis – none shall be allowed to accumulate on site. All expended materials shall be recycled or disposed of in a legal manner.

1.9 COORDINATION

- A. The Vendor and the Furniture manufacturer shall coordinate and cooperate with Client representatives and the Interior Designer.
- B. Vendor shall attend all project meetings as requested by the Client and/or Interior Designer.
- C. **All color and finish selections will be made post bid.** The finish and color selections will be issued as part of a master color document once all manufactures finish material submittals have been received and selected.

1.10 WARRANTY

- A. All products shall have a minimum of 10-year written non-prorated warranty, unless industry standards dictate otherwise, agreeing to replace without charge all defective materials, workmanship, and/or installation.
- B. Removal and replacement of defective or non-conforming product or installation shall be accomplished in a manner to minimize disturbance to Client functions.
- C. Each manufacturer must provide statement with bid describing and guaranteeing the warranties for all furniture products and components. Where applicable, a statement must also be provided stating the number of years that the current wireway systems can be purchased by the Client to be retrofitted onto the systems furniture and computer table products.

PART 2: SEATING

2.1 PUBLIC BENCH SEATING- GENERAL

- A. CH-1: **Not part of this section. Refer to 12500 Public Area Furniture**
- B. CH-2: **Not part of this section. Refer to 12500 Public Area Furniture**
- C. CH-3: **Not part of this section. Refer to 12500 Public Area Furniture**
- D. CH-4: **Not part of this section. Refer to 12500 Public Area Furniture**

2.2 ADMIN LEVEL- LOUNGE SEATING

- A. Acceptable Manufacturers and Products
 - 1. Krug: Carlyle Soft Seating
 - 2. Substitutions: Under provisions of Section 01631.

B. CH-5:

1. Manufacturer: Krug
2. Line: Carlyle Soft Seating
3. Description: Lounge chair w/ metal frame and upholstered arms, seat & back
4. Dimensions: 33" W x 30"D x 32"H Seat Height : 17.5"
5. Finishes: Metal Frame: Standard
Upholstered Seat & Back: COM fabric \$35/ yard

C. CH-6:

1. Manufacturer: Krug
2. Line: Carlyle Soft Seating
3. Description: Lounge loveseat w/ metal frame and upholstered arms, seat & back.
4. Dimensions: 60"W x 30"D x 32"H Seat Height : 17.5"
5. Finishes: Metal Frame: Standard
Upholstered Seat & Back: COM fabric \$35/ yard

2.3 ADMIN LEVEL-EXECUTIVE TASK

A. General Specifications for all task chairs:

1. Ten year warranty.
2. Hard casters for chairs located in carpeted rooms, soft casters for chairs located in rooms with hard surfaces.

B. Acceptable Manufacturers and Products

1. Krug: Dorso S- Line (High Back)
2. Substitutions: Under provisions of Section 01631.

C. CH-7:

1. Manufacturer: Krug
2. Line: Dorso S- Line (High Back)
3. Description: Executive high back chair w/ adjustable arms, height adjustable, seat slider, and headrest
4. Dimensions: 24"W x 22"D
5. Finishes: Upholstered Back: Grade 3
Upholstered Seat: Grade 3
Trim/ Base: Polished Aluminum

2.4 ADMIN LEVEL-TASK SEATING

A. General Specifications for all task chairs:

1. Ten year warranty.
2. Hard casters for chairs located in carpeted rooms, soft casters for chairs located in rooms with hard surfaces.
3. Fully ergonomic task chair w/ pneumatic seat height adjustment, fully adjustable arms, adjustable seat, and tension control.

B. Acceptable Manufacturers and Products

1. Haworth: Zody
2. Steelcase- Reply (Mesh Back)
3. Keilhauer -Morley (Knit Back)
4. Substitutions: Under provisions of Section 01631.

C. CH-8:

1. Manufacturer: Haworth
2. Line: Zody
3. Description: Ergonomic task chair w/ pneumatic seat height adjustment, 4D fully adjustable arms, lumbar support, back lock,& forward tilt
4. Finishes: Mesh Back: Standard-color to be selected
Upholstered Seat: Grade 1
Trim/ Base: Standard plastic finish

2.5 ADMIN LEVEL- CONFERENCE SEATING

A. General Specifications for all task chairs:

1. Ten year warranty.
2. Hard casters for chairs located in carpeted rooms, soft casters for chairs located in rooms with hard surfaces.
3. Conference chair w/ pneumatic seat height adjustment & fixed arms

B. Acceptable Manufacturers and Products

1. Krug: Dorso S- Line (Mid Back)
2. Substitutions: Under provisions of Section 01631.

C. CH-9:

1. Manufacturer: Krug
2. Line: Dorso S- Line (Mid Back)
3. Description: Conference chair mid back w/ pneumatic seat height adjustment and fixed arms.
4. Dimensions: 24"W x 22"D x 42"H Seat Height: 18-22"
5. Finishes: Metal Frame: standard- color to be selected
Upholstered Back: Grade 3
Upholstered Seat: Grade 3
Trim/ Base: Polished Chrome

2.6 ADMIN LEVEL- ASSEMBLY SEATING

A. Acceptable Manufacturers and Products

1. Haworth – X99 Seminar Chair
2. Substitutions: Under provisions of Section 01631.

- B. CH-10:
1. Manufacturer: Haworth
 2. Line: X99- Seminar chair
 3. Description: Nesting mesh back arm chair w/ folding seat & casters
 4. Dimensions: 22" W x 24" D x 36" H Seat Height 18"
 5. Finishes: Back: Standard Soft Mesh- tbd
Seat: Upholstered: COM \$35 yd Dimensions:

2.7 ADMIN LEVEL- GUEST SEATING

- A. Acceptable Manufacturers and Products
1. Keilhauer –Flit Armchair
 2. Haworth: Very Side 4-Leg w/ Armchair Upholstered
 3. Krug: Dorso Guest S-Line 4- Leg w/ Armchair
 4. Substitutions: Under provisions of Section 01631.
- B. CH-11:
1. Manufacturer: Keilhauer
 2. Line: Flit Armchair
 3. Description: Armchair w/ upholstered seat & back, plastic glides
 4. Dimensions: 22" W X 22" D x 32" H Seat Height: 18"
 5. Finishes: : Metal Frame: Standard
Upholstered Seat & Back: Grade A or 1
 6. Note: Include Glides

2.8 BASE GRADE - TASK CHAIR

- A. Acceptable Manufacturers and Products
1. Sit on It: InFlex
 2. Substitutions: Under provisions of Section 01631.
- B. CH-12:
1. Manufacturer: Sit On It
 2. Line: InFlex
 3. Description: Basic Task w/ Upholstered seat +back height adjustable w/ arms
 4. Dimensions: 25" W x 21" D x 33" H
 5. Finishes: Metal Frame: Standard – tbd
Upholstered Seat + Back: Grade 1

2.9 BASE GRADE – SIDE CHAIR

- A. Acceptable Manufacturers and Products
 - 1. Sit on It: InFlex
 - 2. Substitutions: Under provisions of Section 01631.

- B. CH-13:
 - 1. Manufacturer: Sit On It
 - 2. Line: In Flex
 - 3. Description: Armless plastic shell chair
 - 4. Dimensions: 20" W x 22" D x 33" H
 - 5. Finishes: Metal Frame: Standard – tbd
Plastic Seat + Back: Standard – tbd
 - 6. Note: Include glides

2.10 BASE GRADE –LAB STOOL

- A. Acceptable Manufacturers and Products
 - 1. Hon: Olson Seating – Lab Task Stool
 - 2. Substitutions: Under provisions of Section 01631.

- B. CH-14:
 - 1. Manufacturer: Hon
 - 2. Line: Olson Seating - Lab Task Stool
 - 3. Description: Armless height adjustable swivel stool.
 - 4. Finishes: Metal Frame: Standard – tbd
Plastic Seat + Back: Standard – tbd

PART 3: TABLES

- A. T-1: **Not part of this section. Refer to 12500 Public Area Furniture**
- B. T-2: **Not part of this section. Refer to 12500 Public Area Furniture**

3.2 ADMIN LEVEL- OCCASIONAL TABLES

- A. Acceptable Manufacturers and Products
 - 1. Krug: Virtue
 - 2. Substitutions: Under provisions of Section 01631.

- B. T-3:
 - 1. Manufacturer: Krug
 - 2. Line: Virtue Occasional Table

3. Description: Square wood occasional table
4. Dimensions: 30" x 30" square
5. Finishes: Wood Frame: Standard

C. T-4:

1. Manufacturer: Krug
2. Line: Virtue Occasional Table
3. Description: Round wood occasional table w/ glass top
4. Dimensions: 36" Dia.
5. Finishes: Wood Frame: Standard
Glass Top: Frosted

3.3 ADMIN LEVEL- MEETING TABLES

A. Acceptable Manufacturers and Products

1. Haworth:Planes
2. HBF- Costa
3. Krug – Revo
4. Substitutions: Under provisions of Section 01631.

B. T-5:

1. Manufacturer: Haworth
2. Line: Planes
3. Description: Rectangular table with nesting flip top Y-leg
4. Dimensions: 36"D x 72"L x 29" H
5. Finish: Metal Base- Standard
Laminate Top: Standard w/ 1-3/16" vinyl edge band
6. Note: Nesting feature w/ lockable casters

C. T-6:

1. Manufacturer: Haworth
2. Line: Planes
3. Description: Rectangular powered nesting flip top training table w/ Y-leg. Powered & data module centered (single sided recessed flip box w/ 2 power outlets & 2 data outlets w/ cord)
4. Dimensions: 36"D x 72"L x 29" H
5. Finish: Metal Base- Standard
Laminate Top: Standard w/1-3/16" vinyl edge band
6. Note: Nesting feature w/ lockable casters & Y-leg vertical wire manager & horizontal stretcher wire management

- D. T-7
1. Manufacturer: Haworth
 2. Line: Planes
 3. Description: Rectangular powered training table w/perimeter leg. **Powered & data module centered (single sided recessed flip box with 2 power outlets & 2 data outlets w/ cord) w/ cable base
 4. Dimensions: 48"D x 72"L x 29" H
 5. Finish: Metal Legs- Standard
Wood Top & Base: Standard w/ 2" wood edgeband
 6. Note: **Only central table in grouping to receive cable base and power data module. Others will be Non-powered.
- E. T-8:
1. Manufacturer: Haworth
 2. Line: Planes
 3. Description: Round table with one piece top & interior 4- legs
 4. Dimensions: 42" Dia.
 5. Finishes: Metal Frame: Standard
Laminate Top: Standard w/ 2" vinyl edgeband
- F. T-9:
1. Manufacturer: Haworth
 2. Line: Planes
 3. Description: Rectangular table with one piece top and perimeter leg
 4. Dimensions: 36" x 72"
 5. Finishes: Metal Base- Standard
Laminate Top: Standard w/ 2" vinyl edgeband
- G. T-10:
1. Manufacturer: Haworth
 2. Line: Planes
 3. Description: Rectangular table with one piece top and perimeter leg
 4. Dimensions: 36" x 60"
 5. Finishes: Metal Base- Standard
Top Standard Veneer w/ 2" wood edgeband- tbd
- H. T-11:
1. Manufacturer: Haworth
 2. Line: Planes
 3. Description: Rectangular height adjustable table w/ two C- legs w/ open space (no stretcher bar). Single Touch pad for 27" -46" height range
 4. Dimensions: 29"D x 60" L Height Ranges from 27"-46" H
 5. Finishes: Metal Base- Standard

6. Note: Laminate Top: Standard w/1-3/16" vinyl edgeband
Include adjustment glides

3.4 BASE GRADE - GENERAL TABLES

A. Acceptable Manufacturers and Products

1. Haworth : 450 Series
2. Steelcase: Answer
3. Herman Miller: Anywhere
4. Substitutions: Under provisions of Section 01631.

B. T-12:

1. Manufacturer: Haworth
2. Line: 450 Series
3. Description: Rectangular table with x-base metal frame
4. Dimensions: 26" D x 60" W x 29"H
5. Finish: Metal Frame: Standard
Top: Laminate top w/ 1-3/16" vinyl edge
6. Note: Installation: Must be secured to wall for floor for security reasons- provide required hardware.

C. T-13:

1. Manufacturer: Haworth
2. Line: 450 Series
3. Description: Round table with x-base metal frame
4. Dimensions: 54" Dia. x 29"H
5. Finish: Metal Frame: Standard
Top: Laminate top w/ 1-3/16" vinyl edge

D. T-14:

1. Manufacturer: Haworth
2. Line: 450 Series
3. Description: Square table with x-base metal frame
4. Dimensions: 30" Sq. x 29"H
5. Finish: Metal Frame: Standard
Top: Laminate top w/ 1-3/16" vinyl edge

PART 4: FREESTANDING WOOD DESKING CASEGOODS FURNITURE

A. General Specifications for all wood casegoods furniture:

1. 1-5/16" thick veneered particle board core
2. Drawer slides have ball bearing movement with positive out-step and hold in catch. File drawers and box drawers have a load bearing capacity of 90 lbs.

3. European style hinging w/ 95 degree opening and fully adjustable.
4. Shop drawing elevations will be required from dealer.
5. Key per individual office. All file cabinets and drawers per office shall be keyed alike.
6. Hardware pull style: Linear or similar
7. (3) Grommets per office –exact location tbd
8. Intermediate back panels to allow for easy access to wall outlets
9. End panels must be provided for finish end run- as shown on drawings.
10. All wood and veneer components to be **FSC certified**

B. Acceptable Manufacturers and Products

1. Haworth : Masters
2. Steelcase: Elective Elements 6
3. Herman Miller: Canvas
4. Krug: Artemis
5. Substitutions: Under provisions of Section 01631.

4.1 WOOD WORK SURFACES

A. WD-D1:

1. Manufacturer: Haworth
2. Line: Masters
3. Description: T- Desk w/ Full Height Inset Modesty
4. Dimensions: 30"D x 54"L
5. Finish: Standard Veneer top w/ solid wood edge- tbd

B. WD-D2:

1. Manufacturer: Haworth
2. Line: Masters
3. Description: Rectangular Straight Work surface
4. Dimensions: 24"D x 102"L
5. Finish: Standard Veneer top w/ solid wood edge- tbd

C. WD-D3:

1. Manufacturer: Haworth
2. Line: Masters
3. Description: Rectangular Straight Work surface
4. Dimensions: 24"D x 42"L
5. Finish: Standard Veneer top w/ solid wood edge- tbd

D. WD-D4:

1. Manufacturer: Haworth
2. Line: Masters
3. Description: T-Desk w/ Full Height Inset Modesty
4. Dimensions: 30"D x 60"L
5. Finish: Standard Veneer top w/ solid wood edge- tbd

- E. WD-D5:
1. Manufacturer: Haworth
 2. Line: Masters
 3. Description: Straight Rectangular
 4. Dimensions: 24"D x 60"L
 5. Finish: Standard Veneer top w/ solid wood edge- tbd
- F. WD-D6:
1. Manufacturer: Haworth
 2. Line: Masters
 3. Description: Corner Work surface
 4. Dimensions: 42" D x 42"W
 5. Finish: Standard Veneer top w/ solid wood edge- tbd
- G. WD-D7:
1. Manufacturer: Haworth
 2. Line: Masters
 3. Description: Straight Rectangular
 4. Dimensions: 24"D x 114"L
 5. Finish: Standard Veneer top w/ solid wood edge- tbd

4.2 WOOD OVERHEAD CABINET STORAGE

- A. WD-S1:
1. Manufacturer: Haworth
 2. Line: Masters
 3. Description: Overhead storage unit with single high hinged doors with six open cubbies below. Includes task lights with fascia length of the unit and corresponding full height + length fabric tack panels.
 4. Dimensions: 84" W x 24"H
 5. Finish: Standard Veneer- tbd.
Tack panels: Grade 1
 6. Note: Special height for tack panels to fit under underneath cubbies.
- B. WD-S2:
1. Manufacturer: Haworth
 2. Line: Masters
 3. Description: Overhead storage unit with two open shelves
Include task lights with fascia length of the unit and corresponding full height + length fabric tack panels.
 4. Dimensions: 72" W x 17" H
 5. Finish: Standard Veneer- tbd.
Tack panels: Grade 1

- C. WD-S3:
1. Manufacturer: Haworth
 2. Line: Masters
 3. Description: Overhead storage unit with single high hinged doors with six open cubbies below. Includes task lights with fascia length of the unit and corresponding full height + length fabric tack panels.
 4. Dimensions: 72" W x 24"H
 5. Finish: Standard Veneer- tbd.
Tack panels: Grade 1
 6. Note: Special height for tack panels to fit under underneath cubbies.

4.3 WOOD FILING STORAGE

- A. WD-F1:
1. Manufacturer: Haworth
 2. Line: Masters
 3. Description: Freestanding mobile wood pedestal Box/Box/File
 4. Dimensions: 15" W x 21" D x 22" H
Finish: Standard Veneer- tbd
- B. WD-F2:
1. Manufacturer: Haworth
 2. Line: Masters
 3. Description: Two drawer fixed under work surface wood lateral file- wood case & drawers
 4. Dimensions: 36" W X 18"D x 28" H
Finish: Standard Veneer- tbd

4.4 PERSONAL STORAGE TOWERS

- A. WD-F3:
1. Manufacturer: Haworth
 2. Line: Masters
 3. Description: Wood personal storage tower – five high open shelf cabinet on one side and full height wardrobe with rod on opposite side. Includes glides. Hand as shown.
 4. Dimensions: 30" W x 24" D x 69" H
 5. Finish: Standard Veneer- tbd
 6. Note: Left or right handed as shown on drawings

B. WD-F4:

1. Manufacturer: Haworth
2. Line: Masters
3. Description: Wood personal storage tower – five high open shelf cabinet on one side and full height wardrobe with rod on opposite side. Include glides. Hand as shown.
4. Dimensions: 36" W x 24" D x 69" H
5. Finish: Standard Veneer- tbd
6. Note: Left or right handed as shown on drawings.

PART 5: SYSTEMS FURNITURE

5.1 General Specifications for all systems furniture:

- A. Assembly of all components shall be possible with conventional tools locally available. If special tools are required three (3) sets shall be furnished to the Client at manufacturer's expense.
- B. The manufacturer and furniture dealer shall provide all brackets, stabilizers, supports, hangers, clips, panel-supported work surface legs, connectors, ganging devices, cover plates, (2) grommets per station, stabilizers, panel wall mounts, systems furniture component wall track, and other miscellaneous hardware as necessary to form a physically and visually completed assembly.
- C. Vertical and horizontal wire management systems for exposed electrical and communications wire (concealment system) shall be provided.
 1. Horizontal and vertical wire managers shall provide separate channels for power and communications wiring.
 2. Horizontal and vertical wire managers shall be prefinished in standard metal or plastic, and shall secure, conceal, and accommodate outlet cords, as well as electrical and communication wiring.
 3. Horizontal wire managers shall be supplied for mounting under all work surfaces. The wire managers shall be attached to the underside of the work surface, without damage to the work surface.
- D. Acceptable Manufacturers and Products
 1. Haworth: Compose
 2. Steelcase: Answer
 3. Herman Miller: Vivo
 4. Substitutions: Under provisions of Section 01631.

5.2 PANEL MOUNTED -WORK SURFACES

- A. General Specifications for all panel mounted work surfaces:
1. Laminate surface with vinyl edge – Grade 1, color to be selected. Unless otherwise noted.
 2. Panel mounted as per drawings.
 3. Include all mounting hardware, brackets, etc. for complete installation.
- B. WS-1:
1. Manufacturer: Haworth
 2. Line: Compose
 3. Description: Rectangular straight work surface
 4. Dimensions: 24"D x 66" W
- C. WS-2:
1. Manufacturer: Haworth
 2. Line: Compose
 3. Description: Rectangular straight work surface
 4. Dimensions: 30"D x 96" W
- D. WS-3:
1. Manufacturer: Haworth
 2. Line: Compose
 3. Description: Rectangular straight work surface
 4. Dimensions: 24"D x 42" W
- E. WS-4:
1. Manufacturer: Haworth
 2. Line: Compose
 3. Description: Rectangular straight work surface
 4. Dimensions: 30"D x 48" W
- F. WS-5:
1. Manufacturer: Haworth
 2. Line: Compose
 3. Description: Rectangular straight Countertop
 4. Dimensions: 12"D x 96" W
 5. Finish: Standard wood veneer- tbd
- G. WS-6:
1. Manufacturer: Haworth
 2. Line: Compose
 3. Description: Rectangular straight Countertop
 4. Dimensions: 12"D x 48" W
 5. Finish: Standard wood veneer- tbd

5.3 WALL MOUNTED- WORK SURFACES

- A. General Specifications for all wall mounted work surfaces:
1. Laminate surface with vinyl edge – Grade 1, color to be selected.
 2. Wall mounted as per drawings.
 3. Include all mounting hardware, brackets, etc. for complete installation.
- B. D-1:
1. Manufacturer: Haworth
 2. Line: Compose
 3. Description: Rectangular straight works surface
 4. Dimensions: 24"D x 48"W
- C. D-2:
1. Manufacturer: Haworth
 2. Line: Compose
 3. Description: Rectangular straight work surface
 4. Dimensions: 24"D x 96"W
- D. D-3:
1. Manufacturer: Haworth
 2. Line: Compose
 3. Description: Rectangular work surface
 4. Dimensions: 30"D x 60"W
- E. D-4:
1. Manufacturer: Haworth
 2. Line: Compose
 3. Description: Rectangular work surface
 4. Dimensions: 24"D x 54"W
- F. D-5:
1. Manufacturer: Haworth
 2. Line: Compose
 3. Description: Rectangular work surface
 4. Dimensions: 24"D x 78"W
- G. D-6:
1. Manufacturer: Haworth
 2. Line: Compose
 3. Description: Rectangular work surface
 4. Dimensions: 30"D x 78"W
- H. D-7:
1. Manufacturer: Haworth
 2. Line: Compose

- 3. Description: Rectangular work surface
- 4. Dimensions: 30"D x 96"W

5.4 FABRIC COVERED PANELS

- A. General Specifications for all fabric covered panels:
 - 1. Include metal top, end, corner, and connector trim caps to complete installation. Include cable management, side covers and adjustable glides.
 - 2. UL listed and Class A fire retardant rating
 - 3. Electrical harness distributes double sided four circuit power within a cable management raceway. **Only spine panel shall be powered at base raceway.** Furniture contractor responsible for any hardwiring of data or electrical necessary for powered panels.
 - 4. Fabric Price Grade 2 (in range of 1-4), colors to be selected.
 - 5. Approximately 3" panel width monolithic panel.
- B. PS-1:
 - 1. Manufacturer: Haworth
 - 2. Line: Compose
 - 3. Description: Monolithic fabric acoustical panel
 - 4. Dimensions: 24"W x 42"H
 - 5. Finish: Grade 2- fabric – tbd
- C. PS-2:
 - 1. Manufacturer: Haworth
 - 2. Line: Compose
 - 3. Description: Monolithic fabric acoustical panel
 - 4. Dimensions: 48"W x 66"H
 - 5. Finish: Grade 2- fabric – tbd
- D. PS-3:
 - 1. Manufacturer: Haworth
 - 2. Line: Compose
 - 3. Description: Monolithic fabric acoustical panel
 - 4. Dimensions: 48"W x 42"H
 - 5. Finish: Grade 2- fabric – tbd
- E. PS-4:
 - 1. Manufacturer: Haworth
 - 2. Line: Compose
 - 3. Description: Monolithic fabric acoustical panel
 - 4. Dimensions: 24"W x 66"H
 - 5. Finish: Grade 2- fabric – tbd

- F. PS-5:
1. Manufacturer: Haworth
 2. Line: Compose
 3. Description: Monolithic fabric acoustical panel
 4. Dimensions: 48"W x 42"H
 5. Finish: Grade 2- fabric – tbd
- G. PS-6:
1. Manufacturer: Haworth
 2. Line: Compose
 3. Description: Monolithic fabric acoustical panel
 4. Dimensions: 48"W x 34"H
 5. Finish: Grade 2- fabric – tbd
- H. PS-7:
1. Manufacturer: Haworth
 2. Line: Compose
 3. Description: Monolithic fabric acoustical panel
 4. Dimensions: 30" W x 34"H
 5. Finish: Grade 2- fabric – tbd

5.5 OVERHEAD STORAGE CABINETS AND SHELVES

- A. General Specifications for all overhead storage cabinets and bookshelves:
1. Mounts to wall or panel as per plan.
 2. All overhead cabinets to have under cabinet task lights. Under cabinet lights to be Standard Ballast Task Lights with T-8 cool white bulb included, rapid start magnetic ballast, hardwired or 8' cord that can be routed. Must be UL listed. **Lights should be daisy chained together to utilize the least number of outlets.** Light size to correspond with overhead size.
 3. Paint Grade 1 or Wood Veneer as specified, color to be selected.
 4. Include locks.
 5. See furniture plans layouts – verify handedness of individual components.
- B. S-1:
1. Manufacturer: Haworth
 2. Line: Compose
 3. Description: Overhead storage cabinet, standard mount, square door.
 4. Dimensions: 36" W
 5. Finish: Paint Grade 1- tbd

- C. S-2:
1. Manufacturer: Haworth
 2. Line: Compose
 3. Description: Overhead storage cabinet, standard mount, square door.
 4. Dimensions: 48" W
 5. Finish: Paint Grade 1- tbd
- D. S-3:
1. Manufacturer: Haworth
 2. Line: Compose
 3. Description: Panel mounted Storage box with metal frame and (2) wood sliding door panels
 4. Dimensions: 96" W x 16" H
 5. Finish: Wood veneer sliding door – Standard Frame: Paint Grade 1- tbd
- E. S-4:
1. Manufacturer: Haworth
 2. Line: Compose
 3. Description: Wall mounted Storage box with metal frame and (2) wood sliding door panels
 4. Dimensions: 72" W x 16" H
 5. Finish: Wood veneer sliding door – Standard Frame: Paint Grade 1- tbd

PART 6: FILING AND STORAGE CABINETS

6.1 FREESTANDING PEDESTAL FILES

- A. General Specifications for all freestanding pedestal file cabinets:
1. Lifetime warranty.
 2. Pedestal file box drawers have adjustable drawer divider, file drawers to have 2 file converters.
 3. Pedestals have full-extension steel ball-bearing slides.
 4. Pedestal file drawers hold letter or legal size.
 5. Key per individual office or cubicle. All file cabinets per cubicle shall be keyed alike.
 6. Pull Style: J-Pull
 7. Paint Grade 1, color to be selected.
- B. Acceptable Manufacturers and Products
1. Haworth: X Series
 2. Steelcase: Universal
 3. Herman Miller : Quadrant
 4. Substitutions: Under provisions of Section 01631.

- C. F-1:
1. Manufacturer: Haworth
 2. Line: X Series
 3. Description: Freestanding Mobile Pedestal Box/Box/File
 4. Dimensions: 15" W x 22"D x 26"H
 5. Pull: J- Pull style
 6. Finish: Paint Metal Grade 1- tbd
- D. F-1B:
1. Manufacturer: Haworth
 2. Line: X Series
 3. Description: Freestanding Mobile Pedestal Box/Box/File
 4. Dimensions: 15" W x 22"D x 26"H
 5. Pull: J- Pull style
 6. Finish: Paint Metal Grade 1- tbd (sides, back + top)
Standard Wood (Front Side)

6.2 UNDER-COUNTER LATERAL FILE

- A. F-2:
1. Manufacturer: Haworth
 2. Line: X Series
 3. Description: Two drawer fixed under work surface lateral file-
Inset front style
 4. Dimensions: 36" W X 18"D x 28" H
 5. Pull: J- Pull style
 6. Finish: Paint Grade 1 – tbd
- B. F-2B:
1. Manufacturer: Haworth
 2. Line: X Series
 3. Description: Two drawer fixed under work surface lateral file-
Inset front style
 4. Dimensions: 36" W X 18"D x 28" H
 5. Pull: J- Pull style
 6. Finish: Paint Grade 1 – tbd (back, sides + top)
Standard Wood Veneer Front- tbd

6.3 PERSONAL STORAGE TOWERS

- A. F-3:
1. Manufacturer: Haworth
 2. Line: X Series
 3. Description: Metal personal storage tower – five high
tower w/ bookcase upper storage unit. Full height
valet on one side- opposite side to have F/F

- pedestal bottom and open bookcase top.
Item #: JTBB-6324 or JTBJ-6324
4. Dimensions: 24" W x 24" D x 56" H
 5. Pull: J-Pull style – touch latch door
 6. Finish: Paint Grade 1 – tbd (back, sides + top)
Standard Wood Veneer Front- tbd
 7. Note: Let or right handed as shown on drawings.

- B. F-4:
1. Manufacturer: Haworth
 2. Line: X Series
 3. Description: Three high storage cabinet with adjustable shelving and doors.
 4. Dimensions: 36" W x 18" D x 40" H
 5. Pull: J-Pull style – touch latch door
 6. Finish: Paint Grade 1 – tbd

6.4 FREESTANDING STEEL LATERAL FILE & COMBINATION CABINETS

- A. F-5:
1. Manufacturer: Haworth
 2. Line: X Series
 3. Description: Five high combination with valet- full height valet on one side- opposite side with (3) high lateral files with (2) high open shelves with door.
 4. Dimensions: 42" W x 18" D x 64" H
 5. Pull: J- Pull style- touch latch door
 6. Finish: Paint Grade 1- tbd

- B. F-6:
1. Manufacturer: Haworth
 2. Line: X Series
 3. Description: Three high drawer lateral file- Inset front style
 4. Dimensions: 36" W x 18" D x 40" H
 5. Pull: J- Pull style
 6. Finish: Paint Grade 1- tbd

- C. F-7:
1. Manufacturer: Haworth
 2. Line: X Series
 3. Description: Five- high metal storage cabinet w/ adjustable shelving in interior of cabinet and (2) full height doors.
 4. Dimensions: 30" W x 18" D x 64" H
 5. Pull: Standard w/ lock
 6. Finish: Paint Grade 1- tbd

- D. F-8:
1. Manufacturer: Haworth
 2. Line: X Series
 3. Description: Three high drawer lateral file- Inset front style
 4. Dimensions: 36" W x 18" D x 40" H
 5. Pull: J- Pull style
 6. Finish: Paint Grade 1- tbd
 7. Note: Include laminate common file tops to match entire length of file run. Not to exceed (3) pieces for entire run.

6.5 FLAT FILES & HIGH BASE STAND

- A. Acceptable Manufacturers and Products
1. Safco Products
 2. Substitutions: Under provisions of Section 01631.
- B. F-9:
1. Manufacturer: Safco Products
 2. Line: Flat Files
 3. Description: 10- Drawer steel flat files for 30" x 42" documents
 4. Dimensions: 46" W x 36"D
 5. Pull: Standard pull wire type
 6. Finish: Standard powder coat metal finish - tbd
 7. Note: Include closed base stand for this model type

PART 7 : MODULAR CASEWORK

- A. General specifications for all modular casework.
1. Ten year warranty
 2. All base cabinets to include HPL countertop and 4" backsplash
 3. All hardware to be standard wire pull type
 4. All cabinets to be keyed alike
 5. No lighting to be included
- B. Acceptable Manufacturers and Products
1. Amcase
 2. Substitutions: Under provisions of Section 01631.
- C. MC-1:
1. Manufacturer: Amcase
 2. Line: Modular Casework
 3. Description: Base cabinet: counter height w/ (4) doors and (1) adjustable interior shelf

- Upper cabinets: 2 high w/ (4) doors and (1) adjustable interior shelf
4. Dimensions: Base: 60" x 24" D x 35" H (Overall)
Uppers: 60" x 12" D x 30" H (Overall)
 5. Finishes: Cabinets: Standard thermofused melamine
Countertop: Standard HPL
 6. Notes: Include all hardware required for complete installation

D. MC-2:

1. Manufacturer: Amcase
2. Line: Modular Casework
3. Description: Base cabinet: counter height w/ (6) doors and (1) adjustable interior shelf
Upper cabinets: 2 high w/ (6) doors and (1) adjustable interior shelf
4. Dimensions: Base: 84" x 24" D x 35" H (Overall)
Uppers: 84" x 12" D x 30" H (Overall)
5. Finishes: Cabinets: Standard thermofused melamine
Countertop: Standard HPL
6. Notes: Include all hardware required for complete installation

PART 8 :MISCELLANEOUS FURNITURE & ACCESSORIES

- A. M-1: **Not part of this section. Refer to 12500 Public Area Furniture**
- B. M-2: **Not part of this section. Refer to 12500 Public Area Furniture**
- C. M-3: **Not part of this section. Refer to 12500 Public Area Furniture**
- D. M-4: **Not part of this section. Refer to 12500 Public Area Furniture**

8.2 INFORMATION BOARD W/ RAIL SYSTEM

- A. Acceptable Manufacturers and Products
 1. Haworth : Planes- Horizontal Wall Rail System
 2. Substitutions: Under provisions of Section 01631.
- B. M-5:
 1. Manufacturer: Haworth
 2. Line: Planes- Horizontal Wall Rail System
 3. Description: Top + bottom rail system with (1) information writable surface board.
 4. Mounting: Mount horizontally on wall surface
 5. Dimensions: Rail: 60" (Field Cut)

- 6. Finishes: Metal Rail: Standard- tbd
Information Board: White
- 7. Note: Include wall cleats + end caps for complete Installation.

8.3 CATERING CART

- A. Acceptable Manufacturers and Products
 - 1. Haworth: Planes- Catering Cart
 - 2. Substitutions: Under provisions of Section 01631.
- B. M-6:
 - 1. Manufacturer: Haworth
 - 2. Line: Planes- Catering Cart
 - 3. Description: Mobile Cart w/ dual handles and (1) adjustable Interior shelf.
 - 4. Dimensions: 36" W x 19" D x 36" H
 - 5. Finishes: Cart Body: Laminate- tbd
Metal Rails + handles: Standard
 - 6. Note: Include lockable casters

8.4 MOBILE MEDIA CENTER

- A. Acceptable Manufacturers and Products
 - 1. Berco: Monorail Media Center
 - 2. Substitutions: Under provisions of Section 01631.
- B. M-7:
 - 1. Manufacturer: Berco
 - 2. Line: Monorail- Flat Panel Media Center (MN1-FPM)
 - 3. Description: Mobile Media Center w/plasma screen mounting, (4) door cabinet base with (1) adjustable shelving per cabinet, grommets in the rear of cabinet,
 - 4. Dimensions: 60"W x 28"D x 66"H
 - 5. Finishes: Metal Base: Standard - tbd
Cabinet body: Standard laminate- tbd
 - 6. Note: Include lockable casters, plasma screen by others (not included) screen size not to exceed 52" plasma.

8.5 KEYBOARD TRAYS

- A. Acceptable Manufacturers and Products
 - 1. Humanscale – Keyboard System
 - 2. Substitutions: Under provisions of Section 01631.

- B. M-8:
1. Manufacturer: Humanscale
 2. Line: Keyboard System
 3. Description: 2G System w/ synthetic leather palm w/ gel
Standard 900 Platform w/ 8" Swivel Mouse (Dual)
 4. Finishes: Mechanism: Black
Platform: Black
 5. Note: Provide a keyboard tray only for private office/
workstations shown on furniture drawings.

8.6 CREDENZA

- A. Acceptable Manufacturers and Products
1. Haworth –Planes Credenza
 2. Substitutions: Under provisions of Section 01631.
- B. M-9:
1. Manufacturer: Haworth
 2. Line: Planes Credenza
 3. Description: Credenza w/ (4) doors and (2) interior adjustable
shelves.
 4. Dimensions: 72" W x 20" D x 29" H
 5. Pull: Standard- tbd
 6. Finishes: Standard Laminate- tbd

8.7 PODIUMS/ LECTURNS

- A. Acceptable Manufacturers and Products
1. Nucraft
 2. Substitutions: Under provisions of Section 01631.
- B. M-10:
1. Manufacturer: Nucraft
 2. Line: High Tech Lectern – Column Lectern w/ power &
data module
 3. Description: Lectern on mobile casters w/ locking
mechanism, power & data module (two simplex
receptacles, two data ports, and four cable
grommets)
 4. Dimensions: 28" W x 22"D x 45"H
 5. Finishes: Wood veneer lectern body & work surface: tbd
Powder coat metal components: standard- tbd
 6. Note: Include wood slide-out shelf, gooseneck
microphone, light with dimmer, cable shroud,
fixed upper shelf with pull out drawer.

8.8 LOCKERS

- A. Acceptable Manufacturers and Products
 - 1. Safco -Standard Lockers
 - 2. Substitutions: Under provisions of Section 01631.
- B. M-11:
 - 1. Manufacturer: Safco
 - 2. Line: Single Tier Locker
 - 3. Description: Heavy gauge steel single tier locker w/ recessed handle w/ 2 point lock mechanism. Hat shelf w/ coat hooks.
 - 4. Dimensions: 12"W x 18" D X 78"H
 - 5. Finishes: Metal: Standard tbd
 - 6. Note: Provide link hardware when in a grouping. Padlock not included.

8.9 HEAVY DUTY METAL SHELVING

- A. Acceptable Manufacturers and Products
 - 1. Safco - Industrial Shelving
 - 2. Substitutions: Under provisions of Section 01631.
- B. M-12
 - 1. Manufacturer: Safco
 - 2. Line: Industrial Shelving
 - 3. Description: 5- High adjustable metal steel shelving unit + Frame w/ required hardware.
 - 4. Dimensions: 18" D x *Approx* 90" Total Length
 - 5. Finishes: Metal: Standard- tbd
 - 6. Note: Multiple units or one unit w/ intermediate supports as structurally required.

8.10 HEAVY DUTY METAL SHELVING

- A. Acceptable Manufacturers and Products
 - 1. Safco - Industrial Shelving
 - 2. Substitutions: Under provisions of Section 01631.
- B. M-12A
 - 1. Manufacturer: Safco
 - 2. Line: Industrial Shelving
 - 3. Description: 5- High adjustable metal shelving unit + frame w/ required hardware.
 - 4. Dimensions: 18" D x *Approx* 54" Total Length
 - 5. Finishes: Metal: Standard- tbd
 - 6. Note: Multiple units or one unit w/ intermediate supports as structurally required.

8.11 EASEL WRITING SURFACE

- A. Acceptable Manufacturers and Products
 - 1. Haworth: Planes -Standard Easel
 - 2. Substitutions: Under provisions of Section 01631.
- B. M-13
 - 1. Manufacturer: Haworth
 - 2. Line: Planes – Standard Easel
 - 3. Description: Mobile easel with (2) white writable surface Information boards. Includes marker set and marker tray
 - 4. Dimensions: 43" W x 28" D x 78" H
 - 5. Finishes: Metal Frame: Standard- tbd
Information Board: White
 - 6. Note: Include lockable casters
 - 7. Quantity: Total quantity (2) M-13 items. Location not shown on drawings.

PART 9 : INSTALLATION & PROCEDURES

9.1 EXAMINATION

- A. Vendor shall perform field inspection of the project site to verify all conditions effecting the proposed installation.
- B. The vendor shall review the drawings, specifications, and other related documents.
- C. The vendor shall report any conditions that would adversely affect the installation. By proceeding with the installation the vendor is indicating acceptance of existing conditions.

9.2 PREPARATION

- A. The Prime Contractor shall pre-clean/prepare the work site floor surfaces prior to delivery of the systems furniture.
- B. Vendor shall verify appropriate cleaning procedures with the Prime Contractor; shall clean floor surfaces free of dust, debris, and loose particles immediately prior to installation of systems furniture, and shall maintain cleanliness throughout the entire installation.

9.3 INSTALLATION

- A. Vendor shall provide a written schedule indicating compliance with the project schedule.

- B. Vendor shall comply with all manufacturers' site preparation, handling, storage, and installation requirements.

9.4 PREPARTATION

- A. Vendor shall provide electrician to connect electrical on system panels, receptacles, and hardwiring of the basefeed whips, etc. to building's electrical power and data.

9.5 CLEANING

- A. Vendor shall wipe down and inspect all components at time of installation, and immediately prior to acceptance inspection, to ensure the installation is complete and free from defects- ready for occupancy and in show room condition.
- B. Vendor shall repair all defects in a manner suitable to the Client, or shall replace the defective/damaged components promptly at the sole discretion of the Client.
- C. Vendor shall perform daily cleaning, inspection cleaning, final cleaning and other final procedures as required by the Client.
- D. Vendor shall provide maintenance instructions to the Client.

END OF SECTION

**NEW PASSENGER TERMINAL
DULUTH INTERNATIONAL AIRPORT
DULUTH, MN**

**SECTION 12502- CONCESSIONS
FURNITURE**

PART 1 :GENERAL

1.1 DESCRIPTION

- A. This section includes loose Seating, Tables, and Miscellaneous Furniture and Accessories for the concessions portion of the new passenger terminal.
- B. The furniture included under this section is not required to comply with the Buy American requirements due to separate funding sources.
- C. Furniture in this section is **not required to be FSC certified.**
- D. Products shall be furnished, delivered and installed. **Refer to drawings Sheet A901- Concessions Plan** -for furniture locations, quantities, and layouts under this section.
- E. Products are to be standard catalogued items for which printed literature, specifications, and certified test results are available. If a product is custom/ or special – it must be accompanied by a detailed line drawing with dimensions.
- F. Products shall be new and in current production. Products shall not be made obsolete within 5 years after purchase, to be available to the Client for additional purchases during that time period.
- G. Used, refurbished, shopworn, demonstrator, prototype, modified, or discontinued products are not acceptable.
- H. Refer to the General Services Administration contract for additional details concerning procurement, processes and procedures as it relates to this package.
- I. Should technical specifications and drawings contradict, contractor shall provide the greater quantity and/or quality and refer questions to designer.
- J. Electronic drawings will be provided to the vendor upon signing of the appropriate file release form.
- K. Vendor to provide final estimate before ordering to allow Client to add or deduct product as necessary to meet given budget.

1.2 SUBMITTALS

- A. Product Data: Provide product data for all specified furniture.
- B. Samples: Submit samples of finish, color, and texture.
- C. Shop drawings: Provide installation drawings as required.

1.3 SUSTAINABLE DESIGN SUBMITTALS

- A. Section 01361 - Sustainable Design Requirements: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
 - 1. Materials Resources Certificates:
 - a. Certify recycled material content for recycled content products.
 - b. Certify source for local and regional materials and distance from Project site.
 - 2. Indoor Air Quality Certificates:
 - a. Certify volatile organic compound content for each interior adhesive and sealant and related primer.
- C. Product Cost Data: Submit cost of products to verify compliance with project sustainable design requirements. Exclude cost of labor and equipment to install products.
 - 1. Provide cost data for the following products:
 - a. Products with recycled material content.
 - b. Local and regional products.

1.4 QUALITY ASSURANCE

- A. All products shall be standard manufacturer's products unless otherwise specified.

1.5 QUALIFICATIONS

- A. Manufacturer:
 - 1. The furniture manufacturer shall be a company specializing in the manufacture of commercial office furniture for a minimum of five (5) years.
 - 2. The systems furniture manufacturer shall provide to the Client certification that each member of the Vendor's workforce is fully qualified to install the furniture proposed.

- B. Vendor:
 1. The installing Vendor's local office shall have been established for a minimum of five (5) years.
 2. The Vendor shall be a company specializing in furnishing, delivering and installing commercial systems furniture, and shall have substantial experience with the manufacturer's products. Installation personnel shall be readily identifiable by uniform or other means acceptable to the Client.

1.6 REGULATORY REQUIREMENTS

- A. Fire Safety Characteristics: Provide material identical to that tested for the following fire performance characteristics, per test method indicated below, performed by UL or other testing and inspection organization acceptable to the Building Code Official. Identify components with appropriate markings of applicable testing and inspecting organizations placed out of general view (semi-concealed, but readily accessed without dismantling the component or assembly):
 1. Pass Critical Radiant Flux Test (Flame Spread Index) – Class 1 – NBS minimum 0.455 watts per cubic centimeter, per NFPA 258/ASTM E 648.
 2. Pass Smoke Chamber Test – 25 or less per UL 992.
 3. Pass Smoke Density no greater than 450 per NFPA 25/ASTM E 662.
- B. Electrical Components: UL Approved.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Products shall be new and shall be delivered in the manufacturer's original and unopened packaging or crating. Under certain pre-approved conditions, the Client may allow products to be delivered "blanket wrapped", if transported by manufacturer owned vehicles, and all products are clearly identified.
- B. Products shall be packaged to prevent damage during transit and storage.
- C. Vendor shall be responsible for the receipt, handling and storage of products and supplies necessary for a complete installation.
- D. Vendor shall comply with manufacturer's requirements for handling and shall take all necessary precautions to prevent damage.
- E. Vendor shall be fully responsible to completely remove all packaging, crating, and expended installation/cleaning supplies from property on a daily basis – none shall be allowed to accumulate on site. All expended materials shall be recycled or disposed of in a legal manner.

1.8 COORDINATION

- A. The Vendor and the Furniture manufacturer shall coordinate and cooperate with Client representatives and the Interior Designer.
- B. Vendor shall attend all project meetings as requested by the Client and/or Interior Designer.
- C. **All color and finish selections will be made post bid.** The finish and color selections will be issued as part of a master color document once all manufactures finish material submittals have been received and selected.

1.9 WARRANTY

- A. All products shall have a minimum of 10-year written non-prorated warranty, unless industry standards dictate otherwise, agreeing to replace without charge all defective materials, workmanship, and/or installation.
- B. Removal and replacement of defective or non-conforming product or installation shall be accomplished in a manner to minimize disturbance to Client functions.
- C. Each manufacturer must provide statement with bid describing and guaranteeing the warranties for all furniture products and components.

PART 2: SEATING

2.1 CONCESSIONS- BAR HEIGHT STOOL

- A. Acceptable Manufacturers and Products
 - 1. Chair Factory – Young Hi Soft
 - 2. Substitutions: Under provisions of Section 01631.
- B. CH-1:
 - 1. Manufacturer: Chair Factory
 - 2. Line: Young Hi Soft
 - 3. Description: Bar stool w/ back- wood frame w/ soft seat.
Includes stainless steel footrest.
 - 4. Dimensions: 15" W x 19" D x 39" H Seat Height 30" H
 - 5. Finishes: Metal Footrest: Standard
Veneer Back: standard - tbd
Soft seat: Standard- tbd
 - 6. Note: Include Glides

2.2 CONCESSIONS- DINING CHAIR

- A. Acceptable Manufacturers and Products
 - 1. Davis – Prime Chair Series
 - 2. Substitutions: Under provisions of Section 01631.
- B. CH-2:
 - 1. Manufacturer: Davis
 - 2. Line: Prime Chair Series
 - 3. Description: Armless ribbed wood shell with upholstered seat, liner, four legs
 - 4. Dimensions: 19" W x 21" D x 32" H SH:18"
 - 5. Finishes: Metal Legs: Standard
Wood Finish: Standard – tbd
Upholstered Seat: Grade 1
 - 6. Note: Include Glides

PART 3: TABLES

3.1 CONCESSIONS- RECTANGULAR DINING TABLE

- A. Acceptable Manufacturers and Products
 - 1. Davis- Veer Table Series
 - 2. Substitutions: Under provisions of Section 01631.
- B. T-1:
 - 1. Manufacturer: Davis
 - 2. Line: Veer Table Series – Indoor
 - 3. Description: Square laminate table w/ birch plywood edge with clear varnish & textured stainless steel column base
 - 4. Dimensions: 30" Sq. x **29" H – standard dining height**
 - 5. Finishes: HPL Table Top: Standard - tbd
Metal Base: Standard- tbd

PART 4: MODULAR RETAIL SYSTEM

4.1 MODULAR RETAIL SYSTEM

- A. Acceptable Manufacturers and Products
 - 1. Marlite- Play (Modular Retail System)
 - 2. Substitutions: Under provisions of Section 01631.
- B. RS-1:
 - 1. Manufacturer: Marlite
 - 2. Line: Play

3. Description: Modular retail system w/ chrome frame and metal wall mounts w/ laminate shelving.
Set Includes: (5) Round Tube 50mm x 3000mm
(5) Adjustable black foot
(10) Adjustable Wall Spacers
(10) Wall Spacer Ring Nuts
(12) Single Shelf Brackets
(7) Double Shelf Bracket
(3) 48" x 18" Laminate Shelves
(10) 36" x 18" Laminate Shelves
4. Dimensions: Total Frame Length: 13'-0" W x 9'-6" H
5. Finishes: Frame: Standard Chrome
Shelves: Standard laminate w/ MDF interior - tbd
6. Note: Refer to Drawing Sheet A901 + A903 for plan location and wall elevation of retail system.

PART 5: MISCELLANEOUS RETAIL STORAGE

5.1 RETAIL MOBILE STORAGE CUBBY

- A. Acceptable Manufacturers and Products
 1. Opto Options Collection – Basics Collection
 2. Substitutions: Under provisions of Section 01631.
- B. M-1:
 1. Manufacturer: Opto Options Collection
 2. Line: Basics Collection
 3. Description: Edge Collection Mobile Cubby
 4. Dimensions: 3'-10" L W x 1'-2" D x 2'-6" H
 5. Finish: Metal Paint Frame Sides- Standard
Laminate Top + Shelf Material: Standard- tbd
 6. Note: Include 2" Heavy Duty Locking Casters

5.2 CIRCULAR BOOK RACK STANDS – BY OWNER

- A. M-2: NOT SPECIFIED (BY OWNER)

PART 6 : INSTALLATION & PROCEDURES

6.1 EXAMINATION

- A. Vendor shall perform field inspection of the project site to verify all conditions effecting the proposed installation.
- B. The vendor shall review the drawings, specifications, and other related documents.
- C. The vendor shall report any conditions that would adversely affect the installation. By proceeding with the installation the vendor is indicating acceptance of existing conditions.

6.2 PREPARATION

- A. The Prime Contractor shall pre-clean/prepare the work site floor surfaces prior to delivery of the systems furniture.
- B. Vendor shall verify appropriate cleaning procedures with the Prime Contractor; shall clean floor surfaces free of dust, debris, and loose particles immediately prior to installation of systems furniture, and shall maintain cleanliness throughout the entire installation.

6.3 INSTALLATION

- A. Vendor shall provide a written schedule indicating compliance with the project schedule.
- B. Vendor shall comply with all manufacturers' site preparation, handling, storage, and installation requirements.

6.4 PREPARTATION

- A. Vendor shall provide electrician to connect electrical on system panels, receptacles, etc. to building's electrical power and data.

6.5 CLEANING

- A. Vendor shall wipe down and inspect all components at time of installation, and immediately prior to acceptance inspection, to ensure the installation is complete and free from defects- ready for occupancy and in show room condition.
- B. Vendor shall repair all defects in a manner suitable to the Client, or shall replace the defective/damaged components promptly at the sole discretion of the Client.
- C. Vendor shall perform daily cleaning, inspection cleaning, final cleaning and other final procedures as required by the Client.

- D. Vendor shall provide maintenance instructions to the Client.

END OF SECTION

**NEW PASSENGER TERMINAL
DULUTH INTERNATIONAL AIRPORT
DULUTH, MINNESOTA**

**SECTION 13050 - FIRE PROTECTION
GENERAL REQUIREMENTS**

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Work Included:

1. The system shall include all fire department connections, roof manifolds, hose stations, fire department outlets, fire, jockey pumps & controllers valves, wet sprinklers, dry sprinklers, etc. sprinkler heads, piping drain risers, cabinets, alarms as required for a complete system. Building or area will be fully sprinkled (exception only as per local code).
2. All areas will be supplied from a combination standpipe sprinkler riser system.
3. Areas exposed to freezing will have a dry type sprinkler system.
4. Before any work is commenced, shop drawings shall be carefully prepared and submitted for approval. It is required that the sprinkler systems be sized hydraulically in accordance with NFPA standards. Submit hydraulic calcdelivery, and balanced supply and demand for the appropriate hazard class as defined in NFPA 13, latest edition accepted by local authority having jurisdiction. Such drawings and calculations must be reviewed and approved by all governing authorities, Fire Department, Owners Insurance Underwriters, Factory Mutual and/or Industrial Risk Insurers before any work is commenced at the jobsite.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.**
- B. Related Work**
1. Division 2, Section 02200, EARTHWORK
 2. Division 2, Section 03300, CAST-IN PLACE CONCRETE.
 3. Division 5, Section 05500, METAL FABRICATIONS.
 4. Division 7, Section 07841, FIRESTOPPING.
 5. Division 7, Section 07920, SEALANTS AND CAULKING.
 6. Division 9, Section 09900, PAINTING.
 7. This section is part of each Division 13000 - "Fire Protection" Section
 8. Division 16, ELECTRICAL
 9. Other Sections where applicable.

1.3 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
- B. Exposed: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Concealed: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.
- D. Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions.
- E. Interior Installations: Protected from weather conditions and not subject to outdoor ambient temperatures.
- F. Piping: Pipe, fittings, flanges, valves, controls, hangers, drains, insulation, and items customarily required in connection with the transfer of gaseous and fluid mediums.
- G. By Other Trades: By persons or parties responsible for work at the project other than the party or parties who have been duly awarded the contract for the work of this Trade. In the event that this document is used to acquire work as part of a general construction contract the words "by other trades" shall mean by persons or parties who are not anticipated to be the sub-contractor for this trade working together with the general contractor. In this context the words "by other trades" shall not be interpreted to mean not included in the overall contract.

1.4 SUBMITTALS

- A. In accordance with Division 1, Section 01330, SUBMITTAL PROCEDURES, prior to purchasing any equipment or materials and prior to assembling or installing the work, the following shall be submitted for approval:
 - 1. Scale drawings indicating insert and sleeve locations if required by Architect or Structural Engineer.
 - 2. Scale drawings showing all piping and duct runs with sizes, elevations and appropriate indication of coordination with other trades. This submission to us shall consist of one (1) original and six (6) prints.
 - 3. Catalog information, factory assembly drawings and field installation drawings as required for a complete explanation and description of all items of equipment. List all manufacturers and certifications. Submit min. six (6) copies.
- B. Documents will not be accepted for review unless:

1. They include complete information in accordance with local code and with the applicable sections of NFPA including 10, 13, 14, 20 and 415 pertaining to appurtenances and accessories.
2. They are submitted as a package where they pertain to related items.
3. They are properly marked with service or function, project name, where they consist of catalog sheets displaying other items which are not applicable.
4. They indicate the project name and address along with the Contractor's name, address and phone number.
5. They are properly marked with external connection identification as related to the project where they consist of standard factory assembly or field installation drawings.

C. Shop Drawing Review

1. The purpose of the review of shop drawings is to maintain integrity of the design. Unless the contractor clearly points out changes, substitutions, deletions or any other differences between the submission and the Contract Documents in writing on the Contractor's letterhead, approval by the Engineer or Architect does not constitute acceptance. It is not to be assumed that the engineer has read the text nor reviewed the technical data of a manufactured item and its components except where the Vendor has pointed out differences between his product and the specified model.
2. It is the responsibility of the contractor to confirm all dimensions, quantities, and the coordination of materials and products supplied by him with other trades. Approval of shop drawings containing errors does not relieve the contractor from making corrections at his expense.
3. Substitutions of equipment, systems, materials, must be coordinated by the Contractor with his own or other trades which may be involved with the item, such as, but not limited to, equipment substitutions which change electrical requirements, or hanging or support weights or dimensions.
4. Any extra charges or credits which may be generated by other trades due to substitutions will not be accepted unless the Contractor has an agreement in writing with the Owner.
5. Substitutions of equipment, systems, etc. requiring approval of local authorities must comply with such regulations and be filed at the expense of the Contractor (should filing be necessary). Substitutions are subject to approval or disapproval by the Engineer. The Contractor in offering substitutions shall hold the Owner and Engineer harmless if the substituted item is an infringement of patent held by the specified item.
6. Shop drawings shall show all data required by NFPA and Authorities having Jurisdiction.

D. Explanation of Shop Drawing Stamp

1. Approval indicates that we have not found any reason why this item should not be acceptable within the intent of the documents.
2. Approved As Noted indicates that we have found questionable components which if corrected or otherwise explained make the product acceptable.
3. Resubmit indicates that this item should be resubmitted for approval before further processing.
 - a. If both "Approved As Noted" and "Resubmit" are checked, the resubmittal is for record purposes only.
4. Disapproved indicates that the item will not meet the intent of the Contract
5. No shop drawing stamp or note shall constitute an order to fabricate or ship. Such notification can only be performed by the Project Manager for Construction, the Contractor scheduling his own work, or the Owner.

E. Maintenance Data and Operating Instructions:

1. Maintenance and operating manuals in accordance with Division 1, Section 01400, QUALITY REQUIREMENTS, Paragraph, INSTRUCTIONS, for systems and equipment.
2. After all final tests and adjustments have been completed, fully instruct the proper Owner's Representative in all details of operation for equipment installed. Supply qualified personnel to operate equipment for sufficient length of time to assure that Owner's Representative is properly qualified to take over operation and maintenance procedures. Supply qualified personnel to operate equipment for sufficient length of time as required to meet all governing authorities in operation and performance tests.
3. Furnish required number of manuals, in bound form containing data covering capacities, maintenance of operation of all equipment and apparatus. Operating instruction shall cover all phases of control and include the following:
 - a. Performance Curves: For pumps, and similar equipment at the operating conditions.
 - b. Lubrication Schedule: Indicating type and frequency of lubrication required.
 - c. List of Spares: Recommended for normal service requirements.
 - d. Parts List: Identifying the various parts of the equipment for repair and replacement purposes.
 - e. Instruction Books may be standard booklets but shall be clearly marked to indicate applicable equipment.

- f. Wiring Diagrams: Generalized diagrams are not acceptable, submittal shall be specifically prepared for this Project.
 - g. Automatic Controls: Diagrams and functional descriptions.
- 4. Where applicable, one set of operating and maintenance instructions shall be neatly hung adjacent to the equipment concerned.
- F. Product Data: For the following:
 - 1. Transition fittings.
 - 2. Dielectric fittings.
 - 3. Mechanical sleeve seals.
 - 4. Escutcheons.
- G. Welding certificates.

1.5 QUALITY ASSURANCE

- A. Applicator: Company specializing in piping installation with seven years minimum experience.
- B. Systems, installation, equipment and materials shall conform to requirements of the local Building Code, Owners Insurance Underwriters, Factory Mutual, Industrial Risk Insurers, local Fire Department, N.F.P.A., ANSI/ASME B31.9 "Building Service Piping" and all authorities having jurisdiction. Equipment and materials Underwriters listed, labeled and approved as required.
- C. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."
- D. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
 - 1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
 - 2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.
- E. Products Criteria
 - 1. All equipment and materials shall be new and without blemish or defect.
 - 2. New equipment and materials shall be Underwriters Laboratories, Inc. (U.L.) labeled and/or listed where specifically called for or where normally subject to such U.L. labeling and/or listing services.
 - 3. Asbestos
 - a. All equipment and materials shall be free of asbestos.
 - 4. Electrical equipment and materials shall be products which will meet with the acceptance of the agency inspecting the electrical work. Where such acceptance is contingent upon having the products examined, tested and

certified by Underwriters or other recognized testing laboratory, the product shall be examined, tested and certified. Where no specific indication as to the type or quality of materials or equipment is indicated, a first class standard article shall be furnished.

5. Electrical Characteristics for Mechanical Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.
6. It is the intent of these specifications that wherever a manufacturer of a product is specified, and the terms "other approved" or "or approved equal" or "equal" are used, the substituted item must conform in all respects to the specified item. Consideration will not be given to claims that the substituted item meets the performance requirements with lesser construction. Performance as delineated in schedules and in the specifications shall be interpreted as minimum performance. In many cases equipment is oversized to allow for pick-up loads which cannot be delineated under the minimum performance.
7. All equipment of one type shall be the products of one manufacturer.
8. Substituted equipment or optional equipment where permitted and approved, must conform to space requirements. Any substituted equipment that cannot meet space requirements, whether approved or not, shall be replaced at the Contractor's expense. Any modifications of related systems as a result of substitutions shall be made at the Contractor's expense.
9. Note that the approval of shop drawings, or other information submitted in accordance with the requirements hereinbefore specified, does not assure that the Engineer, Architect, or any other Owner's Representative, attests to the dimensional accuracy or dimensional suitability of the material or equipment involved or the ability of the material or equipment involved or the mechanical performance of equipment. Approval of Shop Drawings does not invalidate the plans and specifications if in conflict, unless a letter requesting such change is submitted and approved on the Engineer's letterhead.
10. Substitutions of equipment for that shown on the schedules or designated by model number in the specifications will not be considered if the item is not a regular cataloged item shown in the current catalog of the manufacturer.

1.6 DELIVERY, STORAGE, HANDLING AND PROTECTION

- A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

- B. Store plastic materials in a location protected from direct sunlight or extreme heat. Support to prevent sagging and bending.
- C. This trade shall be responsible for its work and equipment until finally inspected, tested and accepted. Carefully store materials and equipment which are not immediately installed after delivery to site. Close open ends of work with temporary covers or plugs during construction to prevent entry of obstructing material.
- D. This trade shall protect work and material of other trades from damage that might be caused by its work or workmen and make good damage thus caused.

1.7 COORDINATION

- A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for mechanical installations.
- B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
- C. Coordinate requirements for access panels and doors for mechanical items requiring access that are concealed behind finished surfaces.
- D. Provide all designating signs for shutoff valves, control vales, alarms, and the like, as required by the agencies having jurisdiction.

1.8 COORDINATION DRAWINGS

- A. Prepare coordination drawings in accordance with Division 1 Section "PROJECT COORDINATION," to a scale of 3/8"=1'-0" or larger; detailing major elements, components, and systems of mechanical equipment and materials in relationship with other systems, installations, and building components. Indicate locations where space is limited for installation and access and where sequencing and coordination of installations are of importance to the efficient flow of the Work, including (but not necessarily limited to) the following:
 - 1. Indicate the proposed locations of piping, equipment, and materials. Include the following:
 - a. Planned piping layout, including valve and specialty locations and valve stem movement.
 - b. Clearances for servicing and maintaining equipment, including space for equipment disassembly required for periodic maintenance.
 - c. Equipment connections and support details.
 - d. Exterior wall and foundation penetrations.
 - e. Fire-rated wall and floor penetrations.
 - f. Sizes and location of required concrete pads and bases.
 - g. Clearances as required by Electric Code.
 - 2. Indicate scheduling, sequencing, movement, and positioning of large equipment into the building during construction.

3. Prepare reflected ceiling plans to coordinate and integrate sprinkler installations, air outlets and inlets, light fixtures, communication systems components and other ceiling-mounted items.

B. Fire Protection Coordination Drawings

1. This trade shall add to Coordination Drawings prepared by the HVAC Contractor showing all of the fire protection work (equipment, piping, conduit, etc.) to be installed as part of the work of this section of the specifications.
2. This Trade after showing all of the fire protection work shall forward the reproducible Coordination Drawings to the Electrical Contractor.
3. The sequence of coordination drawings shall be HVAC-PLBG- C-FP-ELEC-CM.
4. The Fire Protection Contractor shall attend a series of meetings arranged by the General Contractor/Construction Manager to resolve any real or apparent interferences or conflicts with the work of the other Contractors.
5. The Fire Protection Contractor shall then make adjustments to his work on the Coordination Drawings to resolve any real or apparent interferences or conflicts.
6. After any real or apparent interferences and conflicts have been incorporated into the Coordination Drawings, the Fire Protection Contractor shall "sign-off" the final Coordination Drawings.
7. The Fire Protection Contractor shall not install any of his work prior to "sign-off" of final Coordination Drawings. If the fire protection work proceeds prior to sign-off of Coordination Drawings, any change to the fire protection work to correct the interferences and conflicts which result will be made by the Fire Protection Contractor at no additional cost to the project.
8. Coordination Drawings are for the Contractor's and Architects use during construction and shall not be construed as replacing any shop "as-built", or Record Drawings required elsewhere in these Contract Documents.
9. Architect's review of Coordination Drawings shall not relieve Contractor from his overall responsibility for coordination of all work performed pursuant to the Contract or from any other requirements of the Contract.

C. Record Drawings

1. As part of the required fire protection work, a complete set of "as-built" or record drawings shall be made up and delivered to the architect.
2. The drawings shall show:-
 - a. All work installed exactly in accordance with the original design.
 - b. All installed as a modification or addition to the original design.

- c. The dimensional information necessary to delineate the exact location of all piping runs which are so concealed as to be untraceable by inspection through the regular means of access established for inspection and maintenance.
- 3. Where shop drawings have been prepared and approved, the "as-built" drawings shall be cross referenced to the respective shop drawing.
- 4. As-built record drawings shall include the updating of all equipment schedule sheets.
- 5. The record drawings shall be of legible reproducible and durable type.
- 6. The Contractor shall make arrangements with the Engineer to obtain design drawings on DVD or compact diskettes in AutoCad 2005 format for use as a basis for the "as-built" drawings. These documents remain the property of Cosentini Associates and shall be used for no other purpose without expressed, written consent. The contractor shall assume all liabilities resulting from unauthorized use or modifications to the drawings.
- 7. Prior to developing any "as-built" drawings, the contractor shall coordinate with the Owner and the Architect Engineer the drawing layers, colors, etc., of the CAD drawings.
- 8. "As-built" information shall be submitted as follows:
 - a. CAD drawing files on DVD or compact diskettes in AutoCad 2005 format.
 - b. One (1) set of reproducible drawings.
- 9. The quantity of design drawings which are made available shall in no way be interpreted as setting a limit to the number of drawings necessary to show the required "as-built" information.
- 10. Progress prints of record drawings shall be submitted monthly during the construction period for Architect's approval.
- 11. This trade shall submit the "as-built" set for approval by the Engineer in a form acceptable to the Engineer.
- 12. Final acceptance of the fire protection systems by the authority having jurisdiction will not be implemented until "as-built" drawings are on site.

1.9 INTERPRETATION OF THE DRAWINGS AND SPECIFICATIONS

- A. As used in the drawings and specifications, certain non technical words shall be understood to have specific meanings as follows:
 - 1. "Furnish"-----Purchase and deliver to the project site complete with every necessary appurtenance and support.

2. "Install"-----Unload at the delivery point at the site and perform every operation necessary to establish secure mounting and correct operation at the proper location in the project.
 3. "Provide"-----"Furnish" and "Install".
- B. Except where modified by a specific notation to the contrary, it shall be understood that the indication and/or description of any item, in the drawings or specifications or both, carries with it the instruction to furnish and install the item, regardless of whether or not this instruction is explicitly stated as part of the indication or description.
 - C. It shall be understood that the specifications and drawings are complementary and are to be taken together for a complete interpretation of the work. Where there are conflicts between the drawings and specifications or within the specifications or drawings themselves, the items of higher standard shall govern.
 - D. No exclusions from, or limitations, in the language used in the drawings or specifications shall be interpreted as meaning that the appurtenances or accessories necessary to complete any required system or item of equipment are to be omitted.
 - E. The drawings of necessity utilize symbols and schematic diagrams to indicate various items of work. Neither of these have any dimensional significance nor do they delineate every item required for the intended installations. The work shall be installed, in accordance with the diagrammatic intent expressed on the drawings, and in conformity with the dimensions indicated on final architectural and structural working drawings and on equipment shop drawings.
 - F. No interpretation shall be made from the limitations of symbols and diagrams that any elements necessary for complete work are excluded.
 - G. Certain details appear on the drawings which are specific with regard to the dimensioning and positioning of the work. These details are intended only for the purpose of establishing general feasibility. They do not obviate field co-ordination for the indicated work.
 - H. Information as to the general construction shall be derived from structural and architectural drawings and specifications only.
 - I. The use of words in the singular shall not be considered as limiting where other indications denote that more than one item is referred to.
 - J. In the event that extra work is authorized, and performed by this trade, work shown on drawings depicting such work, and/or described by Bulletin is subject to the base building specifications in all respects.

1.10 SEPARATION OF WORK BETWEEN TRADES

- A. The Specifications for the overall construction delineate various items of work under separate trade headings. The list below sets forth this delineation to the extent that it affects the Fire Protection Work.

- B. In the absence of more detailed information, this list shall be taken as a specific instruction to the Fire Protection trade to include the work assigned to it.
- C. Indications that the Fire Protection trade is to perform an item of work mean that it is to perform the work for its own accommodation only, except as specifically noted otherwise.
- D.
- | | | |
|------|---|---|
| Oth | = | Other than electrical or mechanical |
| Plb | = | Plumbing |
| FP | = | Fire Protection |
| Htg | = | Heating, Ventilating & Air Conditioning |
| Elec | = | Electrical |
| F | = | Furnished |
| I | = | Installed |
| P | = | Provided (furnished and installed) |

Item	Oth	Plb	FP	Htg	Elec	Notes
Motor for plumbing equipment			p			
Motor controls for fire protection equipment.			f		i	Specifications and drawings delineate detailed exceptions.
Wiring for plumbing equipment motors and motor controls.					p	Specifications and drawings delineate detailed exceptions.
Temporary heat	p					
Temporary water	p					
Temporary light and power.	p					
Temporary toilets.	P					
Temporary fire protection.	p					Specification and drawings delineate detailed exceptions.
Hoisting	p					
Rigging	p					
Bracing of building for safe rigging.			p			

Item	Oth	Plb	FP	Htg	Elec	Notes
Cutting, chasing and patching	p					Cost where due to late installation, or improper coordination of work is the responsibility of the delinquent trade.
Framed slots and openings in walls decks and slabs.			p			
Sleeves through slabs, decks and walls.			p			
Sleeves through membraned and waterproofed slabs, decks and walls.			p			
Waterproof sealing of pipes passing through sleeves.			p			
Waterproof sealing of sleeves through membraned through membraned and water proofed slabs.			p			
Fireproof sealing of excess openings in slabs, decks and fire rated walls.			p			
Standpipe, Sprinkler piping and heads, and valves.			p			
Excavation and backfill inside buildings.	p					
Excavation and backfill outside buildings.	p					
Keeping site and excavations free from water during construction.	p					To accommodate the overall project.
Fastenings			p			
Supports			p			

Item	Oth	Plb	FP	Htg	Elec	Notes
Concrete encasement of underground runs.	p					
Base flashing for roof drains and all piping penetrating roof.	p					
Cap flashing for all piping penetrating roof.			p			
Concrete foundations, pads and bases.	p					Furnishing of anchors and vibration mounts included in the Fire Protection Trade..
Concrete (masonry) pits.	p					Fire Protection Contractor to furnish sizes and locations.
Pit frames and covers.	p					Fire Protection Trade to furnish sizes and locations.
Trenches in building foundation.	p					
Field touch up painting of damaged shop coats.			p			
Prime coating hangers and supports.			p			
Rustproofing field cut and assembled iron supporting frames and racks.			p			
Finished painting	p					
Finished wall and ceiling access doors, panels and supporting frames.			p			Supplying list locating all required access doors (none to be less than 16" x 16") Included in Fire Protection Contractor.
Cat walks to mechanical equipment.	P					Fire Protection Contractor to supply list of locations.
Ladders to mechanical equipment and fire protection valves.	p					Fire Protection contractor to supply list of locations.
Fire hose cabinets and hose.			p			

Item	Oth	Plb	FP	Htg	Elec	Notes
Fire pump, jockey pump and controller.			p			
Fire extinguishers.	p					
Fire extinguisher cabinets.	p					
Rubbish removal.			p			Where one trade furnishes and another installs, the installing trade removes the shipping and packing materials which accumulate.
Special tools for equipment maintenance.			p			
Fire service from street main, including curb valve and box, double check valve and OS&Y valve connection inside building.			p			
Electric heating cables for pipe tracing.					p	

- A. The Fire Protection Trade is required to supply all necessary supervision and coordination information to any other trades who are to supply work to accommodate the Standpipe and Sprinkler installation.
- B. Where the Fire Protection Trade is required to install items which it does not purchase, it shall include for such items:
1. The co-ordination of their delivery.
 2. Their unloading from delivery trucks driven in to any designated point on the property line at grade level.
 3. Their safe handling and field storage up to the time of permanent placement in the project.
 4. The correction of any damage, defacement or corrosion to which they may have been subjected.
 5. Their field assembly and internal connection as may be necessary for their proper operation.
 6. Their mounting in place including the purchase and installation of all dunnage supporting members and fastenings necessary to adapt them to architectural and structural conditions.

7. Their connection to building systems including the purchase and installation of all terminating fittings necessary to adapt and connect them to the building systems.

1.2 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.

Reference	Definition
ASTM	American Society for Testing Materials
NFPA	National Fire Protection Association
UL	Underwriters Laboratories, Inc.
NEMA	National Electrical Manufacturers Assn.
FM	Factory Mutual
USAS	United States of America Standards Institute
ANSI	American National Standards Institute
AWWA	American Water Works Association
F.S.	Federal Specifications, U.S. Government
I.S.O.	Insurance Services Organization

1.3 CERTIFICATION OF EQUIPMENT AND PIPING SUPPORTS

- A. Provide details for support, restraint and bracing of equipment and piping. Such details shall be of complete detailed shop drawings based on the contractor's installation techniques, equipment arrangement and the specific routing of the work. The submission of shop drawings shall include all necessary calculations and manufacturer's certifications as required to demonstrate the suitability of the proposed installation. Calculations shall be performed by an approved licensed structural engineer with experience in the field of equipment support and seismic design, who shall be retained by the contractor for this purpose.
- B. See Section 13060 "Fire Protection Hanger and Supports" for additional information and requirements.

1.4 UNIT PRICES

- A. Include unit prices (ADD AND DEDUCT) that are to apply for each type of sprinkler head. Unit prices shall include complete installation, receiving, handling, distributing, storing, hoisting, protection, overhead, profit, taxes, etc., and piping, fittings, hangers, escutcheons, heads and all accessories. Provide unit prices for each type of sprinkler head, each type and size of valve, each type and size of piping.

1.5 CODES, PERMITS AND INSPECTIONS

- A. All work shall meet or exceed the latest requirements of all national, state, county, municipal and other authorities exercising jurisdiction over construction work at the project.
- B. All required permits, approval and inspection certificates shall be obtained, paid for, and made available at the completion of the work, by the Fire Protection Contractor.
- C. Any portion of the work which is not subject to the approval of an authority having jurisdiction, shall be governed by the applicable sections of the overall National Fire Code, as published by the National Fire Protection Association (NFPA).
- D. Installation procedures, methods, and conditions shall comply with the latest requirements of The Federal Occupational Safety and Health Act (OSHA)..
- E. Prepare and submit to the building owner a set of "as-built" record drawings for approval, in a form acceptable to the building owner.
- F. The Fire Protection Contractor shall be responsible for the installation and filing until the installation has been approved by the authorities having such jurisdiction and accepted by the building owner.

1.6 GUARANTEES AND CERTIFICATIONS

- A. All work shall be guaranteed to be free from leaks or defects. Any defective materials or workmanship as well as damage to the work of all trades resulting from same shall be replaced or repaired as directed for the duration of stipulated guaranteed periods.
- B. The duration of guarantee periods following the date of beneficial use of the system shall be one year. Beneficial use is defined as operation of the system to obtain its intended use.
- C. The date of acceptance shall be the date of the final payment for the work or the date of a formal notice of acceptance, whichever is earlier.
- D. Certification shall be submitted attesting to the fact that specified performance criteria are met by all items of Fire Protection equipment.

1.7 EXAMINATION OF SITE AND CONTRACT DOCUMENTS

- A. Before submitting prices or beginning work, thoroughly examine the site and the Contract Documents.
- B. No claim for extra compensation will be recognized if difficulties are encountered which examination of site conditions and Contract Documents prior to executing Contract would have revealed.

1.8 WORKMANSHIP

- A. The entire work provided in this Specification shall be constructed and finished in every respect in a workmanlike and substantial manner.
- B. It is not intended that the drawings shall show every pipe, fitting and appliance. Fire Protection Contractor shall furnish and install all such parts as may be necessary to complete the systems in accordance with the best trade practice.
- C. Keep other trades fully informed as to shape, size and position of all openings required for apparatus and give full information to the General Contractor and other trades in a timely manner so that all openings may be built in advance.
- D. In case of failure on the part of the Fire Protection Contractor to give proper and timely information as required above, he shall do his own cutting and patching or have some done by the General Contractor, but in any case, without extra expense to the Owner.
- E. Obtain detailed information from the manufacturers of apparatus as to the proper method of installing and connecting same. Obtain all information from the General Contractor and other trades which may be necessary to facilitate work and completion of the whole project.

1.9 CONTINUITY OF SERVICES

- A. Do not interrupt existing services without Owner's Representative approval.
- B. Schedule interruptions in advance, according to Owner's Representative instructions. Submit, in writing, with request for interruption, methods proposed to minimize impact on Owner's operations. Interruptions shall also be coordinated with the local Fire Department.
- C. Interruptions shall be scheduled at such times of day and work to minimize impact on Owner's operations.

1.10 FIRE FLOW TEST

- A. The Fire Protection Contractor shall perform up-to-date fire flow tests indicating the static and residual pressures in the water mains used for fire service with certified flow volumes at time of test. Tests must be conducted at or near peak demand times of day.
- B. This data must be used in conjunction with Contractor's hydraulic calculations to submit any revised Fire Pump Specifications listing new GPM flow required, head generated, horsepower requirements, etc., for approval by the Engineer.

1.11 UTILITY SERVICES:

- A. This contractor will install sprinkler services to a point 5'-0" beyond the building wall and connect to all services provided by the site utility contractor. Coordinate adaptable materials with Site Contractor.
- B. Services shall be installed in accordance with the provisions of the local authorities having jurisdiction and the Sprinkler Trade shall obtain all necessary approvals.
- C. It is intended that directly or indirectly, all required metered water, services shall be installed ready for operation without additional cost to the Owner.

1.12 SUPERVISORY ALARMS AND ALARM PANEL:

- A. A fire and sprinkler alarm panel will be provided by another trade. The following devices and equipment will be wired to this panel by the Electrical Trade:-
 - 1. Tamper switches - on all fire standpipe and sprinkler control valves.
 - 2. Fire pumps - pump running alarm (each pump) fire pumps power available (each pump), low suction pressure, pump failure to start, pump in off position, phase reversal, phase failure.
 - 3. Waterflow indicators.
 - 4. Alarm check valve flow switch.
 - 5. Dry pipe valve water flow switches.
 - 6. Air compressor power failure switch.
 - 7. Air compressor low air pressure switches.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified. Substitutions will not be permitted unless approved by the Engineer.

2.2 TOOLS AND LUBRICANTS:

- A. Furnish special tools not readily available commercially, that are required for disassembly or adjustment of equipment and machinery furnished.
- B. Lubricants: A minimum of one quart of oil, and one pound of grease, of equipment manufacturer's recommended grade and type, in unopened containers and properly identified as to use for each different application.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Coordinate location of piping, sleeves, inserts, hangers, ductwork and equipment. Locate piping, sleeves, inserts, hangers, and equipment clear of windows, doors, openings, light outlets, and other services and utilities. Follow manufacturer's published recommendations for installation methods not otherwise specified.
- B. All threads on valves, fire department connections, and other equipment to which local fire department could attach hose shall be provided with hose thread to suit local fire department.
- C. All equipment and materials suitable and rated for system water working pressure.
- D. Color finish of valve handles, fire department caps and plugs, etc., as required by local fire department.
- E. The drawings and information included in this specification are given as a guide only, and they therefore do not relieve this Contractor from providing all work and equipment necessary to complete the installation according to the requirements of Local Building Code, Owners Underwriters, N.F.P.A. and all other governing authorities.
- F. The arrangement, positions and connections of pipes, drains, valves, etc., shown on the drawings shall be taken as a close approximation and while they shall be followed as closely as possible, the right is reserved by the Architect and/or Design Engineer to change the locations, to accommodate any conditions which may arise during the progress of the work without additional compensation to this contractor for such changes, provided that the changes are requested prior to the installation of this Contractor's work. The responsibility for accurately laying out the work rests with this Contractor. Should it be found out that any of his work is so laid out that interferences will occur, he shall also report that to the Architect before installation.
- G. The Architect and/or Design Engineer reserves the right to reject any and all work not in accordance with the approved shop drawing.
- H. Whether or not the system shown on the Contract Drawings meets the requirements of the National Fire Protection Association, these specifications require the furnishing and installation of fire protection systems complete in all details and in accordance with local code and the standards of the National Fire Protection Association.

3.2 PROTECTION AND CLEANING:

- A. Cleaning of Piping System (General)
 - 1. During construction, properly cap, plug and cover all openings in pipe, lines and equipment nozzles so as to prevent the entrance of sand, dirt, and foreign matter. Each system of piping shall be flushed (for the purpose of removing grit, dirt, sand, and foreign matter from the piping), in accordance with NFPA requirements for as long a time as is required to thoroughly clean the systems.

B. Adjusting (General)

1. After the entire installation has been completed, make all required adjustments to automatic controls, pressure reducing valves, etc., until all performance requirements are met.

C. All bearings of all equipment shall be oiled or greased as recommended by the manufacturer, after installation.

D. The alignment of each centrifugal pump shall be checked and each pump shall be properly aligned after the pumps are placed in service. Mechanical seals and shaft sleeves shall be replaced by this Contractor without charge in the event that unusual wear or faulty operation occurs during the guarantee period.

E. Cleaning (General)

1. Upon completion of the work, all equipment shall be thoroughly cleaned, polished and left in first class condition for final acceptance.

3.3 EXCAVATION AND BACKFILL

- A. The excavation and backfill will be done by the General Contractor. The fire protection trade shall be responsible for the coordination of trench routing, slop and elevation.

3.4 ARCHITECTURAL COORDINATION AND SAMPLES

- A. All devices and appurtenances which are to be installed in all finished areas must be coordinated with the Architect for final approval as it relates to location, finish, materials, color, texture, etc.
- B. Submit samples of all materials requested by the Architect.
- C. Samples shall be prepared and submitted with all postage and transportation costs paid by the Contractor submitting same. Label each sample with identifying numbers and titles.
- D. Submit samples of:-
1. All exposed to view items such as sprinkler heads, etc.

3.5 TESTS

- A. Provide all designating signs for shutoff valves, control valves, alarms, and the like, as required by the agencies having jurisdiction.
- B. Testing of Systems

1. Perform all required tests in the manner prescribed by and to the satisfaction of the local building department and local fire department, NFPA, Owners Insurance Underwriters, and all authorities having jurisdiction. Owners and Architects representatives shall be present to witness tests. Obtain all required certificates of approval and pay any fees or costs in conjunction therewith.
2. Provide and pay for all devices, materials, supplies, labor and power required in connection with all tests. All tests shall be made in the presence and to the satisfaction of the Architect and inspectors having jurisdiction.
3. Defects disclosed by the tests shall be repaired, or if required by the Architect, defective work shall be replaced with new work without extra charge to the Owner. Tests shall be repeated as directed, until all work is proven satisfactory.
4. This Contractor shall also be responsible for the work of other trades that may be damaged or disturbed by the tests, or the repair or replacement of his own work, and he shall, without extra charge to the Owner, restore to its original condition, work of the trades so damaged and disturbed, engaging the original Contractors to do the work of restoration.

3.6 TESTING OF FIRE SAFETY SYSTEMS

- A. Include in the base bid price sufficient man hours to conduct tests of fire safety systems. The trades shall jointly assign personnel to test the following
 1. Electric
 2. HVAC Fans and Dampers
 3. Automatic Controls and Signals
 4. Fire Suppression System (Sprinkler, Standpipe, Pre-action, etc.)
 5. Fire Protective Alarm System
- B. This trade shall coordinate with other trades and jointly test all systems. When all systems are working properly, inform Owner in writing so that Owner's representative can witness.

3.7 TEMPORARY FIRE PROTECTION DURING CONSTRUCTION - UTILIZATION OF FIRE STANDPIPE SYSTEM

- A. The permanent fire standpipe system shall be utilized for temporary fire protection all in accordance with the Fire Department and Building Department standards.
- B. Portions of fire standpipe system supplemented with temporary piping, (booster pumps when required by Authority having jurisdiction,) etc., as required; including siamese connections, hose valves, etc., shall be kept in active working order and such temporary fire protection means shall be continually installed and extended as closely following the installation of the general construction as practical.

- C. Inform the local Fire Department and the Architect of the extent of temporary fire standpipe system available for Fire Department use (location of temporary and permanent siamese connections, hose stations, etc.). Submit periodically scheduled reports to the local Fire Department indicating the extent of the temporary and permanent fire standpipe facilities available for fire fighting used.

END OF SECTION 13050

**NEW PASSENGER TERMINAL
DULUTH INTERNATIONAL AIRPORT
DULUTH, MINNESOTA**

**SECTION 13053 - FIRE PROTECTION
GENERAL MATERIALS AND METHODS**

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. This Section includes the following:

1. Piping materials and installation instructions common to most piping systems.
2. Transition fittings.
3. Dielectric fittings.
4. Mechanical sleeve seals.
5. Sleeves.
6. Escutcheons.
7. Grout.
8. Access doors.
9. Equipment installation requirements common to equipment sections.
10. Painting.
11. Concrete bases.
12. Supports and anchorages.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Related Work

1. Division 2, Section 02200, EARTHWORK
2. Division 2, Section 03300, CAST-IN PLACE CONCRETE.
3. Division 5, Section 05500, METAL FABRICATIONS.
4. Division 7, Section 07841, FIRESTOPPING.
5. Division 7, Section 07920, SEALANTS AND CAULKING.
6. Division 9, Section 09900, PAINTING.
7. Division 13, Section 13050 - BASIC FIRE PROTECTION REQUIREMENTS.
8. Division 16, ELECTRICAL
9. Other Sections where applicable.

1.3 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- F. Piping: Pipe, fittings, flanges, valves, controls, hangers, drains, insulation, and items customarily required in connection with the transfer of fluids.
- G. By Other Trades: By persons or parties responsible for work at the project other than the party or parties who have been duly awarded the contract for the work of this Trade. In the event that this document is used to acquire work as part of a general construction contract the words "by other trades" shall mean by persons or parties who are not anticipated to be the sub-contractor for this trade working together with the general contractor. In this context the words "by other trades" shall not be interpreted to mean not included in the overall contract.

1.4 SUBMITTALS:

- A. See Section 13050, "Basic Fire Protection Requirements" for requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified. Substitutions will not be permitted unless approved by the Engineer.

2.2 PIPE, TUBE, AND FITTINGS

- A. Refer to individual Division 13 Sections 13915 "Fire Suppression Piping" for pipe, tube, and fitting materials and joining methods.

2.3 JOINING MATERIALS

- A. Refer to individual Division 13 piping Sections 13915 "Fire Suppression Piping" for joining methods and materials.

2.4 DIELECTRIC FITTINGS

- A. Refer to individual Division 13 Section 13915 "Fire Suppression Piping" for dielectric fittings.

2.5 MECHANICAL SLEEVE SEALS

- A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.
 - 1. Manufacturers:
 - a. Advance Products & Systems, Inc.
 - b. Calpico, Inc.
 - c. Metraflex Co.
 - d. Pipeline Seal and Insulator, Inc.
 - 2. Sealing Elements: NBR interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
 - 3. Pressure Plates: Stainless steel. Include two for each sealing element.
 - 4. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.6 SLEEVES

- A. General:
 - 1. Provide sleeves for each pipe passing through walls, partitions, floors, and roofs. Penetrations in fire/smoke rated components shall be by UL listed assembly.
- B. Galvanized-Steel Sheet: 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint.
- C. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.
- D. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- E. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.
 - 1. Underdeck Clamp: Clamping ring with set screws.
- F. Molded PVC: Permanent designed to be embedded in concrete, with nailing flange for attaching to wooden forms.
- G. Sleeve Materials

Type Designation

1

Galvanized steel sheet.

- | | |
|---|--|
| 2 | Standard weight galvanized steel pipe. |
| 3 | Standard weight galvanized steel pipe 1/4" steel plate extending from outside of sleeve a minimum of 2" all around, similar to F&S Mfg. Corp. Fig. 204. |
| 4 | Cast iron pipe sleeve with center flange, similar to James B. Clow & Sons No. F-1430 and F-1435. |
| 5 | Standard weight galvanized steel pipe with flashing clamp device welded to pipe sleeve or watertight sleeves, similar to Zurn 195-10 with oakum and lead caulking as required. |
| 6 | Metal deck and wall sleeves. Similar to Adjust-to-Crete Manuf., Co. |

H. Sleeve Sizes

1. Floors and required fire rated partitions - 1/2" maximum clearance between outside of pipe (or insulation on insulated pipes) and inside of sleeve.
2. Partitions not fire rated - 1-1/2" maximum clearance between outside of pipe (or insulation on insulated pipes) and inside of sleeve.

I. Sleeve Lengths

Location	Sleeve Length
Floors	Equal to depth of floor construction including finish. In waterproof floor construction sleeves to extend minimum of 2" above finished floor level.
Roofs	Equal to depth of roof construction including insulation.
Walls & Partitions	Equal to depth of construction and terminated flush with finished surfaces.

J. Sleeve Caulking & Packing

Type Designation	Caulking & Packing Requirements
A	Space between pipe and sleeve packed with oakum or hemp and caulked watertight with lead.
B	Space between pipe or pipe covering and sleeve shall be caulked with an incombustible permanently plastic, waterproof non-staining smooth appearance or pack with mineral wool or other equally approved fire resistive material to within ½" of both wall faces and provide caulking compound as per above.

K. Sleeve Application

Sleeve Type Thru Required Fire Rated Construction	Sleeve Type Thru Non-Fire Rated Construction	Location	Sleeve Caulking & Packing Type Designation	Sleeve Caulking & Packing Type Thru Fire Rated Construction
5	5	Membrane waterproof floor, roof & wall construction.	B	B
5	5	Non-membrane waterproof floor, roof & wall construction where flashing is required.	A or B	B
2	1, 2	Interior walls, partitions & floors.	B	B
3 or 4	3 or 4	Exterior walls.	A	A
2	6	Cellular metal deck floors.	B	B
				Sleeve Caulking &

Sleeve Type Thru Required Fire Rated Construction	Sleeve Type Thru Non-Fire Rated Construction	Location	Sleeve Caulking & Packing Type Designation	Packing Type Thru Fire Rated Construction
1	1	Precast concrete floor with poured con- crete topp- ing. Note: Sleeves to have flat flanges and/ or guides which rest on top of precast slab.	B	B

2.7 ESCUTCHEONS

- A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.
- B. One-Piece, Stamped-Steel Type: With set screw or spring clips and chrome-plated finish.
- C. Split-Plate, Stamped-Steel Type: With concealed or exposed-rivet hinge, set screw or spring clips, and chrome-plated finish.

2.8 GROUT

- A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.
 - 1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
 - 2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.
 - 3. Packaging: Premixed and factory packaged.

2.9 FIRESTOPPING

- A. In addition to fire protection means specified elsewhere in this specification, this trade shall comply with the following:
 - 1. All pipe penetrations requiring Fire Stopping shall be "UL" approved thru-wall fire stop assemblies.

2. Contractor shall provide assembly for each type of pipe material thru fire-rated wall thickness.
3. Fire Stopping assemblies shall be installed as approved by local authority having jurisdiction.
4. Fire stop assemblies shall be Rectorseal, 3M, Hilti, Tremco, or approved equal.

2.10 PIPE AND EQUIPMENT SUPPORTS AND RESTRAINTS

- A. See Division 13, Section 13060 "Fire Suppression Supports and Hangers".

2.11 TOOLS AND LUBRICANTS

- A. Furnish special tools not readily available commercially, that are required for disassembly or adjustment of equipment and machinery furnished.
- B. Lubricants: A minimum of one quart of oil, and one pound of grease, of equipment manufacturer's recommended grade and type, in unopened containers and properly identified as to use for each different application.

2.12 ACCESS DOORS IN FINISHED CONSTRUCTION

- A. Access Doors
 1. Access doors as required for operation and maintenance of concealed equipment, valves, controls, etc. will be provided by another trade.
 2. This Trade is responsible for access door location, size and its accessibility to the valves or equipment being served.
 3. Coordinate and prepare a location, size, and function schedule of access doors required and deliver to a representative of the installing trade.
 4. Access doors shall be of ample size, minimum of 16" x 16"..

2.13 FOUNDATIONS

- A. General
 1. All equipment, piping, etc., mounted on/or suspended from approved foundations and supports, as shown on the drawings and as specified in Section 13060, "Fire Protection Supports and Hangers".

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Coordinate location of piping, sleeves, inserts, hangers, ductwork and equipment. Locate piping, sleeves, inserts, hangers, and equipment clear of windows, doors, openings, light outlets, and other services and utilities. Follow manufacturer's published recommendations for installation methods not otherwise specified.

3.2 PROTECTION AND CLEANING:

- A. See Section 13050 - "Fire Protection Basic Requirements" for requirements.

3.3 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. Install piping according to the following requirements and Division 13 Sections specifying piping systems.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping to permit valve servicing.
- G. Install piping at indicated slopes.
- H. Install piping free of sags and bends.
- I. Install fittings for changes in direction and branch connections.
- J. Install piping to allow application of insulation as required.
- K. Select system components with pressure rating equal to or greater than system operating pressure.
- L. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:
 - 1. One-piece, stamped-steel type with spring clips.
- M. Sleeves are not required for core-drilled holes or for holes formed by removable PE sleeves.
- N. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

1. Cut sleeves to length for mounting flush with both surfaces.
 - (a) Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas **2 inches (50 mm)** above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
 2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
 3. Install sleeves that are large enough to provide **1/4-inch (6.4-mm)** annular clear space between sleeve and pipe or pipe insulation. Use the sleeve materials as specified in paragraph 2 of this section:
 - (a) Steel Pipe Sleeves: For pipes smaller than **NPS 6 (DN 150)**.
 - (b) Steel Sheet Sleeves: For pipes **NPS 6 (DN 150)** and larger, penetrating gypsum-board partitions.
 4. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing: Secure flashing between clamping flanges. Install sleeve to extend sleeve to **2 inches (50 mm)** above finished floor level. Refer to Division 7 Section "Sheet Metal Flashing and Trim" for flashing.
 5. Seal space outside of sleeve fittings with grout.
 6. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 7 Section "Joint Sealants" for materials and installation.
 7. For exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for **1-inch (25-mm)** annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- O. Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
 - P. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to paragraph 2 of this section and Division 7 Section "Through-Penetration Firestop Systems" for materials.
 - Q. Verify final equipment locations for roughing-in prior to installing sleeves.
 - R. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.4 PIPING JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and Division 13 Sections specifying piping systems - Section 13915, "Fire Suppression Piping".

3.5 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.
- B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- C. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
- D. Install equipment to allow right of way for piping installed at required slope.

3.6 CONCRETE BASES

- A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to Division 13 Section 13060 "Fire Protection Supports and Hangers".

3.7 ERECTION OF WOOD METAL SUPPORTS AND ANCHORAGES

- A. Refer to Division 5 Section 05500 "Metal Fabrications" for structural steel.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.
- C. Refer to Division 13 Section 13060 "Fire Protection Supports and Hangers" for additional requirements.
- D. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor mechanical materials and equipment.

3.8 GROUTING

- A. Mix and install grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors.
- B. Clean surfaces that will come into contact with grout.
- C. Provide forms as required for placement of grout.
- D. Avoid air entrapment during placement of grout.
- E. Place grout, completely filling equipment bases.
- F. Place grout on concrete bases and provide smooth bearing surface for equipment.

- G. Place grout around anchors.
- H. Cure placed grout.

3.9 PAINTING

- A. Painting of mechanical systems, equipment, and components is specified in Division 9 Section.
- B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.
- C. All electrical motors, pump casings, and other apparatus shall be provided with factory applied protective coating and after installation shall be carefully cleaned, rubbed down and oiled.
- D. For protective coatings of other equipment such as hangers, etc., refer to that section of the specification wherein construction data is described.
- E. Provide prime coat painting for the following:-
 - 1. Miscellaneous steel and iron provided by this trade.
 - 2. Hangers and supports.

3.10 DRIP PANS

- A. Examine the drawings and in cooperation with the Electrical Trade confirm the final location of all electrical equipment to be installed in the vicinity of piping. Plan and arrange all overhead piping no closer than two feet from a vertical line to electric motors and controllers, switchboards, panelboards, or similar equipment. Piping is not permitted in Electric Equipment, Transformer, Switch Gear, Telephone Rooms. Except as required by the authority having jurisdiction to provide fire suppression.
- B. Where the installation of piping does not comply with the requirements of foregoing paragraph, the piping shall be relocated.
- C. Furnish gutters as follows:
 - 1. Provide and erect a gutter of 16 ounce cold rolled copper or 18 gauge galvanized steel, under every pipe which is within 2'-0" from a vertical line to any motor, electrical controllers, switchboards, panelboards, or the like.
 - 2. Each gutter shall be reinforced, rimmed, soldered and made watertight, properly suspended and carefully pitched to a convenient point for draining. Provide a 3/4" drain, with valve as directed, to nearest floor drain or slop sink, as approved.
 - 3. In lieu of such separate gutters, a continuous protecting sheet of similar construction adequately supported and braced, properly rimmed, pitched and drained, may be provided over any such motor, and extending 2'-0" in all directions beyond the motor, over which such piping has to run.

END OF SECTION 13053

**NEW PASSENGER TERMINAL
DULUTH INTERNATIONAL AIRPORT
DULUTH, MINNESOTA**

**SECTION 13060 - FIRE PROTECTION
HANGERS AND SUPPORTS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes hangers and supports for mechanical system piping and equipment.
- B. Related Sections include the following:
 - 1. Division 5 Section 05500 "Metal Fabrications" for materials for attaching hangers and supports to building structure.
 - 2. Division 13 Section 13915 on fire-suppression piping for fire-suppression pipe hangers.

1.3 DEFINITIONS

- A. MSS: Manufacturers Standardization Society for the Valve and Fittings Industry.
- B. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.4 PERFORMANCE REQUIREMENTS

- A. Design channel support systems for piping to support multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.
- B. Design heavy-duty steel trapezes for piping to support multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.
- C. Design seismic restraint hangers and supports for piping and equipment.
- D. Design and obtain approval from authorities having jurisdiction for seismic restraint hangers and supports for piping and equipment.

1.5 SUBMITTALS

- A. Product Data: For each type of pipe hanger, channel support system component, and thermal-hanger shield insert indicated.
- B. Shop Drawings: Signed and sealed by a qualified professional engineer for multiple piping supports and trapeze hangers. Include design calculations and indicate size and characteristics of components and fabrication details.
- C. Welding Certificates: Copies of certificates for welding procedures and operators.

1.6 QUALITY ASSURANCE

- A. Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
- B. Engineering Responsibility: Design and preparation of Shop Drawings and calculations for each multiple pipe support and trapeze by a qualified professional engineer.
- C. Systems, installation, equipment and materials shall conform to requirements of the local Building Code, Owners Insurance Underwriters, Factory Mutual, Industrial Risk Insurers, local Fire Department, NFPA, ANSI/ASME B31.9 "Building Service Piping" and all authorities having jurisdiction. Equipment and materials Underwriters listed, labeled and approved as required.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements of Factory Mutual, Underwriters Laboratory; provide products by one of the following:
 - 1. Pipe Hangers:
 - a. AAA Technology and Specialties Co., Inc.
 - b. B-Line Systems, Inc.
 - c. Carpenter & Patterson, Inc.
 - d. Empire Tool & Manufacturing Co., Inc.
 - e. Globe Pipe Hanger Products, Inc.
 - f. Grinnell Corp.
 - g. GS Metals Corp.
 - h. Michigan Hanger Co., Inc.
 - i. National Pipe Hanger Corp.
 - j. PHD Manufacturing, Inc.
 - k. PHS Industries, Inc.
 - l. Piping Technology & Products, Inc.
 - 2. Channel Support Systems:
 - a. B-Line Systems, Inc.
 - b. Grinnell Corp.; Power-Strut Unit.
 - c. GS Metals Corp.
 - d. Michigan Hanger Co., Inc.; O-Strut Div.
 - e. National Pipe Hanger Corp.
 - f. Thomas & Betts Corp.

- g. Unistrut Corp.
 - h. Wesanco, Inc.
3. Thermal-Hanger Shield Inserts:
 - a. Carpenter & Patterson, Inc.
 - b. Michigan Hanger Co., Inc.
 - c. PHS Industries, Inc.
 - d. Pipe Shields, Inc.
 - e. Rilco Manufacturing Co., Inc.
 - f. Value Engineered Products, Inc.
 4. Powder-Actuated Fastener Systems:
 - a. Gunnebo Fastening Corp.
 - b. Hilti, Inc.
 - c. ITW Ramset/Red Head.
 - d. Masterset Fastening Systems, Inc.

2.2 MANUFACTURED UNITS

- A. Pipe Hangers, Supports, and Components: MSS SP-58, factory-fabricated components. Refer to "Hanger and Support Applications" Article in Part 3 for where to use specific hanger and support types.
 1. Galvanized, Metallic Coatings: For piping and equipment that will not have field-applied finish.
 2. Nonmetallic Coatings: On attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- B. Channel Support Systems: MFMA-2, factory-fabricated components for field assembly.
 1. Coatings: Manufacturer's standard finish, unless bare metal surfaces are indicated.
 2. Nonmetallic Coatings: On attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- C. Thermal-Hanger Shield Inserts: **100-psi (690-kPa)** minimum compressive-strength insulation, encased in sheet metal shield.
 1. Material for Piping: ASTM C 552, Type I cellular glass or water-repellent-treated, ASTM C 533, Type I calcium silicate with vapor barrier.
 2. For Trapeze or Clamped System: Insert and shield cover entire circumference of pipe.
 3. For Clevis or Band Hanger: Insert and shield cover lower 180 degrees of pipe.
 4. Insert Length: Extend **2 inches (50 mm)** beyond sheet metal shield for piping operating below ambient air temperature.

2.3 MISCELLANEOUS MATERIALS

- A. Powder-Actuated Drive-Pin Fasteners: Powder-actuated-type, drive-pin attachments with pull-out and shear capacities appropriate for supported loads and building materials where used.

- B. Mechanical-Anchor Fasteners: Insert-type attachments with pull-out and shear capacities appropriate for supported loads and building materials where used.
- C. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars, black and galvanized.
- D. Grout: ASTM C 1107, Grade B, factory-mixed and -packaged, nonshrink and nonmetallic, dry, hydraulic-cement grout.
 - 1. Characteristics: Post hardening and volume adjusting; recommended for both interior and exterior applications.
 - 2. Properties: Nonstaining, noncorrosive, and nongaseous.
 - 3. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.
- E. All hanger rods shall be dipped in zinc chromite primer before installation or shall be galvanized, all hanger rods shall be double nutted.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

- A. Specific hanger requirements are specified in Sections specifying equipment and systems.
- B. Comply with Factory Mutual, Underwriters Laboratory, NFPA and MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Specification Sections.
- C. Chain straps, perforated bars, wire hangers are not permitted except for seismic bracing.
- D. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
 - 1. Adjustable Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated stationary pipes, NPS 4" to NPS 30 (DN100 to DN750).
 - 2. Steel Pipe Clamps (MSS Type 4): For suspension of cold pipe, NPS ½ to NPS 24 (DN15 to DN600), if little or no insulation is required.
 - 3. Pipe Hangers (MSS Type 5): For suspension of pipes, NPS ½ to NPS 4 (DN15 to DN100), to allow off-center closure for hanger installation before pipe erection.
 - 4. Adjustable Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated stationary pipes, NPS ¾ to NPS 3 (DN20 to DN80).
 - 5. Adjustable Steel Band Hangers (MSS Type 7): For suspension of noninsulated stationary pipes, NPS ½ to NPS 8 (DN15 to DN200).
 - 6. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated stationary pipes, NPS ½ to NPS 8 (DN15 to DN200).
 - 7. Adjustable Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated stationary pipes, NPS ½ to NPS 2 (DN15 to DN50).
 - 8. Split Pipe-Ring with or without Turnbuckle-Adjustment Hangers (MSS Type 11): For suspension of noninsulated stationary pipes, NPS ¾ to NPS 8 (DN10 to DN200).
 - 9. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated stationary pipes, NPS ¾ to NPS 3 (DN10 to DN80).
 - 10. U-Bolts (MSS Type 24): For support of heavy pipe, NPS ½ to NPS 30 (DN15 to DN750).

11. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
 12. Pipe Saddle Supports (MSS Type 36): For support of pipes, **NPS 4 to NPS 36 (DN100 to DN900)**, with steel pipe base stanchion support and cast-iron floor flange.
 13. Pipe Stanchion Saddles (MSS Type 37): For support of pipes, **NPS 4 to NPS 36 (DN100 to DN900)**, with steel pipe base stanchion support and cast-iron floor flange and with U-bolt to retain pipe.
 14. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes, **NPS 2-1/2 to NPS 36 (DN65 to DN900)**, if vertical adjustment is required, with steel pipe base stanchion support and cast-iron floor flange.
 15. Single Pipe Rolls (MSS Type 41): For suspension of pipes, **NPS 1 to NPS 30 (DN25 to DN750)**, from two rods if longitudinal movement caused by expansion and contraction might occur.
 16. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes, **NPS 2-1/2 to NPS 20 (DN65 to DN500)**, from single rod if horizontal movement caused by expansion and contraction might occur.
 17. Complete Pipe Rolls (MSS Type 44): For support of pipes, **NPS 2 to NPS 42 (DN50 to DN1050)**, if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
 18. Pipe Roll and Plate Units (MSS Type 45): For support of pipes, **NPS 2 to NPS 24 (DN50 to DN600)**, if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.
 19. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes, **NPS 2 to NPS 30 (DN50 to DN750)**, if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.
- E. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, **NPS 3/4 to NPS 20 (DN20 to DN500)**.
 2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, **NPS 3/4 to NPS 20 (DN20 to DN500)**, if longer ends are required for riser clamps.
- F. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
1. Steel Turnbuckles (MSS Type 13): For adjustment up to **6 inches (150 mm)** for heavy loads.
 2. Steel Clevises (MSS Type 14): For **120 to 450 deg F (49 to 232 deg C)** piping installations.
 3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
 4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
 5. Steel Weldless Eye Nuts (MSS Type 17): For **120 to 450 deg F (49 to 232 deg C)** piping installations.
- G. Building Attachments: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.

2. Top-Beam C-Clamps (MSS Type 19) (Provide retainer clip with each C-Clamps): For use under roof installations with bar-joist construction to attach to top flange of structural shape.
 3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
 4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
 5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
 6. C-Clamps (MSS Type 23) (Provide retainer clip with each C-Clamps): For structural shapes.
 7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
 8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
 9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
 10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
 11. Malleable Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
 12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:
 - a. Light (MSS Type 31): 750 lb (340 kg).
 - b. Medium (MSS Type 32): 1500 lb (675 kg).
 - c. Heavy (MSS Type 33): 3000 lb (1350 kg).
 13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
 14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
 15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where head room is limited.
- H. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
1. Steel Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
 2. Protection Shields (MSS Type 40): Of length recommended by manufacturer to prevent crushing insulation.
 3. Thermal-Hanger Shield Inserts: For supporting insulated pipe, 360-degree insert of high-density, 100-psi (690-kPa) minimum compressive-strength, water-repellent-treated calcium silicate or cellular-glass pipe insulation, same thickness as adjoining insulation with vapor barrier and encased in 360-degree sheet metal shield.
- I. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.

2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed **1-1/4 inches (32 mm)**.
3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41 roll hanger with springs.
4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from hanger.
6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from base support.
7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from trapeze support.
8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:
 - a. Horizontal (MSS Type 54): Mounted horizontally.
 - b. Vertical (MSS Type 55): Mounted vertically.
 - c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.

3.2 HANGER AND SUPPORT INSTALLATION

- A. Pipe Hanger and Support Installation: Comply with Factory Mutual, Underwriters Laboratory, NFPA and MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.
- B. Channel Support System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled channel systems.
 1. Field assemble and install according to manufacturer's written instructions.
- C. Heavy-Duty Steel Trapeze Installation: Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated, heavy-duty trapezes.
 1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
 2. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D-1.1.
- D. Install building attachments within concrete slabs or attach to structural steel. Space attachments within maximum piping span length indicated in Factory Mutual, Underwriters Laboratory, NFPA, and MSS SP-69. Install additional attachments at concentrated loads, including valves, flanges, guides, strainers, and expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

- E. Install powder-actuated drive-pin fasteners in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
- F. Install mechanical-anchor fasteners in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- G. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.
- H. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- I. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- J. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by Factory Mutual, Underwriters Laboratory, NFPA, and ASME B31.9, "Building Services Piping," is not exceeded.

3.3 EQUIPMENT SUPPORTS

- A. Fabricate structural-steel stands to suspend equipment from structure above or to support equipment above floor.
- B. Grouting: Place grout under supports for equipment and make smooth bearing surface.

3.4 METAL FABRICATION

- A. Cut, drill, and fit miscellaneous metal fabrications for heavy-duty steel trapezes and equipment supports.
- B. Fit exposed connections together to form hairline joints. Field-weld connections that cannot be shop-welded because of shipping size limitations.
- C. Field Welding: Comply with Factory Mutual, Underwriters Laboratory, and AWS D1.1 procedures for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

3.5 ADJUSTING

- A. Hanger Adjustment: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

3.6 PAINTING

- A. Touching Up: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
- B. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils (0.05 mm).
- C. Touching Up: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 9 Section "Painting."
- D. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 13060

**NEW PASSENGER TERMINAL
DULUTH INTERNATIONAL AIRPORT
DULUTH, MINNESOTA**

**SECTION 13075 - FIRE PROTECTION
IDENTIFICATION**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following mechanical identification materials and their installation:
 - 1. Equipment nameplates, markers and signs.
 - 2. Pipe markers.
 - 3. Valve tags and schedules.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For color, letter style, and graphic representation required for each identification material and device.
- C. Valve numbering scheme.
- D. Valve Schedules: For each piping system, furnish to Owner's Representative three (3) complete framed plastic laminated valve tag schedules. Schedule shall indicate tag number, valve location by floor and nearest column number, valve size and service controlled. Furnish extra copies of the valve and equipment schedules (in addition to mounted copies) to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. ASME Compliance: Comply with ASME A13.1, "Scheme for the Identification of Piping Systems," for letter size, length of color field, colors, and viewing angles of identification devices for piping.

1.5 COORDINATION

- A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

- B. Coordinate installation of identifying devices with location of access panels and doors.
- C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT IDENTIFICATION DEVICES

- A. Equipment Nameplates: Stainless steel or anodized aluminum, with data engraved or stamped, for permanent attachment on equipment.
 - 1. Data:
 - a. Manufacturer, product name, model number, and serial number.
 - b. Capacity, operating and power characteristics, and essential data.
 - c. Labels of tested compliances.
 - 2. Location: Nameplate shall be located on the equipment in a location which is accessible and visible when the equipment is installed.
 - 3. Fasteners: As required to mount on equipment in a permanent (tamper resistant) manner.

2.2 PIPING IDENTIFICATION DEVICES

- A. Manufactured Pipe Markers, General: Preprinted, color-coded, with lettering indicating service, and showing direction of flow.
 - 1. Apply Opti-code pressure sensitive vinyl color coded pipe markers identifying pipe contents and direction of flow.
 - 2. On exposed piping apply markers on 30 foot centers of straight runs, at valve locations, at points where piping enters and leaves a partition, wall, floor or ceiling.
 - 3. On concealed piping installed above removable ceiling construction apply markers in manner described for exposed piping.
 - 4. On concealed piping installed above non-removable ceiling construction, or in pipe shafts, apply markers at valve or other devices that are made accessible by means of access doors or panels.
 - 5. Marker widths shall be 8" for pipes up to 2" diameter and 12" wide for 2-1/2" to 6" diameter piping and 24" wide for larger diameter piping. Letter heights stating service shall be preprinted on marker 3/4" high for 8" markers 1-1/4" high for 12" markers and 2-1/2" high for 24" markers.
 - 6. For painted or insulated pipes apply markers after insulation and painting work has been completed.
 - 7. Colors shall conform to ANSI Standard A13.1. Provide 24 additional markers of each type for future use by Owner's personnel.
 - 8. Follow manufacturer's instructions for application procedures using non-combustible materials and contact adhesives. Loop 3/4" wide pressure-sensitive tape of same color as marker background around pipe at both ends of marker and overlap tape on itself a minimum of 2".
 - 9. Markers and tape manufactured by Seton Name Plate Co. or other approved.

10. Colors: Comply with ASME A13.1, unless otherwise indicated.
 11. Lettering: Use piping system terms indicated and abbreviate only as necessary for each application length.
 12. Pipes with OD, Including Insulation, Less Than 6 Inches (150 mm): Full-band pipe markers extending 360 degrees around pipe at each location.
 13. Pipes with OD, Including Insulation, 6 Inches (150 mm) and Larger: Either full-band or strip-type pipe markers at least three times letter height and of length required for label.
 14. Arrows: Integral with piping system service lettering to accommodate both directions; or as separate unit on each pipe marker to indicate direction of flow.
- B. Pretensioned Pipe Markers: Precoiled semirigid plastic formed to cover full circumference of pipe and to attach to pipe without adhesive.
 - C. Shaped Pipe Markers: Preformed semirigid plastic formed to partially cover circumference of pipe and to attach to pipe with mechanical fasteners that do not penetrate insulation vapor barrier.
 - D. Self-Adhesive Pipe Markers: Plastic with pressure-sensitive, permanent-type, self-adhesive back.
 - E. Plastic Tape: Continuously printed, vinyl tape at least 3 mils (0.08 mm) thick with pressure-sensitive, permanent-type, self-adhesive back.
 1. Width for Markers on Pipes with OD, Including Insulation, Less Than 6 Inches (150 mm): 3/4 inch (19 mm) minimum.
 2. Width for Markers on Pipes with OD, Including Insulation, 6 Inches (150 mm) or Larger: 1-1/2 inches (38 mm) minimum.

2.3 VALVE TAGS

- A. Attach a 2" square engraved anodized aluminum or brass tag stamped with designating numbers 1/2" high filled in with black enamel to each valve, except those on fixtures. Tags shall contain the abbreviation "F.P. above designating number.
- B. Securely fasten valve tag to valve spindle or handle with a brass chain.
- C. All valves that have an alarm wired back to an alarm panel, shall be identified and coordinated with the numbering system of the alarm panel.
- D. Provide approved ceiling tile markers in areas where removable ceilings occur to indicate location of valves or other devices, equipment and fittings which require maintenance service.

2.4 VALVE SCHEDULES

- A. Valve Schedules: For each piping system, on standard-size bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

1. Valve-Schedule Frames: Glazed display frame for removable mounting on masonry walls for each page of valve schedule. Include mounting screws.
2. Frame: Extruded aluminum.
3. Glazing: ASTM C 1036, Type I, Class 1, Glazing Quality B, 2.5-mm, single-thickness glass.

PART 3 - EXECUTION

3.1 APPLICATIONS, GENERAL

- A. Products specified are for applications referenced in other Division 13 Sections. If more than single-type material, device, or label is specified for listed applications, selection is Installer's option.

3.2 EQUIPMENT IDENTIFICATION

- A. Install and permanently fasten equipment nameplates on each major item of fire protection equipment that does not have nameplate or has nameplate that is damaged or located where not easily visible. Locate nameplates where accessible and visible. Include nameplates for the following general categories of equipment:

1. Pumps, compressors, and similar motor-driven units.

3.3 PIPING IDENTIFICATION

- A. Install manufactured pipe markers indicating service on each piping system. Install with flow indication arrows showing direction of flow.
- B. Locate pipe markers and color bands where piping is exposed in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior nonconcealed locations as follows:
 1. Near each valve and control device.
 2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
 3. Near penetrations through walls, floors, ceilings, and nonaccessible enclosures.
 4. At access doors, manholes, and similar access points that permit view of concealed piping.
 5. Near major equipment items and other points of origination and termination.
 6. Spaced at maximum intervals of 50 feet (15 m) along each run. Reduce intervals to 25 feet (7.6 m) in areas of congested piping and equipment.
 7. On piping above removable acoustical ceilings. Omit intermediately spaced markers.

3.4 VALVE-TAG INSTALLATION

- A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; shutoff valves and hose connections. List tagged valves in a valve schedule.
- B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions as indicated in the previous articles:
 - 1. Valve-Tag Size and Shape:
 - a. Fire Protection: **1-1/2 inches (38 mm)**, round
 - 2. Valve-Tag Color:
 - a. Fire Protection: Red
 - 3. Letter Color:
 - a. Fire Protection: Black.

3.5 VALVE-SCHEDULE INSTALLATION

- A. Mount valve schedule on wall in accessible location in each major equipment room.

3.6 WARNING-TAG INSTALLATION

- A. Write required message on, and attach warning tags to, equipment and other items where required.

3.7 ADJUSTING

- A. Relocate mechanical identification materials and devices that have become visually blocked by other work.

3.8 CLEANING

- A. Clean faces of fire protection identification devices and glass frames of valve schedules.

END OF SECTION 13075

**NEW PASSENGER TERMINAL
DULUTH INTERNATIONAL AIRPORT
DULUTH, MINNESOTA**

**SECTION 13129 – PREFABRICATED
CONTROL BOOTHS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes fabricated steel control booth with ADA accessible restroom.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for control booths.
- B. Shop Drawings: For control booths. Include plans, elevations, sections, details, accessories, and fastening and anchorage details, including mechanical fasteners.
 - 1. Anchor-Bolt Plans: Submit anchor-bolt plans and templates. Include location, diameter, and projection of anchor bolts required to attach control booths to foundation. Indicate post reactions at each location.
- C. Samples for Initial Selection: For each type of exposed finish.
- D. Samples for Verification: For each type of exposed finish in manufacturer's standard sizes.
 - 1. Include Samples of wall panels and accessories to verify finish selection.

1.4 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For control booths to include in maintenance manuals.

1.6 COORDINATION

- A. Cast-in Anchorage: Coordinate installation of anchorages for control booths. Furnish sleeves, concrete inserts, anchor bolts, and items with integral anchors that are to be embedded in concrete bases. Include setting drawings, templates, and directions for installing anchorages. Deliver such items to Project site in time for installation.

1.7 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair finish or replace control booths that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Control booths shall withstand the following loads and stresses within limits and under conditions indicated according to ASCE/SEI 7:
 - 1. Wind Loads: 30 PSF.
 - 2. Floor Live Load: 50 PSF
 - 3. Roof Live Load: 50 PSF
- B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
 - 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- D. Safety Glazing Products: Category II materials complying with testing requirements in 16 CFR 1201.
- E. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC A117.1.

2.2 FABRICATED STEEL CONTROL BOOTHS

- A. General: Fabricate control booths from an integrated set of mutually dependent components to form a completed assembly, ready for installation on Project site.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. AustinMohawk and Company, Inc.
 - b. Canada Kiosk.

- c. Keystone Structures, Inc.
 - d. Little Buildings, Inc.
 - e. MFI Mardan Fabricators.
 - f. Par-Kut International.
 - g. Porta-King Building Systems.
- B. Building Style: Butt-glazed corners.
- C. Structural Framework: Fabricated from 2-by-2-by-0.075-inch steel structural or mechanical tubing. Connect framework by welding.
- D. Exterior Doors: Swinging door on back.
 - 1. Swinging Door: 36" wide; 1-3/4 inches thick; tubular-frame design fabricated from galvanized steel; with top half of door glazed. Equip door with deadlock, three butt hinges, closer, and full weather stripping.
 - a. Glazing: Fixed unit with clear insulating glass.
 - b. Deadlock: Mortised, with lever handle and removable cylinder capable of being master keyed.
- E. Interior Doors: Swinging door.
 - 1. Swinging Door: 36" wide; 1-3/4 inches thick; tubular-frame design fabricated from galvanized steel. Equip door with three butt hinges and privacy lock.
- F. Windows: Extruded-aluminum sash frames glazed with clear insulating glass.
 - 1. Frame Finish: Manufacturer's standard mill or clear anodic.
 - 2. Horizontal Sliding Transom Window: Equip with cam lock, weather stripping, and ball-bearing rollers.
 - 3. Corner Shape: Square.
- G. Wall Panel Assembly: Assembly consisting of exterior face panel fabricated from 0.075-inch nominal-thickness, galvanized-steel sheet; and interior face panel fabricated from 0.052-inch nominal-thickness, galvanized-steel sheet; with 2-inch-thick, rigid fiberglass or polystyrene board insulation, R=10, in cavity between exterior and interior face panels.
- H. Base/Floor Assembly: No perimeter frame, with finished floor fabricated from 0.108-inch nominal-thickness, galvanized, rolled steel tread plate.
- I. Flat Roof/Ceiling Assembly: Assembly consisting of exterior roof panels, interior ceiling panels, and insulation, R=17.4, between exterior and interior panels; sloped to drain at booth perimeter.
 - 1. Exterior Roof Panel: Fabricated from 0.075-inch nominal-thickness, galvanized-steel sheet; with painted finish.
 - 2. Interior Ceiling Panel: Fabricated from 0.079-inch nominal-thickness, galvanized-steel sheet; with fiberglass insulation in cavity between ceiling and roof.
 - 3. Canopy Fascia: Fabricated from 0.079-inch nominal-thickness, galvanized-steel sheet, of manufacturer's standard design.
 - a. Height: 8 inches.
 - b. Overhang: Flush with face of walls below.
 - 4. Roof scuppers.

- J. Work Counters: Full width of control booth, reinforced; with 16-inch-wide drawer below each counter and an access opening for electrical cords at each rear corner of counter.
 - 1. Material: 0.078-inch-thick, stainless-steel sheet.
 - 2. Depth: 22 inches.
- K. Electrical Power Service: 100-A, 120/240-V ac, single-phase, three-wire service.
 - 1. Unit shall be delivered complete with all wiring required for fluorescent light with lamp and switch, three 110V/120V ground-fault circuit interrupter (GFCI) duplex outlets, heating unit, cooling unit, exhaust fan and water heater, a 100A 12-circuit load center with branch circuit breakers and 100A main breaker.
 - 2. All wiring shall be copper #12 AWG minimum, enclosed in EMT.
 - 3. All fittings, wiring devices and fixtures UL listed.
- L. Lighting Fixtures: Three ceiling-mounted fluorescent lighting fixtures, 48 inches long, with acrylic lens and two 30-W T8 lamps in each fixture. Provide single-pole switches mounted adjacent to doors to control lighting fixtures.
- M. Heating Unit: Wall-mounted, thermostatically controlled, 110-V, 1500-W electric heater with fan-forced operation and with capacity of not less than 5000 Btu/h. Enclose in enameled-steel cabinet and mount under work counter.
- N. Cooling Unit: Roof-mounted, thermostatically controlled air conditioner with cooling capacity of not less than 13,500 Btu/h. Enclose in enameled-steel cabinet.
- O. Restroom Exhaust Fan: 80 CFM.
- P. Restroom Fixtures: Provide ADA compliant plumbing fixtures including:
 - 1. Water Closet: Low flow type WC; 1.28 GPF; white vitreous china.
 - 2. Lavatory: Wall hung; white vitreous china with chrome faucet.
- Q. Restroom Accessories: Provide ADA compliant accessories including :
 - 1. Coat hook.
 - 2. Mirror (above sink).
 - 3. Paper towel dispenser.
 - 4. Toilet Paper holder.
 - 5. Stainless steel grab bars.
- R. Hot Water Heater: 2-1/2 Gal. point-of-use type.
- S. Anchorage: Cast-in-place anchor bolts fabricated from non-ferrous or corrosion-resistant materials, with allowable load or strength design greater than or equal to the design load as determined by testing conducted by a qualified testing agency.
- T. Materials:
 - 1. Zinc-Iron Alloy Coated (Galvannealed) Steel Sheet: ASTM A 653/A 653M, commercial quality, G90 coating designation; mill phosphatized.

2. Galvanized, Rolled Steel Tread Plate: ASTM A 786/A 786M, rolled from steel plate complying with ASTM A 572/A 572M, Grade 55; hot-dip galvanized according to ASTM A 123/A 123M.
 3. Steel Structural Tubing: ASTM A 500/A 500M, Grade B.
 4. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
 5. Steel Mechanical Tubing: ASTM A 513, welded-steel mechanical tubing.
 6. Zinc-Coated (Galvanized) Steel: Hot-dip galvanized according to ASTM A 123/A 123M.
 7. Stainless-Steel Sheet: ASTM A 666, Type 304.
 8. Plastic Laminate: NEMA LD 3, HGS or HGL grade.
 9. Plywood: DOC PS 1, Exterior grade.
 10. Particleboard: ANSI A208.1, Grade M-2.
 11. Clear Tempered Float Glass: ASTM C 1048, Kind FT, Condition A, Type I, Class 1, and Quality q3; 6 mm thick.
 12. Clear Insulating Glass: ASTM E 2190. Factory-assembled units consisting of two lites of 2.5-mm-thick clear float glass, ASTM C 1036, Type I, Class 1, Quality q3, and dehydrated air space, with a total overall unit thickness of 1 inch and with manufacturer's standard dual seal.
- U. Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
1. Color and Gloss: As selected by Architect from manufacturer's full range.

2.3 FABRICATION

- A. Factory fabricate control booths completely.
- B. Factory preglaze windows and doors.
- C. Factory prewire control booths, ready for connection to service at Project site.
- D. Accessible Control Booths: Where indicated to be accessible, fabricate control booths as follows:
 1. Provide service windows located no higher than 34 inches above exterior grade.
 2. Provide door opening with minimum 32-inch clear width.
 3. Provide minimum 60-inch clear turning spacing within the booth.
 4. Provide minimum 27-inch clearance beneath interior work surfaces. Locate work surfaces 28 inches minimum and 34 inches maximum above the floor.
 5. Locate controls and operable parts no lower than 15 inches and no higher than 48 inches above the floor where reach is unobstructed. Where side reach is obstructed, locate controls and operable parts no lower than 15 inches and no higher than 46 inches above the floor.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, including concrete bases; accurate placement, pattern, and orientation of anchor bolts; critical dimensions; and other conditions affecting performance of the Work.
- B. Examine roughing-in for electrical and communication systems to verify actual locations of connections before control booth installation.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install control booths according to manufacturer's written instructions.
- B. Accessible Control Booths: Install with interior floor surface at same elevation as adjacent paved surfaces.
- C. Set control booths plumb and aligned. Level baseplates true to plane with full bearing on concrete bases.
- D. Fasten control booths securely to concrete base with anchorage indicated.
- E. Connect to electrical power service and data systems.
- F. Perform startup checks of heating and cooling units according to manufacturer's written instructions.

3.3 ADJUSTING

- A. Adjust doors, operable windows, and hardware to operate smoothly, easily, properly, and without binding. Confirm that locks engage accurately and securely without forcing or binding.
- B. Lubricate hardware and other moving parts.
- C. After completing installation, inspect exposed finishes and repair damaged finishes.

END OF SECTION 13129

**NEW PASSENGER TERMINAL
DULUTH INTERNATIONAL AIRPORT
DULUTH, MINNESOTA**

**SECTION 13700 – PART 1542 COMPUTER
CONTROLLED ACCESS
SYSTEM (CCAS) AND CCTV SYSTEM**

PART 1 - GENERAL

1.1 SUMMARY

- A. The scope of the work includes complete and integrated 49 CFR Part 1542 Computer Controlled Access System (CCAS). The integrated CCAS shall include access controls, CCTV and other systems as specified herein and indicated on the drawings.
- B. The work includes furnishing all labor, materials, tools, and equipment, and the performance of all operations necessary for coordinating, detailing, fabricating, inspecting, documenting, delivering, installing and testing the hardware, software and firmware for a complete and integrated CCAS in accordance with this section, including but not limited to the following:
 - 1. Operator Consoles and Photo Identification System.
 - a. Security Center Security Control Console (SCC) as indicated on drawings.
 - b. Photo Identification Subsystem (PIDS) Terminal and Badging.
 - 2. Paging and E-mail notifications
 - a. All alarms shall be transmitted via paging and e-mail system in addition to the SCC. The intent is to alert assigned personnel. Provide system necessary for remote notification as specified in paragraph 2.3.E.
 - 3. Data Processing Subsystem (DPS)
 - a. Fault Tolerant Servers, as indicated on the drawings and specified herein.
 - 4. Data Transmission Subsystem (DTS).
 - a. Network Based Intelligent Field Panels (IFPs).
 - 5. Controlled Access Subsystem (CAS).
 - a. Card Readers with PINpads.
 - b. Electronics Interface Boxes (EIB).
 - c. Exit Pushbuttons.
 - d. Interface with door locking sub-system.
 - e. Interface with delayed egress Panic Hardware.
 - f. Gate Control Panel for vehicle gates.
 - g. Signage.
 - 6. Intrusion Detection Subsystem (IDS).
 - a. Tamper Switches.
 - b. Door and Gate Position Switch (Balanced Magnetic Switch).
 - c. Duress Alarm Devices.
 - d. Vehicle Presence Sensor (ground loops).
 - 7. Surveillance and Assessment Subsystem (SAS).
 - a. Complete Integrated Video Management System.
 - b. Day / night IP Fixed Cameras.
 - c. Day / night IP Autodome PTZ Cameras.
 - d. Camera Mounting.
 - e. Camera Power Supply and Cabling.
 - f. Video Servers and Storage.

- g. Intelligent Video Analytics: Intelligent Video Analytics (IVA) is a separate system that is not required to be integrated with the Video Servers and Storage (NVR) and CCAS other than to transmit alarms to CCAS. References throughout the specifications for integration of the IVA apply only if the selected products normally offer those features.
- 8. Other CCAS Components.
 - a. Battery Backup Units (BBU).
 - b. Workstations.
 - c. Color Video Camera.
 - d. Photographic Lighting Unit.
 - e. Signature Input Unit.
 - f. ID Badge Printer.
 - g. ID Badges.
 - h. ID Badge Programmer.
 - i. ID Badge Encoder / Decoder.
 - j. Die Cutter.
 - k. Laminator.
 - l. Wireless transmitter / receiver.
- 9. Electrical Power Communication and Control Wiring and Conduit System.
 - a. Provide all conduit and wiring required to provide a complete and operational system.
- 10. Miscellaneous Provisions.
 - a. Nonstandard Test Equipment, Tools, Adaptors and Fittings.
 - b. Portable Intelligent Field Panel Analyzer shall include a laptop computer similar in capacity of administrative workstation.
- 11. Other Items.
 - a. Connections to existing perimeter gates as indicated on drawings.

1.2 RELATED WORK

- A. All Division 16 Electrical sections apply to the work specified in this section.
- B. The CCAS shall interface with the following Contract items to be provided in other sections:
 - 1. Network Electronics. (Provided under this contract).
 - 2. Uninterruptible Power Supplies. (Provided under this contract).

1.3 REFERENCES, CODES AND REGULATIONS

- A. It is not the intention of this section to provide all details of design and fabrication. The Contractor shall ensure that the equipment has been designed and fabricated in accordance with applicable engineering codes and standards. When specific requirements are stated in this section that exceed and / or overlap those requirements of the codes and standards referenced herein, this section shall govern.
- B. This section is based on the latest applicable codes and standards in force at the time the Specification is issued for bid. Should the applicable codes or standards listed herein be revised before or after the award of the Contract, the Contractor shall inform the Architect / Engineering (A/E) immediately, in writing, upon receipt of such information. Before adoption of any subsequent issue, the Contractor shall identify the changes in writing and shall not proceed with engineering, material and / or fabrication changes without A/E's written permission.

- C. Design, material, fabrication, testing, inspection, certification, documentation and operation shall conform to the following referenced codes, regulations, standards and specifications.
1. Regulations Transportation Security Administration 49 CFR:
 - a. Part 1520 - Protection of Sensitive Security Information.
 - b. Part 1540 - Civil Aviation Security.
 - c. Part 1542 - Airport Security.
 - d. Part 1544 - Aircraft Operator Security.
 2. Guidelines.
 - a. Recommended Security Guidelines for Airport Planning, Design and Construction - DOT/FAA/AR-00-52 June 2001.
 - b. RTCA/DO-230 Standards for Airport Security Access Control Systems.
 3. American National Standards Institute (ANSI):
 - a. C2 - National Electrical Safety Code.
 - b. C37.90A - Guide for Surge Withstand Capability Tests.
 - c. C62.41 - Guide for Surge Voltage in Low Voltage AC Power Circuits.
 - d. C63.12 - Recommended Practice on Procedures for Control of System Electromagnetic Compatibility.
 - e. X3.4 - American Standard Code for Information Interchange (ASCII).
 4. American Society of Testing and Materials (ASTM):
 - a. ASTM B 8 - Concentric-Lay Stranded Copper Conductors.
 - b. ASTM D 635 - Rate of Burning and / or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position.
 5. Federal Communications Commission (FCC):
 - a. FCC Rules and Regulations, Part 15 and 68.
 6. General Services Administration (GSA):
 - a. FS W-A-450B - Federal Specification (Interim): Components for Interior Security Alarm Systems.
 7. Institute of Electrical and Electronics Engineers (IEEE):
 - a. IEEE Transaction Volume COM-21 - Lightning Surges in Open Wire, Coaxial and Paired Cables.
 - b. IEEE C62-1990 - Guides and Standards for Surge Protection.
 - c. IEEE 802 - Standard for Local Area Networks.
 - d. IEEE 802.2 - Standards for Local Area Networks: Media Access Control (MAC) Bridges.
 - e. IEEE 802.3 - Ethernet local area network.
 - f. IEEE 802.11a - Wireless local area network.
 8. International Standards Organization (ISO):
 - a. ISO/IEC 8802-3 - Information Processing System - Local Area Networks - Part 3.
 - b. ISO/IEC 8802-4 - Information Processing System - Local Area Networks - Part 4.
 9. Insulated Cable Engineer Association (ICEA):
 - a. S-19-81 - Rubber Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.
 10. National Electrical Manufacturers Association (NEMA):
 - a. NEMA 250 (1985) - Enclosures for Electrical Equipment.
 11. National Fire Protection Association (NFPA):
 - a. NFPA 70 (1996) - National Electrical Code (NEC).
 12. Occupational Safety and Health Act (OSHA):
 - a. OSHA 2206 - General Industry Safety and Health Standards.
 13. Underwriters' Laboratories (UL):
 - a. UL 6 - Rigid Metal Electrical Conduit.

- b. UL 198 (1988) - Fuses.
- c. UL 294 (1987) - Standard for Access Control Systems.
- d. UL 437 - Key Locks.
- e. UL 512 (1987) - Fuse Holders.
- f. UL 634 (1985) - Connectors and Switches for Use with Burglar Alarm Systems.
- g. UL 639 (1986) - Intrusion Detection Units.
- h. UL 796 (1984) - Printed Circuit Boards.
- i. UL 1076 (1988) - Proprietary Burglar-Alarm Units and Systems.
- j. UL 1449 (1985) - Standard for Safety Transient Voltage Surge Suppressors.

14. Applicable Federal, state and local laws, regulations, ordinances and codes.

- D. In the event of conflicting requirements between the authorities cited above or between authorities cited and those specified, such disagreements shall be resolved by the A/E or Owner.
- E. Nothing in this section, including invocation of certain specific codes, standards or specifications, shall relieve the Contractor of the responsibility for compliance with the codes, standards or specifications which are generally recognized to be applicable to the work specified herein.

1.4 SYSTEM DESCRIPTION

- A. The Computer Controlled Access System (CCAS) as outlined in this section and detailed in Part 2 of this document is the key central component for managing physical security and the bridge between physical and logical security for this project. The system shall provide a variety of integral functions including the ability to regulate access and egress; provide identification credentials; monitor, track and interface alarms; and view, record and store digital surveillance video linked to CCAS events.
- B. The CCAS shall utilize a single seamlessly integrated relational database for all functions utilizing a fully multi-tasking multithreading Microsoft Windows 2000/2003 or Windows XP Operating System. CCAS software shall be written so that all modules (Access Control, Alarm Monitoring, ID / Credential Management, Visitor Management and Digital Video Management) are developed and built from a unified single 32-bit source code set.
- C. Upgrades or expansion of the CCAS to a larger size system in scale shall not require installation of a different and / or new CCAS application or require the administrator / operator to learn a different and / or new interface from the previous version.
- D. CCAS software shall be written using Unicode format. Unicode enables a single software product to be targeted across multiple platforms and languages without re-engineering and allows for data to be transported through different systems without corruption.
- E. CCAS software shall be written to Microsoft's published standards for User Interface Design, Secure Coding Practices and Database Implementation Guidelines (Microsoft⁷ Open Database Connectivity (ODBC) interface).

- F. CCAS software shall be written to ISO Standards on Software Development for C++ and C#.
- G. CCAS and its software shall seamlessly interface with and monitor intelligent system controllers, reader interface modules, I/O panels, burglar alarm panels, burglar alarm panel receivers, biometric devices, personal protection devices, intercom systems, fire alarm panels (secondary monitoring only), building management systems and digital video recorders approved for use by the CCAS manufacturer.
- H. The CCAS shall be able to communicate via RS-485, RS-232, TCP-IP/Ethernet and dial-up via modem.
- I. All tasks shall be accessible from any compatible client workstation on the network utilizing one or all of the following.
 - 1. Traditional client server architecture.
 - 2. N-tier architecture where the CCAS shall support the expansion of the system architecture and allow for end-user deployment based upon their system architecture needs. The CCAS shall allow but not require the separation of the database, application server, web server and client interface. The system shall require that all connections to the database are performed through a trusted link from the client or internet browser interface.
 - 3. Centralized distribution (publishing) of applications using Windows Terminal Server and Citrix on Windows, Unix, Linux or Apple Macintosh based systems through any compatible internet browser application and / or by means of a mobile computing platform using a wearable computer, Tablet PC or PDA device.
- J. The CCAS shall utilize an open architecture where all data must reside on a single database and must be accessible in real time to every / any CCAS workstation or web based client connected to the network. The system shall be configurable to support all of the following databases: Microsoft SQL Server 2000 Personal and Standard editions with SP3a, Microsoft SQL Server 2005 Standard and Enterprise editions and Microsoft SQL Server 2005 Express, Oracle Server 9.i. and Oracle Server 10g. Oracle data may reside on Windows or UNIX platforms.
- K. The system architecture shall support Microsoft Windows Clustering, Hot-Standby, Fault Tolerant Servers and Fault Tolerant Hot Standby Servers.
- L. The CCAS shall support an unlimited number of Access Control Readers, an unlimited number of Inputs / Outputs, an unlimited number of Client Workstations, and an unlimited number of Cardholders

1.5 SUBMITTALS

- A. The Contractor shall submit all items in accordance with the requirements of, Section 01300 - SUBMITTALS.
- B. Unless noted otherwise in General Conditions, within thirty (30) days of award of Contract, the Contractor shall submit manufacturer's specification or data sheets for all subsystem equipment to be utilized in the CCAS.
- C. The Contractor shall submit the following:
 - 1. Shop Drawings: Provide complete shop drawings which include the following:

- a. Indicate all system device locations on 1/8" scale architectural floor plans. No other system(s) shall be included on these plans.
 - b. Include full schematic wiring information on these drawings for all devices. Wiring information shall include cable type, conductor routings, quantities, and connection details at device.
 - c. Include a complete CCAS one-line, block diagram.
 - d. Include a statement of the system sequence of operation of each access control portal and overall system performance.
 - e. Include a statement indicating seamless integration of various systems.
2. Product Data: Provide complete product data that includes the following:
 - a. Manufacturer's technical data for all material and equipment at the system and sub system level to be provided as part of the CCAS.
 - b. A system description including analysis and calculations used in sizing equipment required by the CCAS. The description shall show how the equipment will operate as a system to meet the performance requirements of the CCAS. The following information shall be supplied as a minimum:
 - 1) Server(s) processor(s), disk space and memory size.
 - 2) Description of site equipment and its configuration.
 - 3) Network bandwidth, latency and reliability requirements.
 - 4) Backup / archive system size and configuration.
 - 5) Start up operations.
 - 6) System expansion capability and method of implementation.
 - 7) System power requirements and UPS sizing.
 - 8) Device / component environmental requirements (cooling and or heating parameters).
 - 9) A description of the operating system and application software.
 3. Contract Close-Out Submittals: Provide three sets of hard copy manuals and three sets electronic format manuals in PDF format including operating instructions, maintenance recommendations and parts list. Include wiring and connection diagrams modified to reflect as-built conditions as part of this submittal.
 4. Manuals: Final copies of the manuals shall be delivered within thirty (30) days after completing the installation test. Each manual's contents shall be identified on the cover. The manual shall include names, addresses, and telephone numbers of the contractor responsible for the installation and maintenance of the system and the factory representatives for each item of equipment for each system. The manuals shall have a table of contents and labeled sections. The final copies delivered after completion of the installation test shall include all modifications made during installation, checkout, and acceptance testing. The manuals shall consist of the following:
 - 1) Functional Design Manual: The functional design manual shall identify the operational requirements for the system and explain the theory of operation, design philosophy, and specific functions. A description of hardware and software functions, interfaces, and requirements shall be included.
 - 2) Hardware Manual: The manual shall describe all equipment furnished including:
 - a) General description and specifications.
 - b) Installation and check out procedures.

- c) Equipment layout and electrical schematics to the component level.
 - d) System layout drawings and schematics.
 - e) Alignment and calibration procedures.
 - f) Manufacturers' repair parts list indicating sources of supply.
 - 3) Software Manual: The software manual shall describe the functions of all software and shall include all other information necessary to enable proper loading, testing, and operation. The manual shall include:
 - a) Definition of terms and functions.
 - b) System use and application software.
 - c) Initialization, start up, and shut down.
 - d) Reports generation.
 - e) Details on forms customization and field parameters.
 - 4) Operators Manual: The operators' manual shall fully explain all procedures and instructions for the operation of the system including:
 - a) Computers and peripherals.
 - b) System start up and shut down procedures.
 - c) Use of system, command, and applications software.
 - d) Recovery and restart procedures.
 - e) Graphic alarm presentation.
 - f) Use of report generator and generation of reports.
 - g) Data entry.
 - h) Operator commands.
 - i) Alarm messages and reprinting formats.
 - j) System permissions functions and requirements.
 - 5) Maintenance Manual: The maintenance manual shall include descriptions of maintenance for all equipment including inspection, periodic preventive maintenance, fault diagnosis, and repair or replacement of defective components.
- D. As-Built Drawings: During system installation, the Contractor shall maintain a separate hard copy set of drawings, elementary diagrams, and wiring diagrams of the CCAS to be used for record drawings. This set shall be accurately kept up to date by the Contractor with all changes and additions to the CCAS. Copies of the final as-built drawings shall be provided to the A/E in DXF or DWG format.

1.6 ABBREVIATIONS

- A. The following abbreviations are used in this document:
- ABA - American Banking Association
 - ANSI - American National Standards Institute
 - AOA - Air Operations Area
 - AOT - Accumulated Outage Time
 - ARFF - Airport Rescue and Fire Fighting
 - ASCII - American Standard Code for Information Interchange
 - ASTM - American Society for Testing and Materials
 - AWG - American Wire Gauge
 - BMS - Balanced Magnetic Switch
 - bps - Bits Per Second
 - CAS - Controlled Access Subsystem
 - CCAS - Integrated Computer Controlled Access Controls and CCTV System
 - CCD - Charged Coupled Device
 - CCTV - Closed Circuit Television

CFR	-	Code of Federal Regulations
CPU	-	Central Processing Unit
DAA	-	Duluth Airport Authority (the Owner)
DLH	-	Duluth International Airport
DPS	-	Data Processing Subsystem
DTS	-	Data Transmission Subsystem
DVR	-	Digital Video Recorder
EIA	-	Electronic Industries Association
EIB	-	Electronics Interface Box
FAA	-	Federal Aviation Administration
FAR	-	Federal Aviation Regulation
FCC	-	Federal Communications Commission
FM	-	Factory Mutual
F/O	-	Fiber Optics
FS	-	Federal Specification
GDT	-	Graphics Display Terminal
GSA	-	General Services Administration
HVAC	-	Heating, Ventilation and Air Conditioning
ICEA	-	Insulated Cable Engineer Association
ID	-	Identification
IDS	-	Intrusion Detection Subsystem
IEEE	-	Institute of Electrical and Electronics Engineers
IFP	-	Intelligent Field Panel
I/O	-	Input / Output
ISA	-	Instrument Society of America
KCS	-	Key Control Subsystem
KVA	-	Kilo-Volt-Ampere
LED	-	Light Emitting Diode
NCTA	-	National Cable Television Association
NEC	-	National Electrical Code
NEMA	-	National Electrical Manufacturers Association
NFPA	-	National Fire Protection Association
OSHA	-	Occupational Safety and Health Act
PIDS	-	Photo Identification Subsystem
PIN	-	Personal Identification Number
PTZ	-	Pan / Tilt / Zoom
PVC	-	Polyvinyl-Chloride
RF	-	Radio Frequency
SA	-	Secured Area
SAS	-	Surveillance and Assessment Subsystem
SCC	-	Security Control Console
STS	-	Signal Transmission Subsystem
TDT	-	Test Duration Time
TSA	-	Transportation Security Administration
UL	-	Underwriters' Laboratories
UPS	-	Uninterruptible Power Supply
VCS	-	Voice Communications Subsystem
VDT	-	Video Display Terminal

1.7 GLOSSARY OF TERMS

For the purpose of this document, the following terms are defined:

- A. Access Mode - The mode of operation in which the CCAS shall only annunciate tamper and trouble conditions at a monitored point. Alarm conditions shall not be annunciated in this mode. (Also referred to as alarm shunting or masking.)
- B. Accountability - A feature of the CCAS which keeps track of an individual's last use of a card reader.
- C. Acknowledge - The action taken by a SCC operator to indicate that they are aware of a specific off-normal event. Acknowledging an event shall silence the audible enunciator at the SCC.
- D. Advisory - An off-normal event providing information about controlled access, key control and data processing functions.
- E. Alarm - An off-normal event at a secured, monitored point indicating the supervision circuitry has detected a condition for which the sensor was designed to react.
- F. Card Reader - A device located at selected AOA/SA access points that shall automatically decode the information from an ID badge / keycard and process the access request locally.
- G. Cipher Code - A code number, between 5 and 9 digits in length (site-selectable), associated with an access point and used by an airline / airport group to request access at that point when it is controlled via the PIN pad only.
- H. Clear - The action taken by a SCC operator to remove an off-normal event display from the Video Display Terminal (VDT) at the SCC. Clearing an event shall allow the operator to annotate the alarm record with the cause of the alarm and a summary of the action taken.
- I. Control Level - 1 of 2 additional measures (keyswitch activation or password input) that may be assigned to a keyboard control function to further restrict its use.
- J. False Alarm - An alarm received for which there is no apparent cause (reason unknown). A false alarm may be due to system malfunction, environmental changes or electromagnetic/radio frequency (RF) interference.
- K. Inactive Mode - The mode of operation during which a point shall not be monitored, and alarm, tamper and trouble conditions at that point shall not be annunciated.
- L. ID Badge / keycard - An encoded device that will be presented at a card reader for automatic verification that the access request is authorized at the associated access point.
- M. Keyboard Control Function - An operator-initiated system command, such as securing or accessing a monitored point, entered via a console / terminal keyboard.
- N. Keycard Number - A number assigned to each ID badge / keycard user and linked by the system to the internal coding of the ID badge / keycard. After being linked, the keycard number shall be used by console / terminal operators when performing keyboard control functions associated with the Controlled Access Subsystem, such as, modifying database records and requesting displays, printouts and historical logs.

- O. Line Supervision - The monitoring of subsystem signal paths to verify their integrity.
- P. Nuisance Alarm - An alarm caused by the system detecting changes in its operating environment that it was designed to detect, but that do not represent a security threat. A nuisance alarm may be caused by wildlife, vegetation or weather conditions.
- Q. Off-Normal Event - A change of status signal from a monitored point to include alarm, tamper and trouble conditions and advisories.
- R. Operator Level - A number assigned to each console/terminal operator authorizing access to all keyboard control functions and database fields associated with that number.
- S. Password - A code or word or number, between 5 and 9 alphanumeric characters (site-selectable) in length, used by authorized console / terminal operators to sign on and off the system and to perform keyboard control functions with a Control level 2 restriction.
- T. Personal Identification Number (PIN) - A code number, between 4 and 9 digits in length, assigned to each ID badge / keycard user for use at access points equipped with PIN pads.
- U. Reset - A signal indicating that the status of a monitored point has returned to normal after the occurrence of an alarm, tamper or trouble condition and can be cleared by an operator.
- V. Secure Mode - The mode of operation during which a point shall be monitored for alarm, tamper and trouble conditions and shall annunciate them as specified herein.
- W. Security Area - An area with 1 or more card reader-controlled access points. Security areas shall be assigned individually or in groups to each ID badge / keycard user to authorize access to all access points associated with each area (subject to time zone constraints).
- X. Shall - Whenever the word "shall" is used in this section, it indicates a mandatory requirement that the Contractor must provide or fulfill to comply with the intent of this section.
- Y. Stop List - A computer-generated listing of all ID badges / keycards that have been deleted, deactivated or flagged to preclude their use (e.g., lost, stolen, etc.).
- Z. Tamper - An off-normal event at a secured or access monitored point indicating the tamper switch has been activated.
- AA. Time Zone - A pre-determined (programmable) schedule, consisting of the days of the week and the hours in each day, when an -ID badge / keycard user is authorized access to a particular security area or when the card readers / PINpads associated with a security area are operational.
- BB. Trouble - An off-normal event at a secured or accessed monitored point indicating an equipment malfunction; a loss of power; a loss of communications; and / or a single break, a single ground fault or a wire-to-wire short in signal wiring.

- CC. Will - Whenever the word "will" is used in this section, it indicates a mandatory requirement that the Contractor must provide or fulfill to comply with the intent of this section.

1.8 OPERATIONAL REQUIREMENTS

A. General

1. The CCAS shall be accessible and controllable via the SCC located in the airport Security Center so as to perform the security-related functions described herein.
2. The desired goal is operation of the CCAS by security and operations personnel with minimal technical training.
3. The CCAS shall provide continuous year-round, twenty-four (24) hours-per-day, seven (7) days-per-week operation.
4. The CCAS shall differentiate between group types of AOA/SA access points as indicated on the drawings and specified herein, and shall provide controlled access, intrusion detection, visual surveillance and data / video / audio signal communication as specified in the specifications and drawings.

B. System Capabilities

1. The CCAS shall perform the following functions:
 - a. Continuously collect and process status information from all monitored points.
 - b. Build and maintain monitored point, ID badge / keycard user and other system databases.
 - c. Electronically supervise wiring to and from all monitored points.
 - d. Regulate personnel and vehicle access and maintain accountability at controlled access points.
 - e. Detect alarm, tamper and trouble conditions and advisories at monitored points, as appropriate.
 - f. Initiate and annunciate duress alarms.
 - g. Visually monitor selected remote locations.
 - h. Automatically / manually display / record CCTV camera outputs. Display alarm event CCTV camera output. Record all alarm events by multiple cameras as indicated on the drawings.
 - i. Audibly and visibly annunciate all alarm, tamper and trouble conditions, advisories and keyboard control function input errors.
 - j. Print all alarm, tamper, and trouble conditions, advisories, executed keyboard control functions and keyboard control function input errors.
 - k. Regulate mechanical key issue / return.
 - l. Display and / or print system status information on demand and automatically on a pre-determined (programmable) time schedule.
 - m. Store all alarm, tamper and trouble conditions, advisories, executed keyboard control functions, subsystem test results and access control information.
 - n. Dump / reload historical records, system programs and database information.
 - o. Display and / or print historical logs on demand and automatically on a pre-determined (programmable) time schedule.
 - p. Perform specified keyboard control functions on demand and automatically on a pre-determined (programmable) time schedule.
 - q. Communicate with selected remote locations.
 - r. Provide a continuous source of power for subsystem operation.
 - s. Produce a combination photo ID badge / keycard.

- t. Perform system reprogramming and regeneration and background processing.
 - u. Interface with related items by others as specified.
 - v. Allow the operator to call up and view CCTV video from within the CCAS by selection of an alarm event on screen without having to manually access event in CCTV client application
 - w. Automatically send real time alarm event metadata to the CCTV application database.
2. The CCAS shall meet the following response requirements:
- a. Control shall be transferred from the primary central processor to the hot-standby secondary central processor (or FT server) within 1 second.
 - b. All Intelligent Field Panels (IFPs) in the system shall be polled for status changes at least once every second.
 - c. With a local database of at least 5,000 ID badge / keycard users, the CCAS shall be able to process access requests at each card reader-controlled access point within .5 second. No automated controlled access function shall delay the reporting of an off-normal event beyond 1 second.
 - d. The elapsed time between the occurrence of a single alarm, tamper or trouble condition and its annunciation as an off-normal event at the appropriate monitoring location(s) shall not exceed 2 seconds. When additional conditions occur before a previous condition has been annunciated, the subsequent conditions shall be annunciated as specified at intervals not exceeding 2 seconds each.
 - e. System response to any valid operator control request shall be initiated and visually indicated within 2 seconds.
 - f. System response to any valid operator request for demand displays shall typically be completed within 2 seconds and in all cases less than 5 seconds.
 - g. New and updated ID badge user data files shall be automatically transferred between the CCAS and the Photo Imaging System Upon validation at the initiating location.
 - h. Historical log printouts shall begin printing within 5 minutes of operator request.
 - i. ID badge / keycard inserts containing both textual and image data will be printed within 3 minutes.
 - j. The PIDS will be available for additional image capturing within 15 seconds after a print command is executed.
3. The CCAS design shall permit additional subsystem equipment to be added by inserting appropriate interfaces and entering minor parameter modifications into the software. The CCAS shall provide for a minimum growth capability of 50 percent of its initial capacity without the necessity for the replacement or addition of major hardware or software items.
4. Intelligent field panels shall be configured not to exceed 75 percent capacity in terms of card reader capacity. For example: if the proposed intelligent field panel is capable of supporting 8 card readers, only 6 of the available card reader inputs shall be used, the remaining 2 card reader inputs shall be designated as spares. Total available spare card reader inputs, at a minimum, shall equal 30 percent of initial quantity of card readers to be installed.

C. System Status

1. Monitored points within the system shall be in 1 of 2 modes: SECURE or INACTIVE.
 - a. In the SECURE mode, the system shall be sensitive to alarm, tamper and trouble conditions and shall annunciate them as specified.
 - b. In the INACTIVE mode, the system shall be insensitive to alarm, tamper and trouble conditions.
 2. Monitored point status changes shall be initiated on demand via the SCC, Programmer's Terminal and the PIDS Terminal or automatically based on a pre-determined (programmable) time schedule. Local accessing shall be reported to the SCC as an advisory.
 3. The CCAS shall provide the capability to selectively enable / disable operation of the following devices on demand via the SCC and the Programmer's Terminal or automatically based on a pre-determined (programmable) time schedule, without affecting the operation or status of other CCAS devices at the same point / location:
 - a. Card Readers.
 - b. Electrified Door Hardware.
 - c. Vehicle Gate Operators.
 - d. Automatic Roll-up Doors.
- D. System Monitoring and Control
1. CCAS equipment necessary for performing specified functions shall be incorporated in the Security Control Console (SCC). The console shall be located in the airport Security Center. The SCC layout and equipment arrangement shall be ergonomically engineered to present an efficient and organized appearance and facilitate operation.
 2. The SCC shall be the focal point for all specified functions associated with the monitoring and control of all CCAS and specified existing equipment. The SCC shall be provided with a VDT and keyboard as the primary man-machine interface. The VDT screen shall be formatted to permit simultaneous display of off-normal event annunciations, operator requested status information and keyboard control function request entries.
 3. A Programmer's terminal shall be provided in the airport Security Center to run diagnostic routines, initiate DPS maintenance utilities, perform system reprogramming and regeneration, enter/edit system database information, generate special reports and logs and perform specified keyboard control functions (site-configurable).
 4. ID badge / keycard preparation and encoding shall be monitored and controlled via the PIDS terminal located in the airport badging area.
 5. The man-machine interface portions of the SCC, Programmer's terminal and PIDS terminal shall be identical to facilitate training and operation.
 6. The specific off-normal events that shall be reported at the SCC: and the specific keyboard control functions that can be performed at the SCC, the Programmer's terminal and the PIDS terminal shall be site-configurable. The Programmers terminal will also serve as an alternate monitoring location to automatically annunciate off-normal events in the event that the SCC is not operable.
 7. The PIDS terminal shall be equipped with a card reader and PIN pad. The card reader PIN pad at the PIDS terminal will be used to verify operation of a newly issued ID badge / keycard and to demonstrate proper use.
 8. A key issue / return panel (box) shall be provided at the airport badging Area to control mechanical key issue and return.
- E. Access Control Software

1. Contractor shall state in their technical submittal that transmittal of the software license transfers ownership of the Duluth International Airport CCAS software to Duluth International Airport for the purpose of operation of the CCAS at Duluth International Airport only. It is understood by the owner that any additional software for installations other than at Duluth International Airport will require purchase of additional licenses for each site.

F. Signal Collection and Transmission

1. The central processors shall interface with CCAS equipment via Intelligent Field Panels (IFPs). The IFPs shall be connected to all card readers and monitored points collect and transmit status information to the primary central processor for processing. Each IFP shall be interrogated at least once every second to verify its status and / or report off-normal events and monitored point resets.
 - a. The IFPs shall buffer and retain status change information until transfer of data to the primary processor is verified.
 - b. In the event communications with the central processors is disrupted, each IFP shall have provisions to store a minimum of 4,000 authorized access transactions, off-normal events and monitored point resets locally. Upon restoration of communications, the IFPs shall upload the stored data. Data uploading shall not interfere with the real-time reporting of subsequent off-normal events and resets.
2. The CCAS shall provide a communication backbone for the collection and transmission of data, control, video and audio signals via metallic conductor (hardwire) and fiber optic (F/O) data path utilizing multiplexers with appropriate network equipment as specified below.
 - a. Card readers shall be hardwired to a Reader Module contained in an EIB within 50 feet of the card reader. The EIBs shall utilize a RS-422/485 multi-drop architecture to connect the reader module to the IFP. No more than 3 EIB locators shall be in a single multi-drop unless approved by A/E.
 - b. The EIB shall be hardwired to an IFP within 500 feet of the point as indicated on the drawings.
 - c. Ethernet TCP/IP architecture shall be used for connecting IFPs to the CCAS. An alternate Ethernet or serial to Ethernet port shall be provided as a backup communication in the event the primary communication fails. The backup communication shall be restored automatically with notification that primary communication has failed.
3. Transmission of CCTV video and data signals from cameras as indicated on the drawings, shall be transmitted via TCP/IP to the CCTV controlling equipment in the airport Security Center. Network based CCTV system shall use fiber and Category 6 cabling system.
4. Reliable data transmission shall be utilized between the IFPs and the central processors. The IFP message format will include its unique address to assure a properly directed response to the primary central processor poll. Accurate reception of error-free data will be ensured by the use of redundant message transmission or by the use of error detecting / correcting codes. Transmission failures will be annunciated as trouble conditions.

G. Controlled Access

1. The CCAS shall monitor and control personnel and vehicle access at AOA/SA access points in accordance with the Airport Security Plan FAR 1542 Amendment. Authorized access shall be granted based on the

following criteria in combination or individually as determined by Duluth International Airport:

- a. Possession of a valid ID badge / keycard.
- b. Knowledge of a valid personal identification number (PIN) corresponding to the valid ID badge / keycard.
2. AOA/SA access points shall be controlled via card reader PINpads and related controlled access and intrusion detection equipment.
3. Operation of an access point via card reader only, PIN pad only, or card reader and PIN pad shall be configurable via the SCCs or Programmer's terminal.
4. The CCAS will provide the capability to selectively enable/disable all automated controlled access operations at a card reader-controlled access point on demand from the SCC, Programmer's terminal or automatically based on a pre-determined (programmable) time schedule.
5. Access shall be controlled by assigning any combination of security areas to each ID badge / keycard user for authorized access. Each security area shall consist of 1 or more card reader-controlled access points. A minimum of 128 user-defined security areas shall be provided.
6. Access may be further controlled by assigning a time zone for access at each security area to each ID badge / keycard user. Each time zone shall define the days of the week and the hours in each day when access is authorized. A minimum of 128 time zones shall be provided.
7. Access authorization decisions will be made locally at the card reader or its associated IFP. Sufficient local memory will be provided to store all access authorization data for up to 5,000 individuals. Access authorization data will be automatically downloaded from the central processors to each access point, as appropriate (i.e., after the addition, modification or deletion of an authorized ID badge / keycard user file or upon restoration of communications between an IFP and the central processors). Authorized access transactions will be reported to the primary central processor individually or in groups. The downloading of access authorization data and the uploading of groups of authorized access transactions will not interfere with the real-time operation of the system. Unauthorized access requests will be reported as off-normal events as they occur.
8. Card readers shall operate in a proximity detection mode. When an ID badge / keycard is presented at a card reader, the encoded information shall be compared with the stored data for authorized access. If a PIN is required for access at that access point at that time, the user shall be prompted to enter the number. Each card reader shall be provided with separate visual indications that an ID badge / keycard has been decoded; a PIN entry is required (initial or retry); an incorrect PIN code has been entered; and access has been granted or denied.
 - a. Unauthorized access requests and / or the presentation of an inactive, expired, lost, stolen, unreturned or an improperly encoded ID badge / keycard shall be annunciated as an alarm. Access will not be granted.
 - b. In the event a PIN is not entered within a pre-determined (programmable) time period after the user is prompted (initially or for a retry), the card reader shall reset and an advisory shall be annunciated.
 - c. The number of consecutive incorrect PIN attempts accepted by the system shall be site-configurable (up to 4). After the maximum number of incorrect entries has been made, the card reader shall reset and an alarm shall be annunciated. An alarm shall also be

- annunciated if the maximum number of incorrect entries associated with the same ID badge / keycard user occurs consecutively at several card readers within a pre-determined (programmable) time period.
- d. At the Automatic Vehicle Gate (Type 12) an access request must be accompanied by a signal from the associated vehicle presence sensor. In the event this signal is not received, an advisory will be annunciated. Access will not be granted.
 9. The system shall provide the capability to initiate the access sequences described on drawings at any access point via the SCC or Programmer's terminal. The format for performing this keyboard control function shall require the inputting of the ID card number of the individual requesting access. This information shall be stored with the record for control function execution.
 10. The specific intrusion detection devices that are placed in the ACCESS mode for an authorized access request shall be site-configurable.
 11. The time periods for activating a local locking device and ACCESSING the intrusion detection device(s) shall be independently programmable from the SCC or Programmer's terminal. In the event 2 or more individuals utilize the same card reader or exit pushbutton, each valid request shall reset the time durations for unlocking and ACCESS status to allow sufficient time for the unalarmed entry / exit of each subsequent individual.
 - a. In the event an access point is not closed within the pre-set ACCESS time, an advisory shall be annunciated.
 - b. In the event an access point is not accessed within a predetermined (programmable) time after an entry request is granted, either locally via a card reader or remotely via the SCC, an advisory shall be annunciated and the event shall be recorded by the CCTV system.
 12. Failure to depress the exit pushbutton prior to exiting a security area will be annunciated as an alarm. Doors equipped with an exit pushbutton will be posted to inform the individual of this requirement.
 13. The CCAS shall have provisions to selectively print, at a specified data printer, all authorized automated access transactions at designated card readers or by designated ID badge / keycard users as they occur. All authorized automated access transactions, whether or not printed, shall be stored on the DPS hard disk units. As a minimum, the printed and / or stored information will include the individual's name and keycard number (except when an exit pushbutton is used), the date, the time, and the card reader or access point location or number.
 14. All access points equipped with electrical locking devices (magnetic locks or other locking devices as shown on drawings), automatic roll-up door operators, and gate operators will be remotely controllable from the SCC individually or in groups. These provisions will also allow the access point to remain in a permanently locked / unlocked or open/closed mode for a pre-determined (programmable) time period. An advisory shall be initiated when this time period expires.
 15. Signs shall be provided on the egress side of access points to advise individuals to press the exit pushbutton before opening the door. Signs shall be posted on the public side of door access points to advise individuals to contact the airport Security Center for nonemergency matters or to push on door panic hardware until alarm sound and that door will open in 15 seconds (time duration will be determined by the airport). Exact verbiage for signs shall be coordinated with the owner.

16. A local gate controller will be provided within the associated gate operator enclosure to permit local operation by an authorized user. Operation of the gate via the controller will be annunciated as an alarm.
17. ID badge / keycard encoding will include a facility code unique to Duluth International Airport, an individual code unique to each user and an issue number. An encoder will be provided with the PIDS to permit on-site encoding of the ID badges / keycards.
18. Each ID badge / keycard user will be assigned a keycard number for use by the console / terminal operators when performing keyboard control functions associated with the CAS and PIDS and requesting displays, printouts and historical logs. The keycard number will be linked by the system to the internal coding of the ID badge / keycard during the badge issue process. The system will allow for linking an existing keycard number and associated database record with a new ID badge / keycard by using a subsequent issue number for continuity when a damaged, stolen or lost ID badge / keycard is replaced.
19. Individual ID badge / keycards and PINS will be assigned via the PIDS. All personal database information associated with each ID badge / keycard user (name, address, etc.) and access authorization data (security areas and time zones) will be transferred from the photo information microprocessor to the CCAS central processors upon entry via the PIDS terminal. (Note: The operator level required to add / modify access authorization data will be higher than the one used to enter / modify of personal information.)
20. Existing personnel database files will be modified and / or deleted from the PIDS, SCC or the Programmer's terminal. When an ID badge / keycard is deleted from the system, the user data will be retained in the on-line databases until transferred to long-term storage.
21. The CCAS will provide the ability to automatically deactivate an ID badge / keycard if it has not been used to access a card reader-controlled access point for a pre-determined (programmable) time period. The user data for an inactive ID badge / keycard will be retained in the on-line DPS database. Provisions to reactivate an ID badge / keycard from the SCC, Programmer's terminal and the PIDS terminal will be provided.
22. The CCAS will provide the ability to flag a particular issue of an ID badge / keycard as lost, stolen or inactive. Additional information shall be recorded in a notes or user definable fields from the SCC, Programmer's terminal and the PIDS terminal.
23. An override command will be provided via the SCC to permit all ID badge / keycard users to enter and exit selected security area access points during emergency situations (i.e., access will be based on a valid facility code only).
24. Each ID badge / keycard user will have the ability to discreetly communicate a duress alarm -via a PINpad during the entry of the PIN. The alarm signal will be transmitted to the primary central processor while the access request is processed as specified heretofore.

H. Intrusion Detection

1. All intrusion detection equipment shall be capable of sensing the stimuli for which they are designed to react with at least a 90 percent probability with 95 percent confidence when the sensitivity is adjusted to produce not more than 1 false alarm per week.
2. Selected access points as shown on drawings shall be equipped with balanced magnetic switches to detect authorized and unauthorized openings.

- a. Each balanced magnetic switch will initiate an alarm signal whenever the door, gate or hatch is opened more than one (1) inch while in the SECURE mode.
 - b. Each balanced magnetic switch shall initiate an alarm signal upon increase, decrease or attempted substitution of an external magnetic field while it is in the SECURE mode.
- 3. Card reader-controlled access points shall be provided with a door status sensor to detect authorized and unauthorized openings and tampering attempts.
 - a. Each door status sensor shall initiate an alarm signal whenever the door is moved more than 1 inch while in the SECURE mode.
- 4. The Automated Vehicle Gate shall be equipped with a gate position switch to detect authorized and unauthorized openings.
 - a. Any attempt to force a gate open or open a gate via the local gate controller shall be annunciated as an alarm condition.
- 5. The Automated Vehicle Gate shall be equipped with vehicle presence sensors (ground loop) on the public and AOA/SA side to detect authorized and unauthorized entrée / exit attempts.
 - a. A signal from the vehicle presence sensor on the public or AOA/SA side of a gate without a concurrent signal from the associated card reader shall be annunciated as an alarm.
- 6. Tamper switches shall be provided inside all CCAS equipment cabinets, consoles, termination boxes and enclosures to detect unauthorized opening or tampering.
 - a. Tamper switches shall be installed and baffled to prevent defeat by deforming or opening the cover and to initiate a signal whenever the cover is displaced more than 1/4 of an inch from the closed position.
- 7. A manually-initiated flex-response (duress) call button device shall be provided at the airport security screening point as required by TSA.
 - a. A signal from the call button device shall be annunciated as an alarm at the SCC.
 - b. A signal from the call button device shall not be annunciated locally.
 - c. The call button shall be located to enable surreptitious activation.
 - d. The flex-response alarm shall only be reset at the initiating location.
- 8. Manually-initiated duress alarm devices shall be located at the airport Security Center SCC and other locations shown on the drawings.
 - a. A signal from the duress alarm device shall not be annunciated as an alarm at the initiating location.
 - b. The duress alarm will be located to enable surreptitious activation.
 - c. The duress alarm shall be reset at the initiating location.
 - d. The duress alarm from the Security Center will be annunciated at the Administration reception area or other locations approved by the airport director. The facility annunciation shall be via flashing blue light.
 - e. The duress alarm from check point screening area shall be annunciated in the security area by a flashing blue light as well as at SCC.
 - f. The duress alarm from administration area shall be annunciated at the SCC.
- 9. End-of-line termination networks shall be provided for all alarm and tamper contacts to provide the appropriate end-of-line impedance for signal line supervision.

I. Surveillance and Assessment

1. Solid-state Closed Circuit Television (CCTV) color cameras shall be provided for visual surveillance of selected areas. Each camera shall be mounted on either a free-standing pole, building exterior / interior wall, roof or hung from the ceiling. The complete system shall be provided as indicated on the drawings and specified herein.
2. Camera locations will be selected so that an individual 6 feet tall standing at the farthest end of the viewing area will be displayed at a height equal to or greater than 10 percent of the CCTV monitor screen.
3. All exterior cameras shall be housed in an environmental enclosure to provide a stable operating environment and to discourage tampering. Exterior cameras shall also be provided with a thermostatically controlled heating and blower system.
4. Display monitors as indicated on the drawings shall be provided for the surveillance and assessment subsystem.
5. Visual identification of which camera output is being displayed on each monitor, whether sequentially, manually or automatically, shall be provided.
6. The SAS shall provide sequence capability at all CCTV monitors. Switching sequence at each monitor shall be independent of the others. The console operators shall have provisions to adjust the sequencing interval and omit or add any camera(s) from the sequence.
7. Digital Video Storage System shall be provided at the airport SCC to automatically record alarm-associated camera outputs and manually record the outputs of any camera displayed on the alarm monitor. Each recording will include the time, the date and the associated camera identification.
8. The SCC will have provisions via a control unit (independent of the VDT keyboard) to manually pan, tilt, zoom and focus any camera. The Surveillance and Assessment Subsystem (SAS) will include provisions to assign up to 10 pre-set positions to each camera equipped with a pan/tilt unit. Upon manual or automatic (alarm condition) selection of a pre-set position, the associated camera will automatically pan, tilt and zoom to the appropriate view. After a pre-determined (programmable) time period, these cameras will automatically return to a pre-set "home" position.
9. The SAS will be designed such that a camera can be displayed on all monitors at the SCC concurrently without degradation of the picture.

J. Off-Normal Event Reporting

1. Alarm, tamper and trouble conditions and advisories shall be annunciated so that there is a visually discernible (color) difference between them. The CCAS shall have the capability to display a minimum of 5 off-normal events simultaneously on the VDTs. The CCAS shall continue to print off-normal events when additional VDT display space is not available. The SCC operators shall be advised via the VDT of pending off-normal events. Provisions for independent call up (scrolling and paging) of those alarm, tamper and trouble conditions and advisories that cannot be initially displayed due to VDT line limitations shall be provided. The VDT displays shall be automatically updated as space becomes available.
2. Off-normal events shall be prioritized by type (alarm, tamper, trouble or advisory) and category (see below) for reporting and historical logging. A minimum of 64 priority groups (programmable) shall be provided. Provisions to assign priority groups to the SCC for primary annunciation will be provided. (Note: Priority grouping will be used to assign monitoring responsibility to the SCC and is not intended to cause one priority group to "bump" a previously displayed priority group at a given VDT.)

3. No alarm, tamper or trouble condition or advisory shall be lost during switchover from normal to backup power (either at the SCC or at a field installed device) or from the primary to hot-standby central processor.
4. The following conditions shall be annunciated as an alarm (alarm categories are shown in parentheses):
 - a. Receipt of a signal from any detector / sensor performing intrusion monitoring functions at a monitored point (intrusion Alarm).
 - b. Unauthorized opening of any SECURED access point (intrusion Alarm).
 - c. Receipt of a flex-response signal from security screening point (Flex-Response Alarm).
 - d. Receipt of a duress signal (Duress Alarm).
 - e. Presentation of an unauthorized, inactive, lost, stolen, unreturned, expired or improperly encoded ID badge / keycard at a card reader controlled access point (Access Alarm).
 - f. Consecutive incorrect PIN entries exceeding the maximum number of tries (Access Alarm).
5. The following condition shall be annunciated as tamper:
 - a. Unauthorized opening of a CCAS equipment cabinet, console, box or enclosure (Tamper Alarm).
6. The following conditions shall be annunciated as trouble (trouble categories are shown in parentheses):
 - a. CCAS equipment malfunction or failure (Equipment Failure).
 - b. Loss of any source supplying power to the CCAS (Power Failure).
 - c. Failure at any portion of the CCAS power conversion or distribution equipment to include equipment power supplies (Power Failure).
 - d. Low battery indication from a UPS or battery backup unit (Low Battery).
 - e. Any attempt to disable or compromise wiring between any monitored point and the IFPs, and between the IFPs and the central processors.
 - f. A single break, a single ground fault, a wire-to-wire short, or any combination of these in the signal wiring between any monitored point and the IFPs, and between the IFPs and the central processors (Line Supervision).
 - g. Signal transmission failure (Communications Failure).
 - h. Automatic switchover from the primary to the hot standby central processor (Processor Failure).
 - i. Loss of video signal (Loss-of-Video).
7. The following conditions shall be annunciated as an advisory (advisory categories are shown in parentheses):
 - a. Failure of a temporarily ACCESSED card reader-controlled access point to close within a specified time after authorized opening (Access Advisory).
 - b. Failure of a temporarily ACCESSED card reader-controlled access point to be opened within a specified time (Access Timeout).
 - c. The time period for an access point opened / unlocked from the SCC has expired (Access Advisory).
 - d. ID badge / keycard user still has an issued key (Key Advisory).
 - e. Manual switchover from the primary to the hot standby central processor (Manual Switchover Advisory).
 - f. Resynchronization of central processors databases started / completed (Resync Started / Complete Advisory).

- g. DPS historical logging storage capacity 85 percent full/about to be overwritten 98 percent full (Historical Storage Advisory).
 - h. ID badge / keycard accountability drops below 95 percent or a predetermined percentage, to include expired, reported lost and stolen ID badge / keycard (Accountability Advisory).
 - i. Failure to enter a PIN within a specified time after being prompted by the card reader (Access Timeout).
 - j. Receipt of an access request from the automated vehicle gate without a signal from the respective vehicle presence sensor (Unauthorized Access Request).
8. Each alarm, tamper or trouble condition and each advisory at a monitored point shall cause an audible annunciator to be sounded and an off-normal event text message to be displayed on the SCC VDTs and printed at the event printer located in the airport Security Center. The displayed and printed text messages shall be in full-word English and shall, as a minimum, include the time of occurrence, the point identification code, the point description, the type and category of event and the required operator response. VDT displays shall contain a minimum of 2 lines per event. The SCC operator shall have provisions to selectively display additional text information (up to 6 lines) for each off-normal event.
- a. The audible annunciator shall be capable of being heard throughout console area. When the console is manned, the volume shall be capable of being reduced not more than 90 percent of its rated output to permit local alarming only. The SCC shall be provided with a momentary silencing switch for the audible annunciator. The audible annunciator shall be capable of being reset but not permanently silenced. The silencing of an audible annunciator in the presence of other unacknowledged off-normal events shall not interfere with the subsequent reporting of these events as specified. The silencing switch shall operate independently of the keyboard control function to acknowledge off-normal events. In addition, the audible annunciator shall be provided at another CCAS workstation as selected by DLH.
 - b. The printed message shall include the time and date and shall be readily distinguishable from other messages printed at the printers.
 - c. Duress alarms shall not be annunciated at the initiating location.
 - d. Subsequent alarm, tamper or trouble conditions at the same point received after the initial signal but prior to operator disposition (clearing) shall not be displayed (i.e., there shall be only 1 VDT text message for each alarm, tamper or trouble condition at the same point regardless of the number of signals received prior to disposition).
 - e. In the event the primary monitoring location is inoperable, an off normal event shall be automatically annunciated at its alternate monitoring location (Programmer's terminal).
9. Upon acknowledgment by any authorized SCC operator, the audible annunciator shall be silenced and cleared at all monitoring locations. The VDT displays shall be updated to indicate an off-normal event has been acknowledged.
- a. The CCAS shall assign each monitored point to a computer-generated color graphic display. Each display shall include a map or floor plan depicting the location of the point, the point identification code and a color-coded flag to identify the status of the point. Upon acknowledgment of an off-normal event, the associated graphic display shall be automatically presented on the GDT at the

acknowledging console. This display shall override any previously displayed graphics at the GDT. In the absence of alarms, the SCC operators shall be able to manually display the graphic associated with a specific point.

- b. The CCAS shall interlock monitored points with a camera output and pre-set position. Upon acknowledgment of an off-normal event, the associated cameras shall be automatically panned, tilted and zoomed (or fixed camera) to the appropriate scene and the output displayed on one of the color CCTV monitor at the acknowledging console. In the absence of alarms, the SCC operators will be able to manually display the camera output associated with a specific point.
- 10. When the cause of an alarm, tamper or trouble condition or advisory has been removed, a reset message shall be displayed and printed at the SCC (or alternate monitoring location on the third floor if the SCC is inoperable). The printed message shall include the time and date of reset, the point identification code, and the point description. Events returning to normal shall not require a separate acknowledgment by the console operators.
 - 11. After a point has been reset, it shall be capable of being individually cleared by any authorized SCC operator. Clearing a point shall remove the displays from all VDTs and GDTs and print an event-cleared message on the event printer. Clearing a point interlocked with an associated video output shall remove the automatically displayed camera output from the CCTV monitor; return the camera to its "home" position.
 - a. As part of the clearing function, each monitoring location shall have provisions to enter an explanation of the event (a minimum of 1 line) for storage with the event data and for printing with the event-cleared message.
 - b. No alarm, tamper or trouble condition or advisory shall be cleared from the VDTs without being stored on the DIPS hard disk units.

K. Test Reporting

- 1. Individual equipment operation and overall system performance shall be verified periodically by simulating or duplicating alarm, tamper and trouble conditions and advisories at each monitored point, as applicable. After annunciation, acknowledgment and reset, as described above, each monitoring location shall have provisions to clear and store these events on the DIPS hard disk units as tests via the keyboard. These provisions shall include at least 2 independent, operator-initiated actions so that a bona fide alarm, tamper or trouble condition or advisory is not accidentally stored as a test.

L. Mechanical Key Control

- 1. A system to monitor and control mechanical key issue and return shall be provided as part of the CCAS. Selective issuing of mechanical keys to authorized ID badge / keycard users shall be performed via PIDS terminal. The operator shall input the respective mechanical key number in the individual's database file and shall log the time, date and mechanical key number. A similar sequence shall be provided for mechanical key return."

M. Demand Display and Printing Functions

- 1. The console terminal operators shall have provisions to display and / or print system status information on a real-time basis. Paging and scrolling capability shall be provided for multi-page displays. Previously displayed information shall be automatically cleared when a new display is requested.

2. Status information shall be displayed on the VDT at the location initiating the request.
3. Status summary requests from the SCC and Programmer's terminal shall be capable of being directed to any printer. If the selected printer is an event printer, off-normal event printing shall be buffered until the printout is completed. Report sorts shall be performed alphabetically or numerically on all fields, as appropriate.
4. The following demand printouts shall be provided at the SCC and Programmer's terminal, as a minimum:
 - a. All INACTIVE monitored points.
 - b. All SECURE monitored points.
 - c. All monitored points in ACCESS.
 - d. All monitored points in ALARM.
 - e. All monitored points in TAMPER.
 - f. All monitored points in TROUBLE.
 - g. All current ADVISORIES.
 - h. All current off-normal events.
 - i. Status of all monitored points.
 - j. All data associated with all monitored points.
 - k. All data associated with all ID badge / keycard users (sort by any set of parameters).
 - l. All data associated with all access points.
 - m. All assigned ID badge / keycards.
 - n. All active, inactive, lost, unreturned, expired or deleted ID badge / keycards (select by type and sort by any set of parameters).
 - o. All access points assigned to each security area.
 - p. The days and times associated with all time zones.
 - q. All ID badge / keycard users assigned to each security area and / or card reader-controlled access point (sort by name and keycard number).
 - r. All ID badge / keycard users assigned to a particular security area and / or card reader-controlled access point (sort by name and keycard number).
 - s. Last card reader used by all ID badge / keycard users (sort by any set of parameters).
 - t. Last ID badge / keycard used at all card readers.
 - u. All unassigned IFP points.
 - v. All mechanical keys assigned to all ID badge / keycard users.
 - w. All mechanical keys issued by key number.
 - x. All keyboard control functions scheduled for automatic execution.
 - y. All ID badge / keycard users sorted by company / tenant.
 - z. All ID badge / keycard users sorted by a company / tenant.
 - aa. Ratio of the number of ID badge / keycards deleted and unreturned or reported as stolen or lost to the number of assigned ID badge / keycards.
 - bb. All Airport and company/tenant personnel with signature authorization.
 - cc. All data associated with all company tenant files.
 - dd. All ID badge / keycards set to expire by a particular date.
 - ee. Sort and print list of ID holder's last training by name or company.
5. The following demand printouts will be provided at the report printer at the PIDS terminal, as a minimum:
 - a. All data associated with all ID badge / keycard users (sort by any set of parameters).

- b. All assigned ID badge / keycards (sort by any set of parameters).
 - c. Status of all assigned ID badge / keycards (select by type (active, inactive, lost, stolen, unreturned, expired, deleted) and sort by any set of parameters).
 - d. All data associated with all company tenant files.
 - e. Time periods of data stored on storage device.
 - f. All ID badge / keycards set to expire by a particular date.
6. The console terminal operators shall have provisions to print the data displayed on their VDT screen at any time.

N. Logging Functions

- 1. Historical logs shall be requested from the hard disk units or other approved storage devices for a particular date or sequence of dates. When a log is requested, the date and the time of day shall be printed along with the log identification.
- 2. Capacity to store up to 500,000 events on-line on the hard disks shall be provided. Historical log data may be transferred to a magnetic tape cartridge for long term storage at any time.
- 3. The CCAS shall monitor the status of all remaining available on-line historical storage space. Routines shall be provided which respond to operator requests to display remaining storage space available and which automatically generate a visual indication when the system's historical storage space capacity is close to being exhausted (e.g. 85 percent full) and when stored data is about to be overwritten (e.g. 98 percent full).
- 4. A file management subsystem shall be provided for maintaining, cataloging and retrieving any historical files with minimum operator interaction. The subsystem shall be designed to accept an operator request specifying the type of data to be retrieved and the associated time period. For data that is stored permanently, the subsystem shall advise the operator which magnetic tape cartridge must be loaded for data retrieval. Upon notification that the appropriate tape cartridge has been loaded, the subsystem shall transfer the data on-line, sort it and generate the requested log.
- 5. Historical logs requests from the SCC, Programmer's terminal, and PIDS terminal shall be capable of being directed to any printer. If the selected printer is an event printer, off-normal event printing shall be buffered until the printout is completed. Historical log sorts shall be performed alphabetically or numerically on all fields, as appropriate.
- 6. The following historical logs shall be provided at the SCC and Programmer's terminal, as a minimum. Provide Crystal Reports or other 3rd party software as required to meet the specifications. The intent is to provide historical log for audit trail and meet TSA reporting requirements. It is recognized that different approved manufacturers may provide the logs in slight variations than as indicated.
 - a. ALARM conditions (sort by point and category).
 - b. TAMPER conditions (sort by point).
 - c. TROUBLE conditions (sort by point and category).
 - d. ADVISORIES (sort by point, category, name and keycard number, as applicable).
 - e. Test results at monitored points (sort by point).
 - f. Access attempts at card reader-controlled access points (sort by point, keycard number and name).
 - g. Authorized automated access transactions (sort by point, keycard number and name).

- h. Authorized access transactions through the keyboard (sort by point, key / card number and name).
 - i. SCC, Programmer's terminal and PIDS terminal operators on duty (sort by console / terminal and operator).
 - j. Operator-initiated keyboard control functions and associated data (sort by control function, console / terminal and operator).
 - k. Database changes (sort by database, console terminal and operator).
 - l. Keyboard control function input errors (sort by console / terminal and operator).
 - m. Keyboard control functions and associated data initiated automatically on a time schedule (sort by control function).
 - n. Mechanical keys issued and returned (sort by individual or key number).
 - o. A stop list of all access authorized changes at each card reader controlled access point and all ID badge / keycards that have been inactivated, deleted or flagged to preclude use (sort by access point and name).
 - p. A list of all ID badge / keycards that have not been used / presented at an access point for a specified time period (sort by individual).
 - q. Number of ID badge / keycards assigned, returned, deleted or reported as stolen or lost (accountability).
 - r. The following historical logs will be provided at the report printer at the PIDS terminal, as a minimum:
 - s. PIDS terminal operators on duty (sort by operator).
 - t. Operator-initiated keyboard control functions and associated data (sort by control function and operator).
 - u. Database changes (sort by database and operator).
 - v. Number of ID badge / keycards assigned, returned, deleted or reported as stolen or lost.
7. A report generator, accessible via the Programmer's terminal or PIDS terminal shall be provided for special reports and logs. After a report has been developed, it shall be available for use by all authorized operators.
8. The capabilities required by this section shall be strictly background mode and shall not interfere with the real-time functions of the system or diminish system throughput or response times.

P. Keyboard Control Functions

- 1. All SCC and Programmer's terminal control functions, except operation of the master intercom station and CCTV equipment, will be performed through the VDT keyboards. The keyboard at the PIDS terminal will be used to perform selected control functions associated with badge preparation and issue.
 - a. The specific keyboard control functions that can be performed at the SCC and the Programmer's terminal shall be site-configurable.
 - b. All keyboard control function requests shall be checked to verify the correctness of all inputted data prior to execution and the operator shall be advised accordingly. Keyboard control function input errors at all consoles / terminals shall be displayed and printed locally and stored on the DPS hard disk units. Input error messages shall be appropriately descriptive and consistent for each control function.
 - c. Keyboard control functions shall be implemented in a manner which minimizes the number of keystrokes required. If the keystrokes are in the form of characters, these characters shall be intuitively obvious for the function they are to perform. If a menu-driven or prompt approach is utilized, provisions to by-pass the menu or prompt shall

- be provided to allow for efficient operation of the system by experienced operators.
 - d. On-line help data for each keyboard control function shall be available to all console / terminal operators.
- 2. A system of operator levels shall be provided at all console / terminals to restrict operator use of keyboard control functions and access to database fields. A minimum of 8 levels shall be provided. Keyboard control functions and database fields shall be assigned to 1 or more operator levels which, in turn, shall be assigned to a console / terminal operator. The operator shall be permitted to perform all keyboard control functions and access all database fields associated with his assigned level (subject also to SCC, PIDS terminal and Programmer's terminal keyboard control function assignment). If the system is menu or prompt-driven, operators shall only have access to those menus / prompts for which they are authorized use.
- 3. Each console and terminal operator shall be assigned a unique password, between 5 and 9 alphanumeric characters in length. This password shall be utilized to log on and off the system and perform keyboard control functions with a Control level 2 restriction. Passwords shall not appear on any system VDT, nor shall they be printed on any system printer.
 - a. An operator shall be automatically logged-off when another operator logs on at that console / terminal.
 - b. An operator shall be automatically logged-off if there has not been any keyboard activity for a pre-determined (programmable for each console terminal) time period.
- 4. Provisions to abort any keyboard control function prior to completion of execution shall be provided. In addition, an "escape" feature shall be provided to cancel a keyboard control function request before execution is initiated.
- 5. The DIPS shall have provisions to automatically initiate keyboard control functions, to include report and historical log printing, based on a predetermined (programmable) time schedule. This schedule shall include both the day(s) and the time(s) when the control function is to be executed. At the time of execution, the keyboard control function shall be displayed at the SCC, printed at the event printer and stored on the DIPS hard disk units.
- 6. Keyboard control functions performed at the SCC, Programmer's terminal, and PIDS terminal shall be displayed at the console / terminal initiating the request at the time of execution and printed on the event printer. All completed keyboard control functions shall be stored on the DPS hard disk units. If keyboard control function request execution is not immediate or obvious, the operators shall be advised when the control function is completed.
- 7. The following keyboard control functions shall be provided at the SCC and Programmer's terminal, as a minimum:
 - a. A command to set and / or reset the internal time and date reference of the central processors.
 - b. A command to selectively define or modify monitored point descriptions.
 - c. A command to interlock a monitored point with a camera output.
 - d. A command to interlock a monitored point with a graphics display.
 - e. A command to selectively define or modify security area identification.
 - f. A command to selectively define or modify time zones.
 - g. A command to selectively assign a keyboard control function to a SCC or Programmer's terminal.

- h. A command to selectively assign any combination of control levels to a keyboard control function.
- i. A command to selectively assign keyboard control functions / database fields to any operator level.
- j. A command to assign or change the operator level for a console / terminal operator on an individual basis.
- k. A command to assign or change the unique password for a console / terminal operator on an individual basis.
- l. Commands to selectively enable / disable CCAS device operation on an individual basis.
- m. A command to inactivate monitored points (individually or in groups).
- n. A command to change the status of monitored points to SECURE (individually or in groups).
- o. A command to selectively change the status of monitored points to ACCESS (individually or in groups).
- p. A command to modify ID badge / keycard user data (individually or in groups).
- q. A command to delete ID badge / keycards (individually or in groups).
- r. A command to reactivate ID badge / keycards (individually or in groups).
- s. A command to initiate the automated access sequence at a card reader-controlled access point. The format for initiating this command shall include inputting the keycard number of the individual requesting access.
- t. A command to program, on an individual basis, the length of time a card reader-controlled access point may remain open without alarm after an authorized access request is granted.
- u. A command to selectively print all automated access transactions at designated card readers or for designated ID badge / keycard users, as they occur.
- v. A command to allow / disallow all active ID badge / keycard users to enter and exit selected card reader-controlled access points based on a valid facility code only.
- w. Commands to lock / unlock access points equipped with electrical locking devices for a pre-determined (programmable) time period (individually or in groups).
- x. A command to selectively acknowledge an alarm, tamper or trouble condition or an advisory.
- y. A command to selectively clear an alarm, tamper or trouble condition or advisory and enter an explanation of the event.
- z. A command to selectively clear and store an alarm, tamper or trouble condition or an advisory as a test.
- aa. Commands to request selected demand displays and printouts.
- bb. A command to selectively clear VDT demand displays.
- cc. A command to print the data displayed on the VDT screen.
- dd. Commands to request selected historical logs.
- ee. A command to halt a historical log in progress.
- ff. Commands to transfer data between the DIPS hard disk units and a DPS magnetic tape cartridge.
- gg. A command to assign a keyboard control function to a time schedule for automatic execution.
- hh. A command to display the graphic display associated with a specified point. This command shall override any manually or automatically displayed graphic previously displayed on the GDT.

- ii. A command to display the camera output associated with a specified point. This command will override any manually or automatically displayed camera output previously displayed on the monitor.
 - jj. Commands to configure an access point for controlled access via a card reader only, a PINpad only or both card reader and PINpad.
8. The following keyboard control functions will be provided at the PIDS terminal, as a minimum (Note: Any or all of these functions may be performed via a mouse):
- a. A command to set and / or reset the internal time and date reference of the photo imaging microprocessor.
 - b. A command to selectively assign keyboard control functions / database fields to any operator level.
 - c. A command to assign or change the operator level for a terminal operator on an individual basis.
 - d. A command to assign or change the unique password for a terminal operator on an individual basis.
 - e. A command to modify ID badge / keycard user data (individually or in groups).
 - f. A command to delete ID badge / keycards (individually or in groups).
 - g. A command to reactivate ID badge / keycards (individually or in groups).
 - h. A command to modify company / tenant file data (individually or in groups).
 - i. A command to capture an individual's video image.
 - j. A command to capture an individual's signature.
 - k. A command to print a badge insert (individually or in groups).
 - l. Commands to interrupt, re-order, restart and cancel a badge insert print queue.
 - m. Commands to reformat a badge insert layout.
 - n. A command to encode an ID badge / keycard.
 - o. Commands to calibrate image color, hue, contrast and sharpness.
 - p. Commands to use the PIDS terminal card reader and digital keyboard to test an assigned ID badge / keycard and PIN and train an individual in the proper use of the reader and PINpad.
 - q. Commands to request selected demand displays and printouts.
 - r. A command to selectively clear VDT demand displays.
 - s. A command to print the data displayed on the VIDT screen.
 - t. Commands to request selected historical logs.
 - u. A command to haft a historical log in progress
 - v. Commands to transfer data between the PIDS hard disk unit and the magnetic tape cartridge unit.
 - w. Command to transfer data between fingerprinting equipment and PIDS hard disk.

Q. Power Supply

- 1. Power for all CCAS equipment shall be provided as indicated on the drawings.
- 2. An Uninterruptible Power Supply (UPS) unit shall be provided at the DLH Security Center for the SCC: and other CCAS equipment located there to assure continued operation upon loss of normal ac power for a period of at least 15 minutes. The Airport diesel generators will provide backup power for this equipment during extended power outages.
- 3. The UPS shall be sized to support the following equipment at a minimum. Provide 50 percent space capacity in the UPS for future loads.

- a. All the CCAS equipment located in SCC, PIDS and EOC.
 - 4. Battery backup units will be provided for field-installed devices not equipped with integral backup batteries to assure continued operation upon loss of normal ac power for a period of at least 4 continuous hours.
 - a. Battery backup units shall be incorporated into the field equipment cabinets or a separate, adjacent tamper-protected enclosure.
 - b. During normal operation, the battery backup units will be maintained at full charge. In the event of a loss of normal and emergency ac power, the associated load will be automatically transferred to the battery backup unit. Upon restoration of ac power, the load will be automatically re-transferred and the batteries will be recharged to capacity at a rate not to exceed 10 times the discharge time.
 - c. When power is being supplied from its batteries, a battery backup unit will monitor battery voltage and will disconnect the load if the voltage drops below 85 percent of its rated output. Upon restoration of ac power, the load will be automatically re-transferred.
 - 5. The status of the UPS unit and battery backup or integral back up unit batteries will be monitored by the CCAS. A low battery condition will be annunciated as trouble.
- R. ID Badge / keycard Preparation
- 1. A PIDS will be provided to produce ID badge / keycards for issue to authorized users. Badge preparation will include the inputting of personal and access authorization data, the capture of an individual's video image and signature, the printing of the badge insert, the cutting and laminating of the badge insert to the keycard and the encoding of the keycard.
 - 2. Personal and access authorization data will be entered via the PIDS keyboard. Database fields with limited input options (e.g., sex, race, etc.) will utilize pop-up windows with mouse selection to facilitate data entry and minimize input errors.
 - 3. A high resolution digital video camera will be utilized to capture a continuous tone color image of an individual. Subject placement will be displayed in a preview window on the PIDS VDT during the capture process and may be moved, via software, for proper centering. Provisions for freezing an image and immediate recapture of an image will be provided. During the capture process, photographic lighting will be controlled by the photo imaging microprocessor.
 - a. The PIDS will support transfer and storage of video images captured via a portable Digital Camera
 - b. The PIDS will be provided with a stored reference frame to calibrate image color, hue, contrast and sharpness.
 - 4. The PIDS will support variable size badge inserts and multiple insert formats. The badge insert layout may include a portion or all of the text and image data contained in an individual's database file (site configurable). Text and image arrangements, insert colors (text and background), fonts, typestyles and image sizes will be site-selectable. Background color will be automatically selected by the system based on the badge type (employee visitor), employer affiliation or access authority. Image sizes will be proportionally variable.
 - 5. Individual badge inserts with all associated text and image data will be capable of being previewed simultaneously on the PIDS VDT prior to printing (either initially or for reissue). The display will be in a "What You See Is What You Get" format.

6. The PIDS will support single and two-sided printing in a horizontal or vertical alignment. Badge inserts will be printed individually or in groups. The system will be capable of printing a minimum of 100 badge inserts while operating unattended. The print queue will be capable of being interrupted, re-ordered and restarted or canceled.
 7. Badge encoding shall include a facility code unique to the airport, an individual code unique to each user and an issue number.
 8. The laminating process will be tamper-resistant and will securely bond the badge insert to the keycard in such a manner that any attempt to alter or extract the data will be visibly obvious or render the ID badge / keycard unusable.
 9. Video image fingerprint data and signature data will be stored on the PIDS hard disk unit. All other data will be transferred to the DPS for storage. An interactive data link will be provided between the PIDS and DPS for the bidirectional exchange of information.
 10. The PIDS will support the display and printing of full size video images.
- S. Miscellaneous Provisions
1. Physical Barriers
 - a. Bollards will be provided around field-installed equipment at Type 12 access points to preclude accidental damage from vehicles. These bollards will consist of 6" concrete-filled pipes appropriately anchored.
 2. Maintenance Aids
 - a. To facilitate routine preventive and corrective service of the CCAS by Airport Maintenance personnel, the CCAS will be provided with a set of all special or nonstandard test equipment, tools, adaptors and fittings to maintain and service the supplied equipment to include card extenders for each different type of printed circuit card, tools for removing tamper-proof screws and a portable IFP analyzer (laptop computer work station).

1.9 QUALIFICATIONS

- A. The system contractor / integrator responsible for providing the CCAS shall have at least ten (10) years experience in furnishing and installation of such systems.
- B. The system contractor integrator shall have previous experience in installation of systems of similar scope for at least 2 projects in the past five (5) years and airport security system under PART 1542 (or FAR 107.14) for at least one (1) project in the past five (5) years. Contractor shall provide names of the project, year completed and references to the A/E for review and approval with bid.
- C. The system contractor's project manager and on-site superintendent shall have a minimum of fifteen (15) years experience each and shall have worked on the projects listed in Art. 1.9B in similar capacity. Submit name with bid.
- D. Manufacturer Qualifications (submit with product submittal)
 1. Manufacturer of the CCAS shall be an established organization with referenced and documented experience delivering and maintaining Security Systems of equal or higher sophistication and complexity as compared to the system detailed in this specification.

2. CCAS Manufacturer's manufacturing facilities shall be certified ISO-9000:2000 operations, utilize ISO-9000:2000 manufacturing procedures and maintain their ISO certifications.
 3. CCAS Manufacturer shall employ at a minimum the following methods for Quality Control of component and assembly devices.
 - a. Visual inspection of devices shall be performed to verify assembly according to defined procedures.
 - b. End of line operational tests shall be performed to ensure product functionality has been correctly configured.
 - c. A system burn-in period shall be utilized to screen for early life failures of electronic components.
 4. Individual functionality and system level regression testing shall be performed to ensure compliance with product specifications. Single and multiple unit system tests shall be performed to mimic end-user installation configurations. Automated hardware and software testing shall be utilized to verify system performance under published operational loads and shall be compared to published system capabilities.
- E. Access controls and CCTV software experience: The access controls and CCTV system integrator / contractor shall have factory trained personnel from the approved manufacturer with a minimum of five (5) years experience in system integration and a minimum of two (2) years experience in the proposed access controls and CCTV systems for this project. Submit name of the qualified personnel with bid.

1.10 MAINTENANCE SERVICES - WARRANTY

- A. General Requirements: The Contractor shall provide all services required and equipment necessary to maintain the entire CCAS in an operational state as specified for a period of two (2) year(s) after formal written acceptance of the system, and shall provide all necessary material required for performing scheduled service or other unscheduled work.
- B. Personnel: Service personnel shall be factory certified in the maintenance and repair of the equipment installed under this section of the specification. The owner shall be advised in writing of the name of the designated service representative, and of any change in personnel.
- C. Routine Inspection and Warranty Maintenance: This work shall be scheduled in advance with Duluth International Airport.
 1. Inspections: The Contractor shall perform two minor inspections at six (6) month intervals (or more often if required by the manufacturer), and two major inspections offset equally between the minor inspections to effect quarterly inspection of alternating magnitude.
 2. Minor Inspections: These inspections shall include:
 - a. Visual checks and operational tests of all console equipment, peripheral equipment, field hardware, sensors, and electrical and mechanical controls.
 - b. Mechanical adjustments if required on any mechanical or electromechanical devices.
 3. Major Inspections: These inspections shall include all work described under paragraph Minor Inspections and the following work:
 - a. Clean all CCAS equipment, including interior and exterior surfaces.
 - b. Perform diagnostics on all equipment.

- c. Check, walk test, and if required by the manufacturers' maintenance procedures, calibrate each sensor.
 - d. Run all system software diagnostics and correct all diagnosed problems.
- D. Operation: Performance of scheduled adjustments and repair shall verify operation of the CCAS as demonstrated by the applicable tests of the performance verification test.
- E. Emergency Service: The owner will initiate service calls when the CCAS is not functioning properly. Qualified personnel shall be available to provide service to the complete CCAS. The owner shall be furnished with a telephone number where the service supervisor can be reached at all times. Service personnel shall be at site within four (4) hours after receiving a request for service. The CCAS shall be restored to proper operating condition within 8 hours after service personnel arrive on site.
- F. Records and Logs: The Contractor shall keep records and logs of each task, and shall organize cumulative records for each component, and for the complete system chronologically. A continuous log shall be maintained for all devices. The log shall contain all initial settings. Complete logs shall be kept and shall be available for inspection on site, demonstrating that planned and systematic adjustments and repairs have been accomplished for the CCAS.
- G. Work Requests: The Contractor shall separately record each service call request on a service request form. The form shall include the model and serial number identifying the component involved, its location, date and time the call was received, specific nature of trouble, names of service personnel assigned to the task, instructions describing what has to be done, the amount and nature of the materials used, the time and date work started, and the time and date of completion. The Contractor shall deliver a record of the work performed within five (5) days after work is accomplished.
- H. System Modifications: The Contractor shall make any recommendations for system modification in writing to the Owner. No system modifications, shall be made without prior approval of the Owner. Any modifications made to the system shall be incorporated into the operations and maintenance manuals, and other documentation affected.
- I. Software: The Contractor shall provide all software updates during the period of the warranty and verify operation in the system. These updates shall be accomplished in a timely manner, fully coordinated with CCAS operators, shall include training for the new changes / features enabled, and shall be incorporated into the operations and maintenance manuals, and software documentation.

PART 2 - PRODUCTS

2.1 GENERAL DESIGN REQUIREMENTS

- A. Operating Environment
 - 1. All indoor equipment shall be capable of operating in an environment of 50 to 95 degrees F with 20 to 80 percent relative humidity, non-condensing.
 - 2. All outdoor-installed components shall include electric heaters and forced ventilation as required for operation in an ambient environment of:

- a. Temperatures between -20 degrees F and +115 degrees F.
 - b. Relative humidity's up to 100 percent at +100 degrees F.
 - c. Wind gusts up to 100 miles / hour.
 - d. Rainfall rates up to 6 inches / hour for periods up to 60 minutes.
- B. Cabinets and Terminals
- 1. All cabinets and terminals shall be free-standing assemblies with leveling provisions and rear access doors. Where rear access cannot be accommodated, cabinet and terminal equipment shall be provided on racks that slide out from the front. Each cabinet and terminal shall be completely modular, physically and electronically. Each module shall be capable of passing through an opening 2 feet 8 inches wide by 6 feet high, maximum. Racks, shelves, and other structural parts shall be constructed to prevent warping or distortion.
 - 2. Cabinet and terminal doors shall open a minimum of 170 degrees to avoid blocking personnel movement. Each door shall be equipped with a UL-approved cylinder lock (per UL 437, "Key Locks" a tamper switch and a piano-type hinge with welded tamperproof pins. All cabinet, console and terminal locks shall be master-keyed by type. Four keys of each type shall be supplied.
 - 3. Racks for the plug-in circuit cards shall permit access to the interconnecting wiring. Initial rack space capacity for circuit cards shall accommodate the requirements specified in Paragraph 1.8B.3. Circuit card identification shall be stenciled or permanently marked on the panel structure adjacent to its location with a minimum letter height of 1/4-inch. All backplane wiring and program allocation for spare slots reserved for future expansion shall be provided so that additional points can be implemented by simply inserting a card into the spare slot and defining the points in central processor memory.
 - 4. Each cabinet and terminal shall contain a copper ground bus running the entire length of the cabinet or console with the enclosure connected to the bus so as to effectively ground the entire structure. A bolted compression-type terminal shall be installed at each end of each ground bus for connection to the facility ground cable.
 - 5. All cabinet, console and terminal materials and paint shall be nonflammable (as defined by ASTM D 635, "Rate of Burning and / or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position"). No preparation or material shall release toxic gases or dense smoke or propagate flames when heated or exposed to open flame.
 - 6. Provisions shall be made for field wiring to enter the cabinets, consoles and terminals at the top and the bottom, except as specified. All cable openings shall be provided with flame-resistant grommets. All wiring for field connections shall terminate on terminal blocks or plug sockets.
 - 7. All unshielded cabinet and terminal wiring, except for off-the shelf equipment, shall be stranded 600 volt Class C stranding in accordance with ASTM B8, "Concentric-Lay Stranded Copper Conductors," or DLH-approved equal. All wiring shall be capable of passing the applicable flame-resistance tests specified in ICEA S-19-81 I A Rubber Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.®
 - 8. Low level signal wiring (100 mV and under) which is designated as having twisted and shielded field wiring shall also have twisted and shielded wiring within the cabinets, consoles and terminals. Each shield shall be connected to a separate terminal point immediately adjacent to the signal wire. Connection to the ground bus, when required, shall be made with insulated No. 12 AWG wire.

9. Each wire shall be identified at both ends with the wire designation corresponding to the wire numbers shown on the wiring diagrams. The wires shall be marked with a sleeve-type, smear-proof, nonconductive, flame-resistant, embossed wire marker or approved equivalent (chlorine or other halogen compounds shall not be used).
10. All exposed wiring within the cabinets, consoles and terminals shall be formed neatly with wires grouped in bundles using non-metallic, flame resistant wiring cleats or bands and with groups substantially supported along their length. Wires shall not be spliced, taped or joined with wire nuts between terminal points. Wiring which crosses hinged joints shall be flexible hinge-type wire. No wiring shall be routed across the face or rear of an instrument, junction box or other device in a manner that will prevent or hinder the opening of covers or will obstruct access to leads, terminals, devices or instruments. Wiring shall not cross a door opening or be fixed to a door. Where wiring must cross sharp metal edges, protection in the form of grommets or equivalent devices shall be provided.
11. Thermostatic control shall be provided for each cabinet, console and terminal equipped with a cooling fan. All fans shall be shaded pole type with fuses and guarded blades. Motor units shall be provided with permanently lubricated bearings for continuous duty and overload protection devices. Replaceable filters shall be provided for all fan vents. These filters shall be removable from outside the cabinet, console and terminal.
12. Nameplates shall be provided for each cabinet, console and terminal. Nameplates for indoor-mounted equipment shall be three-ply laminate, black face, and white core. Outdoor-mounted equipment shall be provided with an engraved metal nameplate.
 1. Where practical, nameplates shall be attached to equipment with two self-tapping stainless steel screws in holes drilled in the equipment.
 2. Where installation of screws is not practical, such as for small nameplates or where equipment cannot be drilled, a permanent adhesive shall be used. The Contractor shall prepare the surface according to the adhesive manufacturer's recommendations.
13. Each cabinet, console and terminal shall be provided with at least one polarized duplex receptacle to facilitate maintenance. Receptacles shall be connected to a separate terminal block with a disconnect switch for the 120 V ac supply. Connect the outlet to a non-UPS circuit.

C. Surge Protection

1. All CCAS power lines shall be equipped with surge protection provisions in accordance with ANSI C62.41, "Guide for Surge Voltage in Low Voltage AC Power Circuits," and UL 1449, "Standard for Safety Transient Voltage Surge Suppressors," as applicable.
2. All data communications lines and sensor inputs shall be equipped with surge protection provisions in accordance with IEEE Transaction Volume COM-21, "Lightning Surges in Open Wire, Coaxial and Paired Cables," as applicable.
3. All protection devices shall be self-restoring and non-destructing and online at all times. Protection devices shall respond within 1 nanosecond on data circuits and within 5 nanoseconds on power circuits.

D. Electromagnetic Interferences

1. Noise suppression shall be provided as required for total system immunity from internally and externally generated sources of electromagnetic and RF interference including that from portable two-way radios. Noise suppression

provisions shall comply with ANSI C63.12, "Recommended Practice on Procedures for Control of System Electromagnetic Compatibility," as applicable.

2. All CCAS equipment shall comply with the standards for electromagnetic interference in FCC Rules and Regulations, Part 15, Subpart J, "Class A Computing Devices," as applicable.

E. Fabrication

1. All metalwork shall be free of sharp edges, burrs, and other imperfections.
2. The interior and exterior surfaces of all enclosures shall be thoroughly cleaned so that the surfaces are free of all rust, mill, scale, oil, and foreign matter. All nonpermanent marks and coatings shall be removed.

2.2 CONSOLES AND EQUIPMENT

A. Operator Consoles and Terminals

1. General.
 - a. All console / terminal equipment shall be as indicated on the drawings. VDTs, GDTs and CCTV monitors shall be located to minimize distortion from angular line-of-sight and glare due to reflected light. PIDS equipment shall be mounted in a manner to facilitate the badge generation process.
 - b. Console / terminal control switches, pushbuttons, indicating lights and nameplates shall be provided on insert modules suitable for rack mounting. These modules shall be located to facilitate visibility and operability. Front mounted modules shall be held in place with tamper-resistant screws that require a special tool for removal. Indicating lights shall be selected to provide long bulb life and ease of bulb replacement. Lamp test capabilities shall be provided. All switches shall be selected and installed to provide protection against contamination that may block operation of the switches or contacts.
 - c. Front cover panels shall be provided for console terminal modules reserved for existing radio and other equipment. The required cutouts in these panels shall be provided to incorporate the equipment neatly and to give the appearance of a single integral unit.
 - d. The consoles / terminals shall have provisions at both ends for terminating printer power and signal wiring. Pre-fabricated cables (10 feet each, minimum) with connectors at both ends shall be provided for the printers.
 - e. Console / terminal cooling provisions shall be sized to accommodate existing radio and other equipment to be integrated into the console terminal layouts.

2.3 MANUFACTURERS

A. CCAS Software.

The integrated Security System software shall be manufactured by the following manufacturers. The specifications are based on products of multiple manufacturers, the products from the approved manufacturers with integrated or 3rd party software to achieve the functionality is acceptable. This shall not be construed to indicate that the approved manufacturers are not required to meet the specifications; however, it recognizes the fact that the approved manufacturers may use 3rd party software to provide specified performance. The specified performance must be met by the approved manufacturers.

1. Access Control.
 - a. Genetec Synergis.
 - b. AMAG Symmetry Enterprise.
 - c. Lenel OnGuard 2009 Enterprise.
 - d. Software House, CCURE 9000.
 - e. HIRSCH Velocity.
 - f. S2 Enterprise.
 - g. Or Approved Equal.
 2. CCTV Storage & Analytics.
 - a. 3VR SmartRecorders.
 - b. iOmniscient.
 - c. Genetec Omnicast.
 - d. ONSSI NDVMS.
 - e. Intransa.
 - f. Pivot3.
 - g. or approved equal.
- B. CCAS Field Hardware as specification indicates Genetec. Equivalent products from approved equal manufacturer may be used.
1. Intelligent Field Panel (IFP) Vertx V1000.
 2. Dual Reader Interface Module (DRM) Vertx V100.
 3. Input Modules (ICM) Vertx V200.
 4. Output Modules (OCM) Vertx V300.
 5. Ancillary devices as required to provide a complete and operational system.
- C. CCAS Authentication Hardware
1. HID I-Class Readers.
 2. L1-Identity Biometric Readers.
 3. or approved equal.
- D. CCAS Credential Printers
1. The CCAS credential management module shall be compatible with printers and printer / encoders from Fargo, Eltron, Magicard and Nisca that support Windows 2000, 2003 and XP drivers.
- E. CCAS Third Party Integrated Devices
1. The CCAS shall interface with third party devices and applications. The Third Part integration shall be accomplished by:
 - a. Direct Serial Interface.
 - b. Virtual Serial Interface (Lantronix controller).
 - c. TCP/IP (DLL, XML, etc).
 - d. Software Development Kit w/ Scripts shall be provided.
- F. Computer Work Stations:
1. The computer work stations shall be as manufactured by Dell. HP or IBM using specified processor. However, all work stations shall be from the same manufacturer.

2.4 DATA PROCESSING SUBSYSTEM (DPS)

- A. General.
1. The DPS shall integrate all access control, credential management, digital video management and functionality into a single database in a networked environment. The DPS shall allow the incorporation and integration of

servers, access control client workstations, badging client workstations, digital video management client workstations, remote access level management client workstations and integrated client workstations sharing the same database on local area or wide area networks. The DPS shall allow future expansion to include additional client workstations without losing functionality.

2. DPS administrative operations shall be available from any client workstation on the DPS that is configured and licensed to do so. System Administrator functions include the creation of maps, alarm response instructions, access levels, time zones, holidays, reports, area control, outputs and all required DPS configurations. System Administration operations shall include changes / configuration to the CCTV image comparison screen, cardholder window, employee capture, and cardholder look-up screen.

B. Fault Tolerant CCAS Server

1. The CCAS Fault Tolerant Server shall be a NEC Express 5800 320 Series server with Intel Xeon series processors. The Server shall be a self-contained fully redundant system (dual module / mirrored components) with on-line serviceability and hot-swappable replacement of all major subsystems including processors, power supplies, PCI bus and SCSI controllers. The server shall provide 99.999% system up time and include the following list of features / hardware:
 - a. NEC Express5800-320Fd-MR Rack mount with Redundant dual Xeon processors, 3.0GHz, 6MBx2 L2 cache.
 - b. Operating Temperature from 50 to 95 degrees F (10 to 35 degrees C) with relative humidity from 20% to 80% (no condensation)..
 - c. Redundant ECC DDR2 SDRAM memory (minimum of 1 GB per module.
 - d. Redundant dual channel Ultra 160 SCSI controllers. (minimum two drives per module, three drives maximum) utilizing 10K RPM Ultra SCSI Disk Drives RAID0/1 configured.
 - e. External 3.5" USB floppy drive, 3 PCI expansion slots, redundant integrated 10/100 and 1000 Ethernet NIC Copper cards, redundant integrated PCI video cards, redundant 24xCDROM drives, 2 serial ports, 2 USB ports, keyboard, mouse and surge suppression strip, USB to PS/2 Converter for KVM Connectivity.
 - f. Windows 2003 Server operating system software with 25 user licenses, ESMPRO system management software suite, Management Workstation Application software (MWA) for remote systems management, VERITAS Volume Manager software for storage management, RDR.

C. CCAS Client Workstation for administrative, programmer, alarm monitoring, CCTV review and badging.

1. The CCAS Client Workstation(s) shall be 100% Windows / Intel Standard compatible, approved for use with Microsoft Windows latest version, and scaled according to the following system application requirements:
 - a. CCAS Client Workstation minimum requirements shall consist of a Dell PowerEdge 2950 or equivalent business class computer.
 - 1) See Plans.

D. Badging System Peripherals

1. Video Camera.

- a. The video camera to capture cardholders' photos shall be highly durable with a built-in auto-focus feature. It shall have an auto iris, an optical power zoom lens and be capable of USB connectivity.
 - b. CCTV Camera shall be Canon Powershot sx110 or equal.
2. Card Printer.
- a. The high definition printer shall be Fargo HDP 5000 or approved equal. Contractor shall develop the card design with the Owner and A/E and provide three different design samples to review prior to implementation and issuance of the cards.
 - b. Specifications:
 - 1) The printer(s) shall be capable of printing full-color images and text on the following card types: ABS, PVC, PET, PETG, matte-finish (clean) and rough finish (clean). The cards may include proximity, contact smart, contactless smart, magnetic stripe, and optical memory technology. The printer must meet the following requirements:
 - 2) Print Method - High Definition Printing Dye-Sublimation / Resin Thermal Transfer.
 - 3) Resolution - 300 dpi (11.8 dots/mm).
 - 4) Colors - Up to 16.7 million / 256 shades per pixel.
 - 5) Print Ribbon Options:
 - a) Provide to print on the specified contactless smart cards.
 - b) Full-color with two resin black panels, Yellow, Magenta, Cyan, 500 prints.
 - 6) High Definition Print Film Options:
 - a) Standard Holographic (500 prints).
 - 7) Overlamine Options:
 - a) PolyGuard Overlamine, .6 mil thick (250 prints).
 - b) All overlaminates, standard holographic design.
 - 8) Print Speed:
 - a) 38 seconds per card / 95 cards per hour in batch mode (YMC with transfer).
 - b) 46 seconds per card / 78 cards per hour in batch mode (YMCK with transfer).
 - c) 70 seconds per card / 51 cards per hour in batch mode (YMCKK with transfer).
 - d) 50 seconds per card / 72 cards per hour in batch mode (YMCK/lamination).
 - e) 75 seconds per card / 48 cards per hour in batch mode (YMCKK/lamination).
 - 9) Accepted Standard Card Sizes - CR-80 (3.370"L x 2.125"W / 85.6mmL x 54mmW).
 - 10) Print Area - Over-the-edge on CR-80 cards.
 - 11) Accepted Card Thickness.
 - a) Print only: .030" (30mil) to .070" (50mil) / .762mm to 1.778mm.
 - b) Print / Lamination: .030" (30mil) to .070" (50mil) / .762mm to 1.778mm.
 - 12) Accepted Card Types - ABS, PVC, PET, PETG, proximity, smart and mag stripe cards, optical memory cards.
 - 13) Input Hopper Card Capacity - 100 cards (.030" / .762mm).
 - 14) Output Hopper Card Capacity - 200 cards (.030" / .762mm).

- 15) Card Cleaning - Replaceable cleaning roller.
- 16) Memory - 16MB RAM.
- 17) Display - User-friendly, SmartScreen LCD Control Panel.
- 18) Software Drivers - Windows® 2000/XP, Windows 2003 or Windows Vista.
- 19) Interface - USB 2.0 (High Speed) and Ethernet with internal print server.
- 20) Operating Temperature - 65° to 90° F / 18° to 32° C.
- 21) Humidity - 20-80% non-condensing.
- 22) Agency Listings:
 - a) Safety: UL 60950, CSA C2.2 No. 60950, CB report (EN 60950), CE mark.
 - b) EMC: FCC Part 15 Class A, EN 55022; 1998 Class A, CRC c1374, EN 61000-3-2: 2000, EN 61000-3-2: 1995, EN 55024; 1998, CE mark, and CCC mark.
- 23) Supply Voltage - 100-240 VAC at 50 Hz / 60 Hz, 3.8A.
- 24) Warranty:
 - a) Printer – 2 year; including 1 year On-Call Express.
 - b) Print head – Lifetime; unlimited pass with Fargo Certified Cards.
- 25) Certified Supplies - Card Printer / Encoders require highly specialized media to function properly. To maximize printed card quality and durability, print head life and printer / encoder reliability, use only Certified Supplies. Warranties are void, where not prohibited by law, when non-Certified Supplies are used.
- 26) Required Options:
 - a) Printer Cleaning Kit.
 - b) Door and cartridge locks.
 - c) Card Lamination Module - dual-sided (simultaneous).
 - d) Dual-sided printing.
 - e) Contactless Smart Card Encoder (HID iCLASS and MIFARE).

E. Report printer

- 1. The report printer shall be a Laser network printer of latest design.
- 2. Specifications:
 - a. Memory: 16 MB of RAM.
 - b. Print Specs:
 - 1) Speed (pages per minute): 19.
 - 2) Resolution: 1200 x 1200 dpi.
 - 3) Language: HP PCL 5e and 6; printer language (emulates Adobe PostScript7 level 2).
 - 4) Fonts: 45 scalable fonts plus 35 postscript fonts built-in.
 - c. Paper Handling:
 - 1) Main input tray capacity: 250-sheet regular weight 20 lb (75 g/m2) paper or up to 30 envelopes.
 - 2) Priority input tray capacity: 10-sheet 20 lb (75 g/m2) paper or 1 envelope.
 - 3) Output bin capacity: 125-sheet 20 lb (75 g/m2) paper or cardstock 16 to 28 lb (60 to 105 g/m2) Straight through paper path handles media 16 to 43 lb (60 to 163 g/m2).
 - d. Paper size:

- 1) Letter 8.5 x 11 and Legal 8.5 x 14 in (215 x 356 mm).
- e. Connectivity: IEEE-1284 compliant bi-directional parallel port and 2.0 compliant USB port; HP Jetdirect 175x print server/ Internet connector; 10/100Base-T Ethernet, Microsoft TCP/IP & IPX/SPX, and LocalTalk protocols.
- f. Environmental Ranges:
 - 1) Operating temperature: 50 to 90.5° F (10 to 32.5° C).
 - 2) Operating humidity: 20 to 80% RH non-condensing.
 - 3) Storage temperature: 32 to 104° F (0 to 40° C).
 - 4) Storage humidity: 10 to 80% RH non-condensing.
- g. Supported OS: Microsoft Windows latest version, Apple Macintosh latest version.
- h. Acoustics:
 - 1) Sound power: LwAd = 6.1 Bels (A) printing, LwAd = 6.5 Bels (A) copying (HP LaserJet 1220).
 - 2) Acoustics are inaudible during powersave mode.
 - 3) Tests per ISO 9296.
- i. Power Requirements:
 - 1) Source: 110 to 120 v (∇ 10%)/127v (∇ 10%)/220 to 240 v (∇ 10%).
 - 2) Frequency: 50 to 60 Hz (∇ 2Hz)/60 Hz NOM/50 to 60 Hz (∇ 3Hz).
- j. Dimensions: (w x d x h) 16.3 x 19.2 x 10.0 in (415 x 487 x 252 mm).
- k. Weight (with cartridge): 18.3 lb (8.3 kg).
- l. Printer shall be HP LaserJet 1035n or approved equal.

F. Modem

- 1. The CCAS modem shall be available for remote diagnostics, downloading of upgrades, dial-in capabilities, and remote communications. The modem shall be plug and play and support the Windows 2000 Operating System. All system servers must include a modem.
- 2. The modem shall have the minimum specifications:
 - a. Data Transmission: 56 Kbps.
 - b. Universal Compatibility: Yes.
 - c. Error Control: V.42/MNP 2-4 error control.
 - d. Data Compression: V.42 bis/MNP5 data compression.
 - e. Approvals: FCC Approved (Part 15 Class B/Part 68), IC (Formerly DOC) Approved, UL Listed and CSA Approved.
 - f. Warranty: five (5) year manufacturer's standard warranty.

G. Backup System

- 1. The system server shall utilize a network backup system for system backups and archiving capabilities. The network backup system must support the Windows 2000/2003 Operating System.
- 2. Scheduled / Unattended Backups: Allows System Administrators to perform backups at pre-determined times. Intervals shall be in hourly, daily, weekly, and monthly intervals.
- 3. Network Backup Storage shall be at minimum same size as CCAS server array.
- 4. Storage shall be connected to network in different location that CCAS servers.

2.5 ACCESS CONTROL FIELD HARDWARE DEVICES

- A. General
 - 1. The system shall be equipped with the access control field hardware required to receive alarms and administer all access granted / denied decisions. All field hardware must be designed to meet UL 294 and ULC requirements. Depending upon the configuration, the system field hardware must be able to include any or all of the following components:
 - a. Intelligent Field Panels (IFP).
 - b. Input Control Module (ICM).
 - c. Output Control Module (OCM).
 - d. Dual Reader Interface Module (DRI).
 - e. Proximity Card Readers.
 - f. Panel Power Supplies.
- B. Intelligent Field Panel (IFP)
 - 1. The Intelligent Field Panel (IFP) shall link the CCAS Software to all downstream field hardware components (RIMs, ICMs and IOMs). The IFP shall provide full distributed processing of access control / Alarm Monitoring rules and operations. A fully loaded and configured IFP with shall respond in less than one-half (0.5) second to grant or deny access to cardholder.
 - 2. The IFP shall continue to function normally (stand-alone) in the event that it loses communication with the CCAS software. While in this off-line state, the IFP shall make access granted / denied decisions and maintain a log of the events that have occurred. Events shall be stored in local memory, and then uploaded automatically to the CCAS database after communication has been restored.
 - 3. In addition, the IFP shall incorporate the following features:
 - a. UL 294, ULC, and CE Certified.
 - b. Support for Host Communications Speed of 38,400 bps.
 - c. Support for Direct Connect, Remote Dial Up, or Local Area Network (LAN) Connection.
 - d. Support for Dual Path Host Communications - Secondary Path shall be Local Area Network (LAN) Connection, or Remote Dial Up Connection via Lantronix Ethernet controller.
 - e. Support for up to 32 MB of On-Board Memory, min 6MB.
 - f. LAN Support shall utilize RJ45 (10/100baseT) Ethernet Interface.
 - g. Flash Memory for real time program updates and overall host communications.
 - h. Support for four 2 wire downstream ports, two 4 wire downstream ports, or combination one 4 wire downstream port and two 2 wire downstream ports. Downstream ports shall be for connecting card readers and data gathering and output control panels via RS-485 multi-drop wiring configuration.
 - i. Memory storage of up to 250,000 card holders and 65,000 transactions.
 - j. Initial base memory download between IFP with standard memory from the CCAS shall require no more than ten (10) seconds.
 - k. Support for up to 32 devices consisting of RIMs, ICMs, and OCMs in any combination desired with a maximum of 16 I/OCM devices.
 - l. Support of multiple card technologies.
 - m. Supervised Communications between IFP and CCAS Software.

- n. AES 128 bit Symmetrical Block Encryption conforming to the FIPS-197 standard between IFP and CCAS Software communications driver.
- o. Multi drop support for up to eight IFPs per CCAS communications port.
- p. Support of up to eight card formats and facility codes.
- q. Support for SEIWG card formats.
- r. RS-485 Full Duplex, UL 1076 Grade AA communication channel to the CCAS head-end.
- s. Integration to other manufacturer's card readers.
- t. Uninterruptible Power Supply (UPS) with battery backup.
- u. 32-bit Microprocessor.
- v. Biometric Interface Support.
- w. An IFP downstream serial port shall multi-drop 16 access control field hardware devices using an RS-485 UL 1076 Grade A communication format allowing a distance of 4,000 feet using Belden 9842 cable or equivalent.
- x. 12 VDC input power.
- y. Issue Code Support for both Magnetic and Wiegand Card Formats.
- z. Individual Shunt Times (ADA Requirement).
- aa. Up to four Digit PIN Codes.
- bb. Downstream serial RS-232 device support.
- cc. Status LEDs for normal component and communication status.
- dd. RoHS Compliance.

C. Input Control Module (ICM)

- 1. The Input Control Module shall provide 16 UL 1076 Grade A or AA alarm input zones and monitor / report line fault conditions, alarm conditions, power faults and tampers. Status LEDs shall provide information about the sixteen alarm zone inputs, cabinet tamper, and power fault.
- 2. In addition, the ICM shall incorporate the following features:
 - a. UL 294, ULC, and CE Certified.
 - b. Alarm contact status scanning at up to 180 times per second for each zone.
 - c. Eight configuration DIP switches to assign unit addresses and communications speed.
 - d. Elevator control support for 64 floors.
 - e. Variable resistor values for line supervision.
 - f. A low power CMOS microprocessor.
 - g. Filtered data for noise rejection to prevent false alarms.
 - h. Up to 16 Grade A, or AA Supervised Inputs in any combination.
 - i. 12 VDC Input Power.
 - j. 2 Form C 2A, 30 VDC Contacts for load switching.
 - k. 2 dedicated inputs for tamper and power status.
 - l. RoHS Compliance.

D. Output Control Module (OCM)

- 1. The Output Control Modules shall provide 12 Form-C 2A 30 VDC relay contacts for load switching. The relays shall be configurable for fail-safe or fail-secure operation. Each relay shall support "On" "Off" and "Pulse"
 - a. 12 VDC input power.
 - b. Two dedicated digital inputs for tamper and power failure status.
 - c. RS-485 communications, multi-dropped (2-wire or 4-wire RS-485).

- d. Up to 16 OCMs per Intelligent System Controller.
 - e. Onboard termination jumpers.
 - f. DIP switch selectable addressing.
 - g. Status LEDs for communication to the host, heartbeat and relay status.
 - h. Elevator control, support for 64 floors.
 - i. RoHS Compliance.
- E. Dual Reader Interface Module (DRI)
- 1. The DRI shall provide a dual interface between the IFP and authentication devices. The DRI must operate with any authentication device that produces a standard Wiegand (Data 1 / Data 0 or Clock and Data) communication output.
 - 2. In addition the DRI shall incorporate the following features:
 - a. 12 VDC power supply.
 - b. Reader communications (Clock / Data or Wiegand Data1 / Data0) - more than 150 different readers approved for use.
 - c. 4 Form-C 2A at 30 VDC relay outputs.
 - d. Up to 16 different formats (8 card and 8 asset).
 - e. Issue code support for Magnetic and Wiegand formats.
 - f. Door contact supervision (Open / Closed).
 - g. REX push-button monitor.
 - h. Strike Control output.
 - i. Bi-color status LED support and 2-wire LED support.
 - j. Beeper control.
 - k. Dedicated tamper and power failure circuits.
 - l. Support for offline reader access mode.
 - m. Onboard jumpers for termination.
 - n. Elevator control, native support for 6 floors.
 - o. DIP switch selectable addressing.
 - p. UL 294 listed and CE approved.
 - q. RoHS Compliance.
- F. Card Readers
- 1. All readers shall be configured with the card reader and reader interface module mounted separately. The reader interface module shall be mounted in the EIB located on the secure side of the door.
 - 2. Smart Access Control Reader with Keypad: Provide *iCLASS*, contactless smart card reader or equivalent where shown on the drawings. Card reader shall be "single-package" type, combining controller, electronics and antenna in 1 package, in the following configurations:
 - a. RK40 - Card Reader, Wall Mounting (Single-Gang Mounting Applications):
 - 1) Provide "single-gang" mounting style contactless smart card reader for wall mounting, Vehicle Stanchions and Pedestals, and where shown on plans.
 - 2) The reader shall be of potted, polycarbonate material, sealed to a NEMA rating of 4X (IP65).
 - 3) The reader shall contain an integral magnet for use with an external magnetic reed switch to provide tamper protection when connected to an external alarm system. Provide external magnet reed switch and tamper indication.
 - 4) The reader shall be UL/C 294 listed, and shall be FCC and

- CE certified, and shall conform to the following ISO Standards: 15693, 14443A (CSN read-only), 14443B1 (read-only), and 14443B2.
- 5) Transmit Frequency: 13.56 MHz6) The reader shall have an approximate read range of 1 inch to 4.5 inches when used with the compatible access card.
 - 7) The reader shall require that a card, once read, must be removed from the RF field for 1 second before it will be read again, to prevent multiple reads from a single card presentation and anti-passback errors.
 - 8) The reader shall be capable of reading access control data from any *iCLASS* contactless smart card or equivalent, and transmitting that data in SIA standard Wiegand format.
 - 9) The reader shall be capable of reading the CSN (card serial number B a permanent, unique identification number) from any MIFARE[®] card using the S50 chip or equivalent, and transmitting that data in SIA standard Wiegand format.
 - 10) The reader shall be capable of writing to the compatible access card in compliance with ISO 15693 or 14443B2.
 - 11) The reader shall provide 1 Wiegand port, for connection to standard access control panels.
 - 12) The reader shall provide Internal Control for Read-only Access Control applications, transmitting Wiegand Data.
 - 13) The reader shall have separate terminal control points for the green and red LEDs, and for the audible indicator.
 - 14) The reader shall have multiple LEDs for increased visibility
 - 15) The reader shall have a 12-position keypad, with metal keycaps, and backlit numbers located above each key.
 - 16) The reader keypad shall be rugged, waterproof and backlit, and impervious to liquid spills, dirt, and water spray from any direction.
 - 17) The reader shall be configurable so that keypad data may be sent as individual keystrokes or buffered and formatted in a card data format, as required by the Host System.
 - 18) The reader shall allow users to enter a PIN code as a primary, secondary or alternate means of identification, based on configuration of the Host System.
 - 19) The reader shall optionally be configurable to verify the user's PIN entry locally, based on a comparison with PIN data stored on the user's card, transmitting Wiegand data to the host only if the PIN code is valid.
 - 20) The reader keypad shall have keys of sufficient size and with sufficient separation such that users wearing gloves can easily press the individual keys.
 - 21) The reader keypad shall work in conjunction with the audio transducer, such that each keypress shall produce a click or beep signifying that the keypress was received by the microprocessor.
 - 22) The reader keypad should have definite tactile "snap" when depressed, giving the user confirmation that the key was pressed correctly.
 - 23) The reader shall have an audio transducer capable of producing unique tone sequences for various status

- conditions.
- 24) The reader shall have a configurable hold input, which when asserted shall either buffer a single card read or disable the reader, until the line is released. This input may be used for special applications or with loop detectors.
 - 25) Access control data shall be protected using 64-bit diversified security keys, encrypted RF data transmission, and mutual authentication using a proprietary symmetrical key-based algorithm.
 - 26) Security keys in the cards and readers shall be required to match, and may be customized for individual sites by using the *iCLASS* Card Programmer (or equivalent) or by special order from the factory.
 - 27) The reader shall have flash memory to allow future feature enhancements to be added in the field.
 - 28) The reader shall have a lifetime warranty against defects in materials and workmanship.
 - 29) Color shall be selected by the Architect: gray, black or white
 - 30) HID Model RK40, or equivalent, compatible with selected card media.
- b. Biometric Card Reader.
- 1) Reader shall use the combination of the fingerprint and *iCLASS* contactless smart card technology from HID. Both the fingerprint and *iCLASS* technology shall be designed to meet the needs of access control. The card reader shall be as manufactured by Bioscript or HID.
 - 2) Reader shall offer a RS-232, RS-485 and Weigand connection.
 - 3) Using the ISO 7816 protocol, the standard for contact smart card applications, the RWKLB575 allow connection to a PC or microcontroller to support read/write applications. Provide RS-232 to USB converter.
 - 4) Keypad: Offers twelve discrete switches with metal keycaps. Raised tactile mark on "5" key for visually impaired users. Configurable audio feedback. Backlit numbers in bezel overlay, above each key. Lighting is configurable: "Always On", "Always Off", "Triggered by Card Read", or "Triggered by Key Press".
 - 5) User Function Keys: Four programmable user function keys with metal keycaps. User function keys are available with factory default settings or can be customized. In either case, user function keys are easily defined in the graphical LCD display.
 - 6) Security: 64 bit authentication keys are extremely secure. Readers and cards require matching keys to function. All RF data transmission between the card and keypad reader is encrypted, using a secure algorithm. The key management system reduces the risk of compromised or duplicated cards.
 - 7) Cards and keypad readers with site-specific keys shall be provided from the factory.
 - 8) Audiovisual Indication: Audio transducer provides configurable tone sequences to signify access granted, access denied, power up, and configuration card read. A light bar provides a clear visual status indication in red, green, or amber. All units contain an LED to light the sensor area if the biometric option is included.
 - 9) Graphical Display: The backlit graphical LCD display offers a 60 x 18

mm viewing area, 120 x 32 resolution. It is factory preset to provide written instructions to the user. Fully customizable, the display also describes the function of the user function keys.

- 10) Indoor Design: Rugged, weatherized polycarbonate enclosure provides reliable performance and resistance to vandalism. Permanent magnet built into housing facilitates tamper alarm when used with a magnetic reed switch.
- 11) Enrollment: Enrollment software and a reader unit shall be provided to write the biometric template to the cards. The template never enters the PC – it is collected by the reader and written to the *iCLASS* card all in one simple process. To alleviate privacy and database management concerns, the biometric template is stored on the *iCLASS* card rather than in the unit.
- 12) *iCLASS* Credential Compatibility: The reader shall be compatible with all *iCLASS* credentials. The units shall read or read/write to credentials compatible with several ISO standards including:
 - a) 15693 - read/write; 2kbits (256Bytes) and 16kbits (2kBytes) *iCLASS* credentials.
 - b) 14443A - read only; MIFARE® Standard (serial number), Ultralight, or DESFire™.
 - c) 14443B2 – read / write; 16kbits (2kBytes) *iCLASS* credentials.
- 13) Reader shall be HID Model RWKLB575 with high security key management and programmable LED / Beeper / LCD key operation or approved equal.

G. Field Hardware Power Supplies: Power Supplies for field hardware shall be designed specifically for the equipment installed. These power supplies shall be regulated, isolated versions for the IFP, ICM, Card Readers and other equipment. Each shall be available in UPS with battery back-up. All power supplies shall be housed in locked enclosures that also allow mounting space for the IFP, ICM, DRI or other device / panel required.

H. Audible Annunciators

1. The audible annunciators and associated volume and reset controls shall be rack-mounted.
2. The audible annunciators shall not conflict with other audible signals at the SCC.
3. Each audible annunciator shall provide a maximum sound output of at least 60 dbA at 1 foot.

I. Local Audible Annunciators

1. Local audible annunciators shall be self-contained units of rugged, vandal-resistant construction.
2. Each annunciator shall incorporate the following features, as a minimum:
 - a. Audible alarm.
 - b. Visual indicator with a solid-state flasher.
 - c. Solid-state power supply.
 - d. Contacts for remote reset.
 - e. Operates on low voltage dc.
3. The audible alarm shall provide a sound output of at least 60 dbA at 1 foot.

2.6 SURVEILLANCE AND ASSESSMENT SUBSYSTEM (SAS)

- A. System Description: Video
1. Provide a complete and operational IP-based Digital Video Management System (IPDVMS) as specified here and shown on the drawings.
 2. IPDVMS shall provide the following functions:
 - a. IPDVMS shall store video from video cameras. Provide access to video in real-time ("live"), and stored on computer-based storage devices for review at a later time.
 - b. Recorders and servers will consist of rack-mountable PCs connected to a LAN.
 - c. Video and other data managed by the IPDVMS accessible from workstation PCs connected directly to the LAN, WAN or modem connections.
 - d. Includes GUI software designed to run on PCs equipped with the Microsoft Windows latest operating system.
 - e. GUI application software functions include system setup, administration and monitoring; live video viewing and PTZ camera control; video playback; video export; alarm monitoring; and other capabilities as detailed in the following paragraphs.
 - f. Provide access and control cameras via wireless handheld devices.
 3. Compatibility with Digital Video Equipment: The IPDVMS shall be designed to work with a wide variety of IP Cameras. The recorders shall utilize a standard Ethernet connection for video input via TCP/IP.
 4. Scalability and Expandability:
 - a. Cameras: The IPDVMS family of products to include cost-effective solutions for any number of cameras including large sites with 1000 or more cameras in a single system.
 - b. Storage: The IPDVMS to support a wide range of automated storage options ranging from as little as a few hours of online storage capacity to months of long-term storage using digital tape or other cost-effective long-term storage media.
 - c. Workstations: The IPDVMS shall be a distributed, multiuser, multitasking system capable of supporting simultaneous requests from multiple workstations.
 - d. Sites: The IPDVMS shall be capable of supporting large organizations with systems at multiple sites connected via LAN, WAN or dial-up modem connections.

2.7 CONTROLLED ACCESS SUBSYSTEM (CAS)

- A. Card Reader Electronics Interface Box (EIB)
1. Each card reader EIB shall consist of a tamper-resistant enclosure equipped with a tamper switch and a UL-approved cylinder lock (per UL 437, "Key Locks"). The card reader EIB shall normally be mounted on the secure side of each card reader-controlled access point. Mounting screws for surface mounting shall be provided inside the enclosure or, if exposed, shall be tamper-resistant requiring a special tool for removal. All EIB boxes shall be keyed alike.
 2. Card reader EIBs shall incorporate the required local power supply and battery backup unit equipment for operating the card reader(s), and the associated electrical locking device(s) at card reader controlled access points. A trouble signal shall be provided to indicate failure of any portion of this power supply equipment.

3. Each card reader EIB shall be capable of supplying power to a minimum of 2 card reader controlled access points. Power cabling from the card reader EIB to the card reader shall be a maximum of 50 feet.
- B. Exit Pushbutton
1. Each exit pushbutton shall consist of a momentary switch within an enclosure. Mounting screws for surface mounting shall be provided inside the enclosure or, if exposed, shall be tamper-resistant requiring a special tool for removal.
 2. Each switch shall provide 1 set of normally open and normally closed contacts. The switches shall be rated for a minimum of 1,000,000 activations without malfunction.
 3. The exit pushbuttons shall be provided with a 1-1/2 inch mushroom button.
- C. Panic Hardware (Push Bars) - Refer to access point schedule for scope of work in the terminal contract.
1. Push bars shall be external surface-mounted rim devices, UL-listed for accident hazard installations.
 2. Each push bar shall incorporate the following features, as a minimum:
 - a. Nonhanded.
 - b. Field sizeable.
 - c. Both time delay exit and lock/unlock operation
 3. Each push bar shall be provided with a surface-mounted rim strike with a signal switch. The signal switch shall be a normally open momentary switch rated for a minimum of 1,000,000 activations without malfunction.
 4. The device finish shall match existing door hardware.
- D. Signage - Refer to access point schedule for scope of work in the terminal contract.
1. Signage shall be provided as indicated on the drawings at selected access points to provide information for the users.
 2. Signs shall be black acrylic plastic with graphics silk-screen applied to the back side of the sign. Lettering shall be white Helvetica medium. Signs shall be square, with rounded corners and white border line. Provide samples of the signs for approval.
 3. The signs shall be applied with adhesive tape to the door or to metal plates which are mechanically attached on the wall adjacent to the door at a height of 5 feet, 7 inches as follows:
 - a. Wood screws for anchoring to wood.
 - b. Toggle bolts for anchoring to hollow masonry or gypsum board.
 - c. Expansion shields and lag bolts for anchoring to concrete or solid masonry.
- E. Gate Control Panels
1. Each gate control panel shall consist of a tamper-resistant weatherproof NEMA 4X (stainless steel) enclosure equipped with a tamper switch and a UL-approved cylinder lock (per UL 4379 "Key Locks") or padlock. The gate control panel shall normally be mounted on the secure side of the card reader-controlled vehicle gate. Mounting screws for surface mounting shall be provided inside the enclosure or, if exposed, shall be tamper-resistant requiring a special tool for removal.
 2. The gate control panel shall incorporate the required local power supply and battery backup equipment for operating the card reader(s), PINpad(s), and

- gate operator at card reader-controlled vehicle gates. A trouble signal shall be provided to indicate failure of any portion of this power supply equipment.
- 3. The gate control panel shall be provided with a heating element to assure continued gate operation during severe cold temperatures.
- 4. A concrete foundation shall be provided for the gate control panel.

2.8 INTRUSION DETECTION SUBSYSTEM (IDS)

A. Balanced Magnetic Switches

- 1. Balanced magnetic switches will be designed for intrusion detection in security applications.
- 2. Each balanced magnetic switch will consist of two (2) cast nonferrous metal enclosures. Mounting screws for surface mounting will be provided inside the enclosure or, if exposed, will be tamper resistant requiring a special tool for removal. Each magnet will be 778ALNICO V or better.
 - a. The switch enclosure will be mounted on the door frame or other non-movable surface. Each switch enclosure will contain a reed switch, an adjustable bias magnet, a tamper switch, and one (1) set of normally open and normally closed contacts. (Note: In lieu of a tamper switch, the enclosure may be encased in epoxy.) Arc protection will be provided to prevent the reed switch from being fused together by transient current conditions. Each switch will be rated for a minimum of 1,000,000 activations without malfunction. The switch enclosure will be provided with a 1/2-inch threaded conduit connector at one end.
 - b. The magnet enclosure will be mounted on the door or other movable surface, so that when the door is closed, the magnet will be within 1 inch of the reed switch.
- 3. Balanced magnetic switches will comply with the applicable requirements of UL 634, Connectors and Switches for Use with Burglar-Alarm Systems and UL 639, Intrusion Detection Units.

B. Gate Position Switches

- 1. Gate position switches shall be designed for wide gap (up to 3 inches) applications.
- 2. Each gate position switch shall consist of 2 cast nonferrous metal enclosures. Mounting screws for surface mounting will be provided inside the enclosure or, if exposed, shall be tamper resistant requiring a special tool for removal. Each magnet shall be ALNICO V or better.
 - a. The switch enclosure shall be mounted on the fence post or other non-movable surface. Each switch enclosure shall contain a reed switch, an adjustable bias magnet, a tamper switch, and 1 set of normally open and normally closed contacts. (Note: In lieu of a tamper switch, the enclosure may be encased in epoxy.) Arc protection shall be provided to prevent the reed switch from being fused together by transient current conditions. Each switch shall be rated for a minimum of 1,000,000 activations without malfunction. The switch enclosure shall be provided with a 1/2-inch threaded conduit connector at one end.
 - b. The magnet enclosure shall be mounted on the gate post or other movable surface, so that when the door is closed, the magnet shall be within 1 inch of the reed switch.

3. Gate position switches shall comply with the applicable requirements of UL 634, Connectors and Switches for Use with Burglar-Alarm Systems and UL 639, Intrusion Detection Units.
- C. Tamper Switches
1. Each tamper switch shall consist of a single-pole, double-throw momentary switch rated for 5 amps at 120 volts. Each switch shall be rated for a minimum of 1,000,000 activations without malfunction.
 2. Tamper switches shall comply with the applicable requirements of UL 634, Connectors and Switches for Use with Burglar-Alarm Systems and UL 639, Intrusion Detection Units.
- D. End-of-line Termination Networks
1. End-of-line termination networks required to provide the proper impedance for supervision specified in Paragraph 1.09G.5 shall be provided on printed circuit cards. A terminal block shall be provided on each card for connection to the individual devices.
- E. Duress Alarm Devices
1. Each duress alarm device shall consist of a momentary switch and a tamper-resistant enclosure.
 2. The momentary switch shall be rated for 1,000,000 activations. The switch shall be provided with a latched output.
 3. Mounting screws for surface mounting shall be provided inside the enclosure or, if exposed, shall be tamper-resistant requiring a special tool for removal.
 4. The duress alarm devices shall be hand-actuated.

2.9 UNINTERRUPTIBLE POWER SUBSYSTEM (UPS)

- A. Battery Backup Units for IFP, EIB and Gate Control Panels.
1. Each battery backup unit shall incorporate an inverter, battery charger, batteries and a sensing and transfer relay housed in a cabinet.
 2. The battery backup unit inverters shall be the filtered rectangular waveform type with an efficiency of not less than 80 percent at 0.9 power factor, full load and rated output.
 3. The battery chargers shall be solid-state and designed for taper charge operation.
 4. Batteries shall be completely sealed and ready for service. The batteries shall be capable of accommodating a minimum of 500 full discharges / recharges.
 5. The sensing and transfer relays shall monitor the ac input and initiate a transfer to the battery supply upon failure or low voltage. Transfer shall be automatic and shall be completed within 20 milliseconds. The sensing and transfer relays shall continue to monitor battery voltage and shall disconnect the load if the voltage drops below 85 percent of its rated output.
 6. Front panel indication of critical status information shall be provided with contacts for remote monitoring via the DPS. A local audible signal shall be provided for off-normal conditions.

2.10 ID BADGE / KEYCARDS

- A. ID badge / keycards shall have provisions to incorporate a badge insert on the front side and the following information on the back side (preprinted):

1. Guaranteed postage and mailing address for lost devices.
 2. Arrow or similar marking to indicate the proper orientation for presentation at a card reader.
 3. Notice: "THIS BADGE MUST BE WORN ON OUTER GARMENT WHEN IN AOA AND MUST BE RETURNED TO AIRPORT OPS WHEN EMPLOYMENT IS TERMINATED."
- B. ID badge / keycards shall be provided with removable pocket clips.
- C. ID badge / keycards shall be capable of incorporating a printed photograph of the user-without interfering with its operation.
- D. ID badge / keycards shall be resistant to wear and environmental deterioration to include breakage, cracking, delaminating or coding changes or losses from any of the following conditions.
1. Minor impact.
 2. Temperature changes.
 3. Radial-type bend up to 90 degrees in either direction (end to end along the longest dimension of the card) for at least 50 bends.
- E. Access Cards (Credentials): Provide a quantity of 2000 *iCLASS* Contactless Smart Card Credentials (or equivalent) in the following form factor:
1. Access Card:
 - a. Access cards shall be used with access readers to gain entry to access controlled portals (e.g.; doors, gates, turnstiles) and to hold information specific to the user.
 - b. The card shall be available in single technology or multiple technology configurations. Double technology cards shall meet the following criteria:
 - 1) The card shall meet the following standards for contactless smart cards: ISO 15693 and ISO 14443B2.
 - 2) The card shall meet ISO 7810 specifications for length, width thickness, flatness, card construction and durability, and shall be in a form suitable for direct two sided dye-sublimation or thermal transfer printing on the specified badge printer.
 - 3) Presentation to the access control reader at any angle within a minimum of one (1) inch shall result in an accurate reading of the card.
 - 4) Unique 64-bit, fixed card serial number, used for anti-collision and key diversification.
 - 5) The card shall support read / write capability, with a minimum of 16 Kbits [2048 bytes] of EEPROM memory. The 2 Kbit card shall have a minimum of 2 Application Areas, and the 16Kbit shall have either (specify) 2 or 16 Application Areas to support future applications. Data retention shall be ten (10) years, nominal. Wiegand card data up to 84 bits in length shall be factory programmed in Application Area 1 for use with access control systems.
 - 6) Each Application Area on the card shall be secured with a 64-bit unique, diversified security key, such that data stored in that area cannot be accessed or modified until the card and reader have completed a mutual authentication process.

- 7) The card shall be capable of completing any write operation, even if the card is removed from the RF field during that operation.
- 8) The card shall be warranted against defects in materials and workmanship for two (2) years, or if multiple technologies are used: with a magnetic stripe the card shall have a fifteen (15) month warranty.
- 9) The card shall not carry any identification showing the location of the property unless otherwise specified herein.
- 10) The card shall be capable of accepting a slot punch on one end, allowing it to be hung from a strap / clip in a vertical orientation.
- 11) The card shall be PET/PVC composite.
- 12) The card shall support 13.56 MHz *iCLASS* contactless smart chip and antenna plus any or all of the following technologies, simultaneously:
 - a) 125 kHz HID Proximity chip and antenna.

F. Corporate 1000 Program

1. Cards shall be uniquely identified for the location using HID Corporate 1000 Program.

2.11 MISCELLANEOUS PROVISIONS

A. Physical Barriers

1. Wherever mechanical locks and keys (mortise locks, key-in-knob, etc.) and padlocks are required to provide access controls, the proposed locks may become part of the DLH Master-Keyed-System.
 - a. This system will employ high security locks, with keyblanks, key codes and keyways restricted by the manufacturer. Locks will be of the seven-pin tumbler type, combined for six pins. Locks will be furnished with interchangeable cores and pinned to the specifications furnished by the DLH Administration. Each lock will be supplied with at least one spare (uncombined) interchangeable core. Keyblanks will be released by the manufacturer only upon written authorization of a predesignated DLH official. Keyblanks will be stamped "DO NOT DUPLICATE". No other markings will be acceptable.
 - b. Each padlock will be furnished with one padlock chain, preattached to the lock shackle. The padlock chain will be no less than 2 feet in length, and no more than 4 feet in length. The unattached chain end will be equipped with a device to allow rapid attachment of padlock chain to chainlink fencing or other mounting surface as required. The padlock chain will be vinyl coated preformed aircraft cable.
2. Bollards shall be provided around field-installed equipment at Type 11 and Type 12 access points to preclude accidental damage from vehicles. These bollards shall consist of concrete-filled pipes appropriately anchored.

2.12 MAINTENANCE AIDS AND SPARE PARTS

A. Nonstandard Test Equipment, Tools, Adaptors and Fittings

1. One set of all special or nonstandard test equipment, tools, adaptors and fittings required to install, maintain and service the CCAS shall be provided to include card extenders for each different type of printed circuit card in the

system, tools for removing tamper resistant screws and a portable IFP analyzer.

2. The portable analyzer unit shall be able to test the IFPs in either an on-line or off-line mode. This unit shall be capable of exercising all devices connected to the IFP and all functions of the IFP itself.
3. All test equipment and tools provided shall be new, unused, of first-class quality and of suitable material.
4. All test equipment and special tools furnished shall be provided with complete operating instructions.

B. Spare Parts

1. Provide spare parts in the amount of 10% of all hardware furnished on the project. The spare parts shall include, but not be limited to, mag locks, card readers, power supplies, balance magnetic contacts, REX switches, tamper switches and other similar components.
2. Provide at least one quantity when 10% results in a quantity of less than one.
3. Provide two IFP panels completely equipped to support six card readers.
4. Provide two IFP hardware components located in the gate control terminal cabinets.
5. Provide two network switches located in GCTC cabinet.

2.13 SOFTWARE REQUIREMENTS

A. General

1. The CCAS software shall perform all processor-related functions at DLH necessary to satisfy the security requirements defined in FAR 1542. This software shall support all functions required for system operations, system software debugging and I/O handling.
2. Source code for application programs shall be in a high level language.
3. The CCAS shall be supplied with 2 complete sets of software and firmware (running and backup), compiled after the completion of the Field Verification Test, to include, as a minimum:
 - a. Executive programs and operating system.
 - b. Utility programs.
 - c. Software debugging and on-line / off-line diagnostic and test routines.
 - d. On-line / off-line hardware diagnostics.
 - e. I/O drivers.
 - f. Application programs.
 - g. Software spooling to I/O devices.
 - h. Macro-assembler.
 - i. On-line high level language compiler.
 - j. Run-time library for the high level language supplied.
 - k. Relocatable loader.
 - l. Full-screen text editor.
 - m. Database manager with report generator.
4. The Contractor shall be responsible for all required software licenses.
5. The Contractor shall not make any modifications to the standard software package provided by the central processor supplier that would in any way preclude the purchase of a standard maintenance and service contract directly from the supplier.
6. Provisions for system regeneration, reprogramming and background processing using either central processor and other supplied equipment shall be provided. These activities shall not interfere with the real-time functions

of the CCAS or the automatic switchover provision. The program development provisions supplied shall allow operators to utilize a high level language that has efficient access to all information included in the system databases. High level reprogramming capability shall include provisions to modify existing display / printout / log formats and to generate new displays / printouts / logs.

7. All utilities and command files required to compile, link and execute the application programs shall be provided. Application program source code shall be loaded, compiled and linked at the job site at the start of the Field Verification Test.
8. All firmware changes to E-PROMS resulting from the Field Verification Test shall be incorporated into all like devices and fully documented.

B. CCAS Software Capabilities

1. The CCAS Software shall support an unlimited number of card readers, input points, video cameras, intrusion detection points, and relay outputs. The CCAS database server shall support an unlimited number of cardholders, visitors, and assets limited only by the available memory on the IFP. The database server shall also support an unlimited number of system events and System Operator transactions in the history file limited only by available hard disk space. Client Workstations shall be limited only by the limitations of the operating system server software.

C. CCAS Software Functionality

1. Time Zones.
 - a. The CCAS shall be capable of creating and storing up to two hundred fifty four (254) time zones. Each time zone shall have a minimum of six (6) intervals. Each interval shall be assignable to any day of the week.
 - b. Each time zone shall be assignable to an alphanumeric name of up to 40 characters. Time zones shall be applied to access levels, card reader modes, alarm inputs, alarm outputs, and alarm masking and logging functions. Time zones shall be allowed to belong to any or all access levels so that the time zone only has to be defined once.
2. Access Levels.
 - a. The CCAS shall be capable of defining a minimum of 32,000 access levels with a minimum of 32 access levels per cardholder per database segment (see Section 2.04.8 Database Segmentation). Access Levels shall consist of a combination of card readers and time zones.
 - b. Each Access Level shall be assignable to an alphanumeric name using up to 40 characters.
 - c. Card readers shall have the ability to be assigned to any or all access levels defined in the CCAS. Individual card readers shall be capable of having a distinct time zone assigned to it.
 - d. The CCAS shall allow an "Allow User Commands" option to be assigned on a per access level basis where keypad readers are in use.
3. Temporary Access Levels.
 - a. The CCAS shall be capable of assigning Temporary Access Levels inclusive of the 32,000 assignable Access Levels.
 - b. Each Temporary Access Level shall be assignable to an alphanumeric name using up to 40 characters.

- c. Each Temporary Access Level shall be definable with a start and end date.
 - d. Temporary Access Levels shall be stored in the IFP and functionality shall be maintained in the event of disconnection with the IFP.
- 4. Access Groups.
 - a. The CCAS shall be capable of assigning Access Groups with a maximum of 32 Access Levels per Access Group.
 - b. Each Access Group shall be assignable to an alphanumeric name using up to 40 characters.
- 5. Precision Access Levels.
 - a. The CCAS shall be capable of assigning Precision Access Levels in addition to the 32,000 Access Levels with the ability to assign unlimited card reader and time zone combinations.
 - b. Each Precision Access Level shall be assignable to an alphanumeric name using up to 64 characters.
- 6. Holidays.
 - a. The CCAS shall provide a minimum of 255 Holiday assignments using an embedded calendar. Holidays shall be assigned an alphanumeric name using up to 40 characters and shall be grouped into eight (8) types of holidays, and shall be assignable to individual time zones. Access rights, card reader modes, and alarm masking schedules must be able to be altered when the current date is designated a Holiday.
 - b. Dates for Daylight Savings Time changes shall be definable and shall take effect automatically.
 - c. The CCAS shall support Holiday Ranges that allow a single holiday to span across multiple calendar days.
- 7. Database Segmentation.
 - a. The CCAS shall be required to support data segmentation whereby each segment shall have its own set of cardholders, field hardware and system parameters (time zones, access levels etc.). This segmentation shall expand the limitations of the CCAS parameters (i.e. access levels and time zones) to the maximum capacity of each parameter multiplied by the number of segments. The following list shall be made available for segmentation:
 - 1) Access Group.
 - 2) Access Levels.
 - 3) Actions.
 - 4) Action Groups.
 - 5) Alarm Inputs.
 - 6) Alarm Mask Groups.
 - 7) Alarm Outputs.
 - 8) Areas.
 - 9) Badge Types.
 - 10) Card Formats.
 - 11) Cardholders.
 - 12) Card Readers.
 - 13) Central Station Receivers.
 - 14) Device Groups.
 - 15) Digital Video Archive Servers.
 - 16) Fire Alarm Panels.
 - 17) Guard Tours.
 - 18) Global I/O Function Lists.

- 19) Global I/O Links.
 - 20) Holidays.
 - 21) Intercom Panels.
 - 22) Intercom Stations.
 - 23) Intrusion Detection Panels.
 - 24) IFPs.
 - 25) Maps.
 - 26) Monitor Zones.
 - 27) Precision Access Groups.
 - 28) Receiver Accounts.
 - 29) System Operators.
 - 30) Time Zones.
 - 31) Tour Groups.
 - 32) Visitors.
 - 33) User Permission Groups.
9. Field Hardware Communications.
 - a. The CCAS shall communicate with the IFPs by the following protocols:
 - 1) RS-232.
 - 2) RS-485.
 - 3) TCP/IP.
 - 4) Dial-up via Modem.
 - b. Communication baud rate shall be system selectable with a range between 9,600 to 38,400 bits per second.
 - c. Download communication between the CCAS and the IFP shall be fully multi-tasking and shall not interfere with operational functions.
 - d. Upon loss of communications between the CCAS Server and the IFP an alarm shall be created with a time stamp. Upon re-established communication the CCAS and the IFP shall automatically re-synchronize from the point of communication loss without operator intervention.
 10. Dual Path Field Hardware Communication.
 - a. The CCAS shall support Dual Path communications between the CCAS Server and the IFPs. This shall allow for a redundant communication path in the event the primary path fails. The secondary path shall support all primary path protocols.
 - b. In the event of a communication failure of the primary path the IFP shall initiate a switch over to the secondary path. During this fail over period the IFP shall periodically check to see if the primary path has been re-established and will automatically switch back upon a successful connection. Alarms shall be generated upon loss or restoration of communications.
 11. Area Control.
 - a. The CCAS shall provide five (5) area control features: Global Hard Anti-passback, Global Soft Anti-passback, Timed Anti-passback, Two Person Control, and Occupancy Limit. Area control shall be a security method of preventing a person from passing their badge to another person for dual entry into a single location utilizing one card.
 - 1) Global Hard Anti-passback.
 - a) The Global Hard Anti-passback feature shall require that a badge always be used to enter and exit an area. The controlled areas shall have both entry and exit card readers at all portals. Entry and Exit Readers

shall be able to span across multiple Ifps. Areas shall be logically defined under the CCAS, and area control shall not be required at all areas of CUSTOMER facility to be utilized. Global Hard Anti-passback shall work in the following manner. A cardholder must present his / her badge at the entry card reader of the area that the person wishes to enter. Once access has been granted into the area, the cardholder cannot present the badge to another entry card reader within the same area without first presenting his / her badge to the respective exit card reader of that area. Should a cardholder attempt to use any other card reader in the same area besides the occupied area=s exit card reader once access has been granted to that area, the cardholder shall be denied access and an alarm shall be reported to the Alarm Monitoring client workstation. Nested control areas (areas inside areas) shall be definable with a minimum of 64 entry and exit card readers. It shall be possible to have an area within an area and / or multiple areas that are independent of each other in which Global Hard Anti-passback rules shall apply.

- 2) Global Soft Anti-passback.
 - a) The Global Soft Anti-passback feature shall require that a badge be used to enter and exit an area. The controlled areas shall have both entry and exit card readers at all portals. Entry and Exit Readers shall be able to span across multiple IFPs. Areas shall be logically defined under the CCAS, and area control shall not be required at all areas of CUSTOMER facility to be utilized. Global Soft Anti-passback shall work in the following manner. A cardholder must present his / her badge at the entry card reader of the area that the person wishes to enter. Once access has been granted into the area, the cardholder cannot present the badge to another entry card reader within the same area without first presenting his / her badge to the respective exit card reader of that area. Should a cardholder attempt to use any other card reader in the same area besides the occupied area=s exit card reader once access has been granted to that area, the cardholder shall be allowed access (if that cardholder has the appropriate access level to access the new area), and an alarm shall be reported to the Alarm Monitoring client workstation. It shall be possible to have an area within an area and / or multiple areas that are independent of each other.
- 3) The following summary criteria shall apply under Global Hard or Soft Anti-passback:
 - a) Initially (Time 0) all card holders are reset to Area 0.
 - b) Any cardholder shall enter a controlled area anytime after Time 0 by presenting a badge to a CCAS entry card reader.

- c) A cardholder shall not exit the controlled area unless he has entered the area presenting a badge to the CCAS entry card reader.
- d) A cardholder shall not enter the controlled area a second time unless the cardholder has exited that area previously.
- e) A cardholder shall be able to enter through any entry card reader and exit through any exit card reader of a single controlled area.
- f) These options shall include a "forgiveness" feature that will allow the System Administrator to reset the anti-passback of all cardholders to Time 0 Area 0, either through a manual override or a time zone command.
- g) The CCAS shall provide an anti-passback exempt option for privileged or VIP cardholders. Cardholders with this option will not have anti-passback rules applied to them.
- h) The CCAS shall also have a "forgiveness" feature that will allow the System Administrator to assign a "one free pass" to an individual cardholder. This shall allow the System Administrator to reset the anti-passback of an individual cardholder to Time 0 Area 0.
- 4) Timed Anti-passback.
 - a) Timed Anti-Passback shall allow the System Administrator to decide how long after a cardholder has swiped their badge that they will have to wait before the same badge will be accepted again at the same card reader. This helps prevent multiple swipes by an individual to allow access to others through turnstile doors.
- 5) Two Person Control.
 - a) Two Person Rule shall be provided to restrict access to certain areas unless there are two (2) cardholders present. This restricts individuals from being alone in restricted or highly secure areas. When an area is configured for Two Person Rule, the following criteria shall prevail:
 - b) The card reader shall grant access only if two valid cardholders (with authorized access levels) swipe their badges one (1) after the other. In the event that a second authorized card is not presented within ten (10) seconds of the first authorized badge, the card reader shall reset and the first card will have to be swiped again.
 - c) Once two (2) people occupy an area, individual access shall be granted.
 - d) Individual exit shall be permitted until an area is occupied by only two (2) cardholders at which point the Two Person Rule applies for exit.
- 12. Mustering.
 - a. The CCAS shall support advanced Mustering functionality. The Mustering function shall provide an automatic capability for

- registering cardholders that are on site during an incident. Designated exit and entry card readers shall be used to enter and leave hazardous locations and safe locations. When an incident occurs, a Muster Report shall be generated that consists of a listing of all personnel that are within the hazardous locations as well as all personnel that have registered in a safe location.
13. Global Input / Output / Event Linkage.
 - a. The CCAS shall support a global linkage feature whereby any input / output / event shall be linked to any other input / output / event in the CCAS. Input / Output Linkages shall be able to span across Intelligent System Controllers.
 - b. System Administrators shall be able to create global I/O function lists, each consisting of a sequence of actions to be performed, such as changing card reader modes, activating outputs, and opening or closing anti-passback areas. Each function list may include up to six actions.
 14. Cardholder Escort Control.
 - a. The CCAS shall support comprehensive Escort functionality based upon Access Levels. Access Levels shall include options for "Escort Required," "An Escort" and "Not an Escort" and "does not require an Escort"
 - b. The Escort feature shall be capable of one-to-one and one-to-many Escort to Escorted functionality.
 15. Cardholder Use Limits.
 - a. The CCAS shall support a Cardholder Use Limit feature that shall allow System Administrators to specify the maximum number of times that a cardholder may use their credential at card readers in the CCAS.
 16. Extended Individual Strike Times.
 - a. The CCAS shall support Extended Individual Strike Times that allows a card reader's strike to be active for an extended period of time beyond the pre-determined standard strike time on a per cardholder basis. The extended strike time shall be user definable up to 255 seconds. Extended strike times shall be set on a card reader by card reader basis.
 17. Extended Individual Door Held Open Times.
 - a. The CCAS shall support Extended Individual Door Held Open Times that allows a card reader's door to be held open for an extended period of time beyond the predetermined standard held open time on a per cardholder basis. The extended held open time shall be user definable up to 131,070 seconds. Extended held open times shall be set on a card reader by card reader basis.
 18. Extended, on Demand, Door Held Open Times.
 - a. The CCAS shall support extended, on demand, door held times via a command keypad. The Extended Held Open command configuration shall consist of a command key sequence that shall be from 3 to 6 keys used to enter the number of minutes to extend the door held open time (up to 999 minutes) and a pre alarm time (from 0 to 30 minutes).
 - b. Only those cardholders having Command Authority at a given card reader configured for >Allow User Commands= shall have the ability to execute the Extended Held Open command at that card reader. The Extended Held Open command shall be available after a valid

cardholder has received an Access Grant at the card reader. The cardholder shall have a period of fifteen seconds after the Access Grant to enter the extended held open command sequence.

19. Elevator Control.
 - a. The CCAS shall provide elevator control using standard access control field hardware that will permit the restriction of cardholder access to certain floors while also allowing general access to other floors. The elevator control feature shall allow, at the elevator, the use of any card reader and all card reader modes used on any other card reader in the SMS. Each elevator card reader shall control access for a minimum of 64 floors.
 - b. The CCAS shall be able to track which floor was selected by an individual cardholder for auditing and reporting purposes.
20. Graphical System Overview Tree.
 - a. A graphical system overview tree shall display a graphical representation of all field hardware (including IFPs, fire panels, intrusion detection devices, personal safety devices, intercom systems, central station alarm receivers), digital video hardware, access levels, time zones, access groups, holidays, and card formats that have been configured in the CCAS. System Administrators shall be able to modify a device that is depicted on the graphical system overview tree or see its properties by double clicking on the icon and the CCAS shall bring them to the appropriate form.
21. Pre-Alarm.
 - a. The CCAS shall support a pre-alarm feature at the card reader. The pre-alarm will sound a tone at the card reader prior to the door held open alarm. The pre-alarm setting shall be configurable for up to a maximum of 5,940 seconds (99 minutes).
22. Alarm / Event Logging.
 - a. All alarms and events in the CCAS shall by default, always be recorded in the database. The CCAS shall give System Administrators the ability to select on a time zone basis, the times that they require the CCAS to log specific events to the database.
 - b. System Administrators shall have the option for Alarm / Events to be set to log or not to log particular alarms / events on any individual reader and or input.
23. Scheduling Utility.
 - a. The CCAS shall provide an integral Scheduling Utility. The Scheduling Utility shall allow System Administrators to schedule actions to occur on a one-time or a recurring basis. Recurring schedules shall be configured to begin immediately, last indefinitely, or have optional start and end dates.
 - b. The Scheduling Utility shall be available from both the System Administration and Alarm Monitoring modules.
 - c. The types of actions that shall be schedulable include but are not limited to:
 - 1) Action Group.
 - 2) Event Archiving / Purging.
 - 3) Arm / Disarm Area.
 - 4) Start of Guard Tour.
 - 5) Execution of Data Exchange Scripts.
 - 6) Activate, Deactivate, Pulse Device Output and Device Output Groups.

- 7) Global Anti-Passback Reset.
 - 8) Download Database to IFPs.
 - 9) Execute Function List.
 - 10) Mask / Unmask Inputs, Input Groups, Alarm Mask Groups, Door Forced Open or Held Open.
 - 11) Open Door, Open Door Group.
 - 12) Change Reader Mode.
 - 13) Automatic Reports.
 - 14) Reset Use Limit.
 - 15) Move Bulk Badges from an Area.
 - 16) Deactivate Badges.
 - 17) Logout Visitors.
 - 18) Schedule PTZ Presets.
- d. The Scheduling Utility shall maintain a history log in the database for actions that it executes.
24. Multiple Card Formats.
- a. The CCAS shall support an unlimited number of card formats. Magnetic stripe and Wiegand card formats shall be supported. Each IFP shall support a minimum of eight (8) access control card formats and if applicable, eight (8) asset formats. As such, each card reader shall also be able to support a minimum of eight (8) access control card formats. If applicable, asset readers shall be able to support a minimum of eight (8) access control card formats and eight (8) asset management card formats. The CCAS shall support any magnetic stripe format that uses card number, facility code, and issue code combinations with a maximum of a nine digit card number and two digit issue code. The CCAS shall support any industry standard Wiegand card format.
25. Denied Access Attempts Counter.
- a. The CCAS shall support a denied access attempts count on a per card reader basis. The "Denied Attempts Count" value shall be configurable from 0 to 255. The following access denial types shall cause the current denied count to be incremented:
 - 1) Unknown PIN entry at a card reader configured as "PIN or Card" mode.
 - 2) Invalid cipher entry at a card reader in Cipher Mode.
 - 3) Invalid PIN entered for a given card at a card reader configured as "Card and PIN" mode.
 - 4) Non-matching biometric presented for a given card at a card reader in biometric verify mode.
26. Card Reader Time Zone Overrides.
- a. The CCAS shall allow for the pre-defined default card reader settings to be overridden or temporarily changed on a time zone basis. At the beginning of the a selected time zone, the selected card reader=s operational mode shall be modified from it=s default mode to any one of the following modes: locked, unlocked, facility code, card only, card or PIN, card and PIN, card and Biometric, card or PIN and biometric, and / or card and PIN and biometric. The aforementioned options shall be available depending on the type of card reader utilized.
 - b. Each card reader shall have the ability to have multiple time zone setting overrides assigned to them as required by the System Administrator.

27. On-Line Context Sensitive Help.
 - a. The CCAS shall provide on-line context sensitive help files to guide System Administrators and System Operators in the configuration and operation of the CCAS. The help menu shall be available from any window in the CCAS by pressing the F1 function key or clicking on the Help icon in the toolbar. Help windows shall be context sensitive so System Administrators can move from form to form without leaving the help window. The CCAS shall also come with complete on-line documentation on CD.
28. Monitor Zones.
 - a. The CCAS shall provide System Administrators the ability to segment their access control CCAS field hardware devices into various zones or areas where Alarm Monitoring client workstations will monitor. These zones shall be assigned an alphanumeric name using up to 128 characters.
 - b. The CCAS shall allow subset relationship devices (such as card readers or ICMs to Intelligent System Controllers) to be automatically part of the monitoring zone when an IFP is selected AND it shall allow the System Administrator to define which subset devices (card readers, ICMs, etc.) belong to that monitor zone.
 - c. Updating of monitor zones shall take place in real time and without requiring operators to re-login.
29. Alarm / Event Routing.
 - a. The CCAS shall be capable of allowing System Administrators to route alarms and events to various Alarm Monitoring client workstations on the network. The CCAS shall allow any alarm or event to be routed to one or multiple client workstations on the network regardless of where the alarm is generated in the field. Alarms shall be routed to client workstations on a device by device level.
 - b. The CCAS shall be capable of automatic re-routing of an alarm from workstation X to workstation Y if the alarm is not responded to within a user definable time period.
 - c. The CCAS shall implement network synchronization that in the event alarm / event is routed to multiple client workstations, once the first client workstation >grabs= the alarm, the alarm / event shall be cleared from all other client workstations. As such, alarms that are routed to an Alarm Monitoring client workstation which does not have a System Operator logged in shall be queued so that all unacknowledged alarms will report to that client workstation once a System Operator has logged into the CCAS. Alarms / Events shall be routed based on default settings or time zone control.
30. Text Instructions.
 - a. The CCAS shall allow for a set of text instructions to be associated with each alarm that arrives into the CCAS. The text instruction function shall allow the System Administrator to enter a minimum of 32,000 characters of text for procedures to follow for each alarm that arrives at the Alarm Monitoring client workstations. Each alarm or event in the CCAS shall have it=s own unique set of text instructions should the System Administrator desire.
31. Customizable Voice Instructions.
 - a. The CCAS shall allow for a customizable voice instruction to be associated with CCAS alarms. The customizable voice instruction

- feature shall allow the System Administrator to record a voice instruction of unlimited length.
32. Customizable Voice Annunciation.
 - a. The CCAS shall allow for a customizable voice annunciation to be associated CCAS alarms. The customizable voice annunciation shall allow the System Administrator to record a voice annunciation of unlimited length.
 33. Alarm Attributes.
 - a. The System Administrator shall have the ability to configure how the CCAS handles the annunciation of alarms on an individual basis. Each alarm and / or event shall have the option(s) to:
 - 1) Display at one or more Alarm Monitoring client workstation.
 - 2) Allow higher priority alarms to be displayed on the Alarm Monitoring client workstation ahead of lower priority alarms.
 - 3) Require the field device, which generated the alarm to be restored to its normal state before the alarm is cleared.
 - 4) Print the alarm to the local event printer.
 - 5) Have a customized voice message annunciate at the client workstation.
 - 6) Have the alarm breakthrough to the Alarm Monitoring window should the System Operator be working in another application
 - 7) Allow System Operators to amend the journal entry once the alarm has been acknowledged.
 - 8) Insure that the alarm will not be able to be deleted from the Alarm Monitoring window upon acknowledgment.
 - 9) Display text and audio instructions outlining the procedures to follow when responding to the alarm.
 - 10) Automatically call-up associated maps.
 - 11) Automatically call up the associated cardholder record.
 - 12) Automatically call up the associated cardholder photo using the video verification function.
 - 13) Require a password to view the alarm.
 - 14) Require a password to acknowledge the alarm.
 - 15) Require acknowledgment to clear.
 - 16) Allow mandatory journal entry upon acknowledgment.
 - 17) Use pre-defined journal entries for alarms.
 - 18) Select the option for journal entry based upon the specific alarm.
 - 19) Bring up video on defined monitors.
 - 20) Automatically send an e-mail message.
 - 21) Automatically send an alphanumeric page.
 - 22) Have the alarm appear on the Alarm Monitoring window with a flashing colored coded bar across the alarm for high priority alarms.
 - 23) Have the alarm, when acknowledged, display an alternative flashing color coded bar across the alarm than for the original alarm color.
 - 25) Require User Logon for Acknowledgment.
 - 26) Have the ability to mark an alarm as Aln Progress@ where the system shall silence any repeating audio notifications on the Workstation where the alarm was routed and remove the alarm sprite notification on the graphical map. Additional

operators monitoring alarms shall be notified that the alarm has been marked AIn Progress.@

34. Alarm-Event Mappings.
 - a. The CCAS attributes in Alarm Attributes shall be assignable on a >global= basis to all devices that share an alarm description. Thus, the >door forced open= alarm attributes shall apply to any door with a card reader that is forced opened in the CCAS. The CCAS shall have the capability to assign a unique group of alarm attributes to specific device / alarm combinations to override the global settings for specific case settings.
35. System Downloads.
 - a. The CCAS shall provide for the downloading of data to the IFPs. Downloads shall load CCAS information (time zones, access levels, alarm configurations, etc.) into the IFPs first, followed by cardholder information and card reader configurations.
 - b. All IFPs on the CCAS shall be capable of either full or selective downloads to individual Intelligent System Controllers, and bi-directionally so that alarms will still report to their respective Alarm Monitoring client workstations as cardholder information is being downloaded.
 - c. A complete database download of 10,000 cardholder records to all IFPs (regardless of the number of IFPs) must be complete within ten (10) minutes.
 - d. Information on cardholder status, badge status, time zones or access levels shall download in real time as they are added, modified, or deleted from the CCAS.
36. Card Reader Options.
 - a. The CCAS shall include the following options for each reader on the system:
 - 1) Allow User Commands.
 - 2) Rename Auxiliary Inputs.
 - 3) Rename Auxiliary Outputs.
 - 4) Independently Supervise REX and DPS.
 - 5) Configure REX and DPS as Normally Open or Normally Closed.
 - 6) Deny if Duress.
 - 7) Alarm Masking.
 - 8) Activate Outputs.
 - 9) Two Card Control.
 - 10) Checkpoint.
 - 11) Do Not Activate Strike on REX.
 - 12) The ability to allow System Administrators to determine on a time zone basis to log or not to log on a card reader by card reader basis:
 - a) Access Grants.
 - b) Access Denied.
 - c) Card Reader Status Alarms.
 - d) The CCAS shall allow for user definable door strike functionality for each card reader in the CCAS.
 - e) The CCAS shall allow for each card reader to be selected as either an "in" reader, "out" reader, or "none" to allow for ease of reporting time and attendance basic "time in" and "time out" data.

- f) Enforce Use Limit - This option shall enable Card Use Limits at the card reader limiting the number of times that cardholders may use their credential to gain access at the card reader.
 - g) Supervise Door - Sets the CCAS so that the card reader door contact is wired as a supervised input.
 - h) The CCAS shall allow for one or more access points in a specified area to be armed and disarmed directly from the Command Control Keypad.
- 37. Input Control Module (ICM) Options.
 - a. The CCAS shall provide the following options for the Input Control Modules:
 - 1) Alarm Masking B The ability to mask the alarm input on a time zone basis.
 - 2) Local Linkage B The ability to locally link outputs with inputs that are attached to the same ICM/Output Control Module (OCM).
 - 3) Activate Output - The ability to activate an output tied to the ICM/OCM on a time zone basis.
 - 4) Activate Output Always- The ability to activate an output always.
 - 5) Configuration of Debounce Times B The ability to control the amount of time that an input state change must remain consistent in order for it to be considered a real change of state.
 - 6) Configuration of Hold Times - When configuring an Alarm Input, a hold time setting shall be settable from 0-15 seconds.
 - 7) Checkpoint B The ability to configure an input as a designated stop on one or more guard tours.
 - 8) Supervised Input B The ability to specify if a specific alarm contact on the ICM is a supervised or unsupervised contact.
 - 9) Entry / exit Delay B The ability to set up entry / exit delays for inputs that are attached to any ICM, SRI, or DRI. This shall include Non-Latched Entry: When an input activates, the alarm will not be reported until the Entry delay expires. If the input is still active when the entry delay expires, the alarm will be reported. If the input is not active when the entry delay expires, then the alarm will not report; Latched Entry: When an input activates, the alarm will not be reported until the Entry delay expires. If the input is still active when the entry delay expires AND the alarm has NOT BEEN MASKED, the alarm will be reported. If the input has been masked when the entry delay expires, then the alarm will not report; Exit Delay: When an input activates, the alarm will not be reported (operates as if masked) until the Exit delay expires. If the input is still active when the exit delay expires, the alarm will be reported. If the input is not active when the exit delay expires, the alarm will not be reported.
- 38. Alarm Monitoring.
 - a. Alarm Annunciation Configuration - The CCAS shall offer the same functionality as ICM of this document.
- 39. Current Status Indication.

- a. The Alarm Monitoring window shall provide a visual status that displays the current status of all devices in the device tree including child devices downstream from the primary device. Additionally there shall be a numeric display of card readers, IFPs and ICMs that are off line.
- 40. Device Group Support.
 - a. The CCAS shall support device grouping for uniform command and control of groups of devices within the system. Four types of homogeneous device groups shall be supported:
 - 1) Card Reader Groups.
 - 2) Input Groups.
 - 3) Relay Output Groups.
 - 4) Video Camera Groups.
- 41. Color Coding for Alarm Priorities.
 - a. The CCAS shall display alarms in the active Alarm Monitoring window with a flashing colored bar across the alarm based upon priority. Acknowledged alarms may be set with alternate color-coding. A minimum of 255 colors must be available for assignment to a minimum of 255 priority levels.
- 42. Highlighting of Unacknowledged Alarms.
 - a. The CCAS shall provide an Unacknowledged Alarm pop-up window that displays alarms that have been unacknowledged after a user defined period of time.
- 43. Pre-Defined Alarm Acknowledgment Responses
 - a. The CCAS shall have the capability for pre-defined alarm acknowledgment responses for alarms in the CCAS. An unlimited number of pre-defined responses shall be able to be configured for each alarm in the CCAS.
- 44. Lost Card Alarm.
 - a. The CCAS shall provide an optional setting to designate a Lost Card Alarm when a badge that is not active. The normal settings would be Terminated or Lost.
- 45. Request to Exit Event.
 - a. The CCAS shall provide an optional setting to annunciate an event when a REX device is used. Normally a REX event is not annunciated.
- 46. Real-Time, Live Video User Verification.
 - a. The CCAS shall have the capability of interfacing to a CCTV system and displaying a live video image next to a stored cardholder image record. This feature shall be system configurable.
- 47. Traces.
 - a. The CCAS shall allow for a live or historical trace on any IFP, ICM, Alarm Input, Credential (Cardholder), Intrusion Detection Device, Monitor Zone, or card reader. If applicable, the CCAS shall allow for a trace on any asset, intercom, or camera. Multiple traces may be run simultaneously. The CCAS shall allow System Operators to filter alarm types from the history trace window. Alarms that shall be filtered from the trace window are access granted alarms, access denied alarms, system alarms, duress alarms, and area control alarms.
- 48. "On the Fly" New Login of System Operators.
 - a. The CCAS shall allow a System Operator to login over another System Operator who is already logged into the same client

- workstation. This process shall log the first System Operator off of Alarm Monitoring and log the new System Operator on, changing any permissions necessary for that System Operator.
49. Auto Exit to Windows 2000 / 2003/ XP Login Window.
 - a. The CCAS shall be configurable to automatically exit the Alarm Monitoring application and log the System Operator out of the Windows 2000 / 2003 / XP Operating System when a System Operator logs off an Alarm Monitoring client workstation. The CCAS shall then bring the System Operator to the Windows / XP Login Window for the next System Operator to log on.
 50. Alarm Monitoring - Column Display & Configuration.
 51. Test Mode.
 - a. The CCAS shall support a Test Mode for Alarm Inputs, Door Forced Open, and Access Grants. Tests on Input Device Groups shall be available to verify that all inputs within the group are operational. Upon entering into Test Mode and for the duration of the test, alarms from members of the group shall either be displayed in a separate window/view on test Alarm Monitoring client workstations or on all Alarm Monitoring client workstations in which the alarms are usually routed. During the test (the duration of the test shall be set by the System Operator), all inputs within the group are manually activated in the field. At the end of the time duration, a report shall be generated flagging any inputs for alarms that were not received. During the Test Mode, all alarm operations carry on as programmed (i.e. Global I/O functions, CCTV commands, printer activity, etc.) so that all functions are tested.
 52. Manual Control.
 - a. The CCAS shall provide the System Operator the option to manually control over all output points or input points connected to the CCAS. Control points are defined as any door strike, auxiliary card reader output, or any other relay output point of an Output Control Module (OCM).
 53. Real-Time, Dynamic Graphical Maps.
 - a. The CCAS shall support graphical maps that display device / group status, function lists and video cameras dynamically in real-time. The maps may be configured to appear on command or when specified alarms are selected for acknowledgment. Map device icons shall have the ability to dynamically change shape and / or color to reflect the current state of the device. The CCAS shall indicate if the field hardware is not operating with the most current version of firmware.
 - b. The CCAS shall support all commands available and used map formats listed below:
 - c. The CCAS shall support user defined icons for field hardware devices. The CCAS shall also give System Operators the ability to affect the mode of card readers, open doors, start a trace on a device, mask / unmask alarm inputs, and activate / deactivate / pulse an output from the map icons.
 - d. The graphical maps shall have the ability to be printed to a local printer.
 54. Automatic Credential Deactivation by Lack of Use.
 - a. The CCAS shall have an automatic credential deactivation function where a cardholder's credential will automatically deactivate after an extended period of inactivity based upon a predetermined time

- period. The credential status may be reset by authorized System Operators.
55. Automatic Credential Deactivation based upon an Event.
 - a. The CCAS shall have a programmable ability to deactivate an active badge based upon a pre-determined event.
 56. Alarm Filtering.
 - a. The CCAS shall have the capability for filtering out alarm types from the Alarm Monitoring window. Alarms that may be filtered are access granted alarms, access denied alarms, system alarms, duress alarms, and area control alarms. If applicable, fire alarms, asset alarms, intercom alarms, central station receiver alarms, intrusion detection alarms, video event alarms, and transmitter alarms may also be filtered.
 57. Manual Override of Card Readers.
 - a. The CCAS shall support System Operator overrides of card readers from the Alarm Monitoring window, graphical maps or the real-time system status tree. The CCAS shall also support the ability to manually set a reader back to default mode.
 58. Alarm Masking.
 - a. The CCAS shall support the masking of alarms to be controlled on a time zone basis or by manual control.
 - b. The CCAS shall support the ability to configure inputs to be "Unable to Mask."
 59. On-Line Context Sensitive Help,
 - a. The CCAS shall provide on-line context sensitive help. The help menus shall be available from any window in the CCAS by pressing the F1 function key or clicking on the help icon in the toolbar.
 60. Sorting Capabilities,
 - a. The CCAS shall allow System Operators to arrange the way that alarms and / or events in the Alarm Monitoring window are listed by sorting the alarms and events. Sort criteria shall be based on priority, time / date, IFP, Card Reader, ICM, Input Device, or Cardholder. Additionally alarms and events can be sorted based on asset scan ID, asset name, intercom station, intrusion panel, transmitter, or transmitter input.
 61. Paging Interface,
 - a. The CCAS shall support a paging interface seamlessly integrated within the CCAS Alarm Monitoring module. System Operators shall have the ability to manually or automatically send numeric or alphanumeric paging messages on demand regarding any alarm currently displayed in the Main Alarm Monitoring window. Pages shall have to ability to be sent to multiple pagers if desired. The CCAS shall allow any pager to be accessed through a paging terminal that communicates through the TAP (Telocator Alphanumeric Paging) protocol.
 62. E-mail Interface,
 - a. The CCAS shall provide an e-mail interface seamlessly integrated within the CCAS Alarm Monitoring module. System Operators shall have the ability to manually or automatically send ASCII text e-mail messages from the Alarm Monitoring module on demand regarding any alarm currently displayed in the Main Alarm Monitoring window. E-mails shall have to ability to be sent to multiple e-mail accounts if desired. The CCAS shall integrate with Microsoft Exchange Server.

63. Credential Management,
 - a. The CCAS shall incorporate a Credential Management (PIDS) and Enrollment module that is integral to the CCAS source code with the ability to create and maintain the Cardholder database. Features shall include the ability to:
 - 1) Add, Modify and Delete records based upon permissions.
 - 2) Capture photo images, biometric information and signatures.
 - 3) Print Credentials.
 - 4) Boolean Search on any single or multiple fields.
 - 5) Determine single or multiple active badges.
 - 6) Assign Access Levels and Access Groups.
 - 7) Bulk Assignment / Modification / Deletion of Access Levels.
 - 8) Bulk Deletion of Cardholder Records.
 - 9) Native support for U.S. Government CHUID standard.
 - 10) Limit the number of times the credential can be printed.
 - 11) Limit the access for searching the database based upon user defined criteria.
64. Mobile Badging Operations.
 - a. The CCAS shall support seamlessly integrated Mobile Badging Operations that allow the CCAS cardholder database to be replicated onto an off the shelf laptop computer. The laptop computer shall then have the ability to go to remote sites to enroll cardholders into the CCAS and later synchronize the data.
65. Credentials.
 - a. The CCAS shall support the following credential types and allow for direct Thermal Dye Sublimation printing onto the credential surface.
 - 1) Composite Credentials - 3.375" x 2.125", UPVC Composite credentials with an ISO standard 30 mil thickness.
 - 2) Proximity credentials.
 - 3) Smart Cards B Contact-less.
 - b. The CCAS shall support HID ICLASS contact-less smart card technology. Security for ICLASS cards shall be handled via challenge and response authentication techniques, data ciphering, message authentication checking and unique unalterable serial numbers. The system shall support HID OEM- 100/150 encoders and allow for 2K and 16K ICLASS encoding.
66. Credential Management Enrollment Features.
 - a. The CCAS shall allow for automation of enrollment procedures with the following attributes based upon badge type:
 - 1) Default Deactivation Date.
 - 2) Default Access Levels.
 - 3) Badge Design Layout.
 - 4) Badge Printer Selection.
 - 5) Encoding Format (if required).
 - 6) Badge ID if set to automatic generation.
 - b. The CCAS Credential Management module shall incorporate a seamless interface to IDScan models CSS-800 and CSS- 1000 series scanners that scan, import text and / or photo data and automatically populates the associated CCAS database fields from drivers licenses, passports, government issued and DOD issued credentials.
67. Cardholder Image Capture.

- a. The CCAS must be compatible with flash lighting, USB sources and digital cameras and allow the capturing of the cardholder image at a minimum resolution of 640 x 480.
 - b. CCAS image capture, storage, and hardware compression techniques must be in compliance with the ANSI standard or JPEG (Joint Photographic Experts Group). Cardholder images must be stored as Binary Large Objects (BLOB) within the cardholder record.
 - c. The CCAS shall provide the ability to capture a cardholder's image through the use of any industry standard scanner or digital camera that utilizes a TWAIN interface. Images shall be able to be scanned in at up to 16.7 million colors for a true color scanned image. When using a digital camera that supports multiple resolutions, the system shall allow the operator to select the desired resolution.
68. Image Import.
- a. The CCAS shall allow for System Operators to have the ability to import a cardholder's image at the time of enrollment. The CCAS must support all standard and commonly used image formats:
69. Biometric Verification.
- a. The CCAS shall allow for the viewing, capturing and deletion of biometric templates.
 - b. All biometric templates shall be stored within the CCAS database, and depending on the Biometric device and the CCAS configuration, in the IFP or on a smartcard chip.
 - c. The CCAS shall support Biometric Verification for the following platforms:
 - 1) RSI Handkey with template on IFP.
 - 2) Identix V20 with template on IFP.
 - 3) Biocentric with template on IFP.
 - 4) Bioscrypt with template (one or two finger capture) on iClass, Mifare ISO 14443A and 1569 technologies or on IFP (model dependant).
 - 5) LG Iris Scan with template on iClass.
 - 6) Ultra-Scan with template on iClass.
 - 7) Cross Match ID-500 ten fingers for ID verification and use with access control authentication.
 - d. The CCAS shall be capable of a search of cardholder records to view biometric template images that are currently associated with that cardholder.
70. Digital Certificate Management.
- a. The CCAS shall support Digital Certificate Services to enable System Operators to securely obtain and manage digital certificates for smart card cardholders. The CCAS shall allow a System Operator to enroll and issue a smart card to each cardholder during enrollment process. This shall allow the issuing of a Smart Card Logon certificate (which provides authentication) or a Smart Card User certificate (which provides authentication plus the capability to secure e-mail) for the purpose of Smart Card Login to PCs.
 - b. The CCAS shall support any smart card reader(s) that have been tested by the Microsoft Windows Hardware Quality Lab and have obtained the Windows-compatible logo and that are to be installed on Windows 2000/2003/XP computers.
71. Smart Card Encoding Support.

- a. The CCAS shall include the ability to support Off-line and In-Line SmartCard Encoding for the following readers and technologies
 - 1) Bioscrypt V-Smart (iClass & Mifare) Off-line and Inline.
 - 2) Integrated Engineering (Mifare) Off-line and Inline.
 - 3) Biometric Container (iClass and DESfire) In-line.
 - 4) Texas Instruments (15693 Vicinity) Off-line.
 - 5) GSC (iClass and DESFire) In-Line.
 - 6) LG Iris Access (iClass) In-line.
 - 7) Ultra Scan (iClass) In-Line.
 - 8) Badge Design.
 - b. The CCAS shall incorporate a Badge Design module that is integral to the CCAS source code with the ability to create and maintain badge designs. Features shall include the ability to support:
 - 1) Complete Badge design and Layout tools.
 - 2) Image Import.
 - 3) Signature Capture.
 - 4) Barcode.
 - 5) Smart chip Support.
- 72. ID Badge Printers.
 - a. The CCAS shall support any printer with industry standard and Microsoft Certified Windows 2000/2003/XP drivers. The CCAS shall support.
 - 1) Double-sided full color printing.
 - 2) Edge to edge printing.
 - 3) High-speed printing.
 - 4) Holographic overlays.
 - 5) In-line Magnetic Stripe Encoding.
 - 6) In-line Smart Card Encoding (printer model specific).
- 73. Avery Dennison Badge Label Templates.
 - a. The CCAS shall provide pre-defined badge layouts that are specific to match Avery Dennison's US and International self adhesive ID labels.
- 74. Image Export.
 - a. The CCAS shall have the ability to export a captured and cropped cardholder image to an industry standard JPEG (.jpg) file format.
- 75. Intelli-Check ID Check Integration.
 - a. The CCAS shall integrate with the Intelli-Check ID Check 1400 product for the scanning of credentials including driver's licenses, military and government issued IDs. This integration will populate cardholder form during the enrollment process. Provide the specified or equivalent product to achieve the function.
- 76. Remote Access Level Management.
 - a. The CCAS shall provide a client / server based or N-Tier architecture browser based Remote Access Level management option. This optional shall allow users with the correct permission to administer and allocate access levels to specific pre determined devices.
- 77. IP Based Integrated Digital Video Management System (IPDVMS).
 - a. The CCAS shall support an integrated IP Based Digital Video Management recording solution that provides the following features and capabilities:
 - 1) Integration with the CCAS.
 - 2) Stand alone operation without connection to the CCAS.

- 3) The IPDVMS shall be computer hardware independent and must meet or exceed the manufacturer's minimum specification for the computer and related devices.
- 4) The IPDVMS shall incorporate a modular architecture and be able to support an unlimited number of cameras.
- 5) The IPDVMS shall be able to simultaneously record and display live video and display recorded video.
- 6) The IPDVMS shall support both event based and continuous recording.
- 7) The IPDVMS shall mark all events and they shall be available for playback and or archiving at any time.
- 8) Video events shall be linked to CCAS events in the CCAS database and only one database shall be acceptable for this interface.
- 9) Up to 32 simultaneous users shall be able to access any video feed from any recorder on the network.
- 10) User defined profiles shall be available for tailoring granular access to configuration and operation.
- 11) Shall have the ability to enhance a frame of video with embedded features or off the shelf software while providing security for the original video image to preserve integrity.
- 12) Shall be capable of independent camera setup for, compression rate, brightness, contrast and other factor setups.
- 13) The IPDVMS shall support Ethernet 10BT, Ethernet 100BT and 1000BT. Network protocols shall be supported including TCP/IP, IPX, and UDP.
- 14) The network interface shall allow remote access of the IPDVMS from anywhere on the end-users LAN/WAN.
- 15) Shall support limiting of frame rate transmission to individual clients.
- 16) The IPDVMS shall support either Multicast or Unicast streaming technology.
- 17) The IPDVMS shall be have the ability to playback stored video over the LAN / WAN for remote access of video clips.
- 18) The IPDVMS shall support World Time Zone.
- 19) Any alarm / event in the CCAS shall have the ability to be associated with a digital video clip in real time. The IPDVMS shall support user defined pre and post roll.
- 20) Each camera shall be configurable for a 32 alphanumeric character name and shall allow for the setup and adjustment of brightness, contrast, archiving, motion detection, Pan / Tilt / Zoom, on a per camera basis.
- 21) The IPDVMS shall support CCTV PTZ control via the CCAS video interface.
- 22) The IPDVMS shall support Analog CCTV PTZ control via approved Video Encoding Devices.
- 23) The IPDVMS shall support MJPEG, H.264 and MPEG4 formats for multiple IP Video Cameras and IP Video Encoders from approved sources.
- 24) The IPDVMS shall support integral time stamping upon receipt of video from the camera.

- b. The IPDVMS shall support the following configuration and customization parameters:
 - 1) Compression percentage.
 - 2) Pre and Post Roll in seconds.
 - 3) Motion Detection Alarms.
 - 4) Set Time Lapse Recording.
 - 5) Continuous Recording Mode.
 - 6) The ability to enforce user authentication to specify individuals or groups that have the ability to view live or recorded video or make modifications to the system.
 - 7) The ability to change any or all of the associated IP camera passwords manually or on schedule.
 - 8) User determination of Event Locking method.
 - 9) Dual Path Fail Over support.
 - 10) Blind Camera (Obstructed View) Alarm reporting.
 - 11) Presets on Alarm.
 - 12) Event Locking to protect specific video events from being overwritten.
 - 13) UNC path support for Network Attached Storage Devices.
 - 14) Configuration of Off-line cameras.
 - 15) Support for Intelligent Motion Video Searching.
 - 16) Advanced Video Analytics and Video Searching.
 - 17) Facial Detection.
 - 18) Object Direction.
 - c. Device Linkages.
 - 1) An unlimited number of access control hardware / device links shall be configurable.
 - 2) A camera viewing priority shall be given to each access control hardware device link.
 - 3) Each alarm / event condition shall have the ability to mark the start of a video event or the end of a video event in real time.
 - d. The IPDVMS shall support automatic firmware downloads to select IP cameras.
 - e. The IPDVMS shall support both internal camera video storage and external camera video storage. Internal storage shall allow the camera to store video events and then download these events to the IPDVMS on a predetermined schedule or on demand.
78. Pan / Tilt / Zoom Control from Alarm Monitoring.
- a. The IPDVMS shall support PTZ control from the Alarm Monitoring workstation. The PTZ control shall support approved IP PTZ cameras and Analog Cameras connected to approved IP Servers.
 - b. The IPDVMS shall support the following PTZ features:
 - 1) Priority Levels.
 - 2) Device Group Control.
 - 3) PTZ Override (Lockout).
 - 4) Proportional PTZ Control.
 - 5) Preset Lock via video screen.
 - 6) Preset Tour.
79. Video Archiving.
- a. The Archive Server software shall be hardware independent, providing the ability to utilize commercial off-the-shelf mass storage devices, including SAN (Storage Area Network) solutions, Tape Libraries, and direct connect external storage drive arrays.

- b. The Archive Server software shall provide the ability to manage and store video information from multiple video recorders to a central location, without operational degradation.
 - c. Each DVMS / IPDVMS shall have the ability to set its own unique archiving properties. Video shall automatically be archived based on user defined "percentage full" settings. When the IPDVMS (** Select either DVMS or IPDVMS) reaches the designated capacity threshold, video shall be automatically copied to the archive storage media and space on the recorder is released for over-write by new video information.
 - d. Regardless of the storage location (local on the recorder or in archive) the system will automatically retrieve video associated with an event on demand. The actual storage location shall be transparent to the user.
80. Browser Based Video Viewer.
- a. IPDVMS shall allow monitoring of real time video from an optional web browser based video viewer using N-Tier architecture and Microsoft Internet Explorer @ 1024x768 resolution. The browser based viewer shall have the ability to select multiple viewing templates. The browser based viewer shall provide the following functionality:
 - 1) Display live video.
 - 2) Digital zooming and panning.
 - 3) PTZ camera control.
 - a) Drag or double click to center.
 - b) Continuous click to center.
 - c) Click and hold to move.
 - 4) Ability to access video from multiple recording sources.
 - 5) PTZ locking.
 - 6) Priority based camera control takeover.
81. Real Video Time Monitoring.
- a. IPDVMS shall allow monitoring of real time video from any Alarm Monitoring client workstation. DVS and Camera status shall be displayed on a System HardwareTree.
82. Video Viewing Layouts.
- a. IPDVMS shall support the ability to save the list of camera views currently being displayed along with the currently selected template with a user defined name to be loaded as needed by the system operator.
83. Video Player.
- a. IPDVMS shall support an advanced matrix view of multiple On-line camera views. Up to a total of 128 fps @ CIF resolution and 72 fps @ 4CIF resolution shall be available for viewing in the Matrix View. The 128 frame rate limitation of video shall be any combination of Live or Recorded video. The number of open video windows shall be dependent on the frame rate and resolution of the cameras. The Video Player shall allow operator sizing of the video windows in the matrix view.
84. Video Camera Groups / Video Camera Tours.
- a. IPDVMS shall support camera grouping to allow for video camera tours in the CCAS Alarm Monitoring Module.
 - b. An unlimited number of camera groups shall be supported in the CCAS and each camera group shall support an unlimited number of

- cameras. Cameras within a camera group shall span multiple digital video servers. Cameras shall have the ability to be placed into multiple camera groups.
- c. The CCAS shall provide for video camera tours that rotate live video between each of the cameras defined in the video camera group at a user defined increment. The time increment shall be user definable in whole seconds.
85. Still Image Capture / Save.
- a. During playback or monitoring of video, the System shall have the ability to create and save a still picture. This operation shall not affect any other operation and shall not alter the recorded video. The file format shall be an industry standard format allowing for file transfer via email, printing or file transfer to other media.
86. Export Video Clip to File.
- a. The CCAS shall have to ability to save and export recorded video to a file for the purpose of sharing and reviewing video clips. The start and end times for each video segment shall be user defined. The exported video clip shall be viewable via a standard Windows media player.
87. Video Image Processing.
- a. IPDVMS shall support video image processing of a single frame captured image through use of an integral image processing module which shall offer the following features:
 - 1) Intensity, Contrast and Saturation.
 - 2) Gamma Correct.
 - 3) Histo-Contrast and Histo-Equalize.
 - 4) Flip, Reverse, Invert and Rotate.
 - 5) Shear.
 - 6) Add Noise, Average, Sharpen, Mosaic, Posterize and Median.
 - 7) Halftone.
 - 8) Emboss.
 - 9) Gray Scale.
 - b. IPDVMS shall allow the ability to save any combination of effects as a defined profile. Profiles shall have the ability to be added or deleted from the CCAS at any time.
88. Video Loss Detection.
- a. The CCAS shall detect video loss from any or all cameras and activate an alarm.
89. Automated Motion Video Searching.
- a. IPDVMS shall support advanced automated motion video searching against pre-recorded video. The automated motion video search shall analyze frames in a video segment to detect motion activity from image to image. It shall display thumbnail images of the frames with activity, complete with a histogram depicting the relative amount of activity within each frame.
 - b. The search shall be defined by selecting a specific camera and a specific time period in which the suspected activity took place and all motion events associated with that camera and time period shall be displayed in either a trace or thumbnail format for review.
90. Remote Monitoring Application.

- a. IPDVMS shall support a Remote Monitoring Application that allows the operator to monitor video from any computer connected to the CCAS network.
- 91. Video Authentication.
 - a. IPDVMS shall support imbedded authentication of video where the video is watermarked with an authentication key / signature during recording of live video to a hard drive. The video player shall have the ability to verify the authenticity during playback. This authentication shall provide the recorder name, camera name, video time and user information. The authentication shall have the ability to be password protected.
- 92. Intelligent Video Analysis System (IVAS).
 - a. The CCAS shall provide an option for an Intelligent Video Analysis solution that shall seamlessly integrate with the IPDVMS. The set of Intelligent Video Analysis algorithms shall provide the following functionality. In addition to the approved manufacturers of CCAS system, 3rd party integration with Vidient, 3M, and Object Video is acceptable. Provide the following IVAS functions.
 - 1) Alert Types.
 - a) Smart Video Motion Detection (the IVAS shall ignore minor vibration and provide motion masking).
 - b) Camera Tampering (shall occur when the IVAS detects a camera is moved from its original position, when the camera view is obstructed or when the focus is changed).
 - c) Sudden Change in Light Intensity (shall occur when the IVAS detects an extreme change in ambient light B light to dark or dark to light).
 - d) New Object in Scene (shall occur when the IVAS detects an object not present when the IVAS originally learned the scene view is left in that view).
 - e) Object Removed from Scene (shall occur when the IVAS detects an object that was present when the IVAS originally learned the scene view).
 - f) Object Detected in Scene (shall occur when the VAS detects an object defined by specific properties including people, automobiles or an object of a specific color).
 - g) Congestion in Defined Area (shall occur when the IVAS detects congestion in a specific region).
 - h) Directional Motion (shall occur when the IVAS detects an object moving in a direction specified in the setup of this feature).
 - i) Object Crosses a Defined Region (shall occur when the IVAS detects an object moving across a virtual boundary or area from a specified direction).
 - j) Moving Object Stops (shall occur when the IVAS detects a moving object in the scene ceases to move).
 - k) Static Object Starts to Move (shall occur when the IVAS detects a static object in the scene starts to move).

- l) Object moves too fast (shall occur when a pre-defined speed has been exceeded).
 - m) Loitering (shall occur when the IVAS detects a person in the scene slows down or ceases to move for a specified period of time).
 - n) Detection of a Human Face (shall occur when the IVAS detects a frontal view of a human face is detected in the scene).
 - o) People Counting (shall occur when the IVAS is set for a top down view of a portal. This feature shall provide an alarm with a positive count for entry and a negative count for exit).
 - 2) The IVAS shall support the ability to store the graphical output for a specific event for use with IVAS alarms. This feature shall allow the graphical output of a specific event to be stored as a file and later used as an overlay to be used and associated with an alarm for historical searching.
 - 3) The IVAS shall support CIF, 4CIF and D1 video resolutions during video processing.
 - 4) The IVAS shall support video infra-red imaging.
93. TSA Reporting Functions:
- a. Provide Crystal Reports or similar 3rd party software to provide various reports required by TSA. Contractor shall work with DLH in developing all required reports in electronic formats for submittal to TSA. In addition, provide customized software if required, to automatically check the badge holder's information with TSA "watch list". The cross check shall be made during the initial issuance and renewal of the badge as well as on a periodic basis as required by TSA.

2.14 INTERFACE REQUIREMENTS

A. Local Power

- 1. Local power at the locations specified on the Contract drawings will be 120 V ac, 60 Hz, single phase. Coordinate work with the terminal construction contractor. Extension or modifications to the power locations shown on the terminal contract shall be performed by this contractor.
- 2. The Contractor shall provide the necessary power conversion, distribution and isolation equipment to ensure the specified operation and protection of all CCAS equipment when fed from the normal and backup sources.
- 3. All power supply components by the Contractor shall be provided with indicating fuses or circuit breakers located to permit convenient and rapid identification and maintenance in accordance with UL 198, "Fuses," UL 512, "Fuse Holders," and NFPA 70, National Electrical Code," as applicable. Fuse holders shall be labeled to indicate fuse type, size, and identification. Circuit breakers shall be labeled to indicate their intended function.

B. Fire Alarm System

- 1. The Contractor shall interface with the Fire Alarm System to provide a common alarm annunciation at the SCC wherever a fire alarm is received.
- 2. The Contractor shall provide the hardware and software necessary to interface these for operation as specified heretofore.

3. The Contractor shall interface with F.A. control relay (ZAM) to type 4 access point panic device to release them upon activation of the relay. The relay is activated upon activation of smoke detectors or sprinkler system flow switch. Coordinate with terminal construction contractor.
- C. Baggage Belt System
 1. The contractor shall interface the baggage belt systems as indicated on the drawings.
- D. Automatic Vehicle Gates
 1. The contractor shall interface with the sliding gate at Access Points as indicated on drawings with gate operators and card reader PINpad to operate as specified.
 2. The Contractor shall provide the hardware and software necessary to interface these for operation as specified heretofore.

PART 3 - EXECUTION

3.1 DELIVERY, STORAGE AND HANDLING

- A. CCAS components shall be delivered properly packaged in factory-fabricated type containers or wrappings which properly protect equipment from damage. The Contractor shall be responsible for all damaged equipment due to improper preparation for shipment.
- B. Equipment subject to deterioration by humidity at the project site shall be provided with plastic covers forming a vapor seal and an adequate quantity of desiccant. Desiccant shall be either visible or stored in a manner which can be easily reached for inspection and replacement. Equipment so protected shall be noted on the packing list.
- C. CCAS components shall be stored in original cartons in a clean dry space protected from weather and construction traffic. The Contractor shall be responsible for observing the equipment manufacturers storage and handling procedures as required to maintain any implied or stated warranty.
- D. CCAS components shall be handled carefully to avoid breakages, impacts, denting and scoring finishes. Damaged equipment shall not be installed but returned for replacement.

3.2 INSTALLATION REQUIREMENTS

- A. Examination
 1. The Contractor shall examine areas and conditions under which the CCAS components are to be installed and notify the A/E, in writing, of conditions detrimental to proper completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in an acceptable manner.
- B. Installation
 1. CCAS components shall be installed in accordance with equipment manufacturer's written instructions, in compliance with NFPA 70, "National Electrical Code (NEC)," and ANSI C2, "National Electrical Safety Code," and

with recognized industry practices, to ensure that the CCAS meets all requirements stated herein and serves its intended purposes.

2. The Contractor shall coordinate installation of CCAS components with work performed by others.
3. Surface-mounted equipment shall be securely fastened to indicated structural supports. The Contractor shall ensure that this equipment is plumb and level.
4. Connectors and terminals, including screws and bolts, shall be tightened in accordance with equipment manufacturer's published torque tightening values. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with the tightening torques specified in UL 486A/13, "Wire Connectors and Soldering Lugs for Use with Copper / Aluminum Conductors," and the NEC.

C. Grounding

1. Equipment grounding connections for CCAS components shall be provided. Ground connections shall be tightened to comply with the tightening torques specified in UL 486A to assure permanent and effective grounds.
2. The Contractor shall ensure and demonstrate that resistance to solid earth for signals is less than, or equal to, 3 ohms.

D. Adjusting and Cleaning

1. Upon completion of installation of CCAS components, the Contractor shall set all field-adjustable controls / components and align and calibrate all equipment for the required performance and operation as specified herein.
2. The Contractor shall touch-up scratched and marred surfaces to match the original finishes.
3. Installed CCAS components shall be protected from damage during the remainder of the construction period.

E. Field Quality Control

1. Prior to energization, the Contractor shall test all field-run wires and cables for electrical continuity and short circuits and to ensure proper polarity of all connections.

3.3 INSPECTIONS AND TESTS

A. Inspections

1. The prime responsibility for inspection of all materials and work furnished by the Contractor pursuant to the Contract rests with the Contractor. The inspection or waiving of inspections by the airport shall not relieve the Contractor of any obligations or responsibilities to perform in accordance with the Contract.
2. The Contractor shall assure that components procured from Subcontractors comply with the requirements of the Contract. Suggested methods of providing this assurance are audits of the Subcontractor and its Quality Control program or receipt inspections and tests designed to demonstrate that the device(s) functions properly and complies with the specified requirements. The airport's "release" of any materials being furnished by the Contractor's Subcontractors shall not be construed to imply acceptance of same in the end product and shall not in any way relieve the Contractor of its responsibility of inspection.

3. The Contractor shall cooperate fully with Duluth International Airport's representatives and shall grant Duluth International Airport free access to all documents and work areas which the airport deems necessary to perform thorough and meaningful tests and observations. The airport's representatives shall have the right to inspect the equipment, workmanship, labor, testing procedures and any other item or task performed, furnished or used by the Contractor under the Contract, and the airport may reject, without cost or liability, any which are defective or unsuitable for the use and purposes intended or which are not in accordance with the intent of the Specification. The Contractor, upon demand by the airport, shall remedy or replace, at the Contractor's expense, such defective or unsuitable equipment or performance item. The Contractor shall act promptly to obtain the airport's approval of corrective or remedial action(s) and shall implement these actions promptly after receipt of Duluth International Airport's approval.
4. The Contractor shall give the airport's representatives at least ten (10) working days notice of events or conditions specifically requested by the representatives. Where specific inspections are required, the work involved shall not proceed beyond that point until the representatives have made or waived such inspection. The Contractor shall provide the representative with appropriate drawings and technical documentation for use during the inspection visits, as required.

B. Field Verification Tests

1. Field tests to verify that the system hardware and software, as approved for shipment, function in the same demonstrated manner after installation of the CCAS will be performed by DLH at the site. The Contractor shall provide any technical assistance required during the tests. A test procedure will be developed by Contractor and reviewed by DLH, prior to performance. These tests shall be performed on the entire system.
2. Where possible, malfunctioning components shall be corrected at the site; otherwise, the Contractor shall remove and replace. Upon correction / replacement, the component shall be retested.
3. System hardware acceptance will be provided by DLH upon satisfactory completion of the approved system hardware verification tests at the site.
4. System software acceptance will be provided by DLH upon satisfactory completion of the approved system software verification tests at the site.

C. Availability Test

1. The Contractor shall demonstrate a continuous operation of the CCAS at the site over a period of 1,440 hours with an availability of 99.5 percent or more to include all supplied hardware and software. This shall be demonstrated after the Field Verification Test of the CCAS.
2. Availability shall be calculated as follows:

$$\text{Availability} = \text{Percent } \frac{\text{TDT} - \text{AOT}}{\text{TDT}} \times 100$$
 TDT where:
 - a. Test Duration Time (TDT) is the total elapsed time from start of the test to completion of the test. This time shall be a minimum of 1,440 hours. The TDT shall equal the time the WAS is undergoing testing less the time allocated for pre-scheduled preventive maintenance as required by the Contractors maintenance manual.
 - b. Accumulate Outage Time (AOT) is the total amount of time after start of the test when any part of the system or its function are not available (downtime) as specified below.
3. Downtime shall be calculated according to the following rules:

- a. The duration of any outage shall be calculated from the time that a functional deficiency is first recognized to the time the deficiency has been corrected to the satisfaction of DLH.
 - b. If an intermittent failure (those which occur and then disappear three (3) or more times) occurs, the problem shall be isolated and repaired. The system shall be considered unavailable while corrective maintenance is being performed.
 - c. Central processor failure not specifically attributed to system hardware malfunctions shall be considered a system failure and downtime shall be accumulated when it occurs at any rate greater than once per week.
 - d. No minimum time shall be charged against any occurrence.
 - e. All time shall be recorded to the nearest minute.
 - f. In the event of the failure of existing equipment, site conditions and / or accidental operator damage to the equipment caused by actions of DLH, its agents or employees, the effect of which is to render the equipment unavailable as described above, the testing shall cease. Upon return to normal operation, the testing shall begin again. No downtime shall be accumulated during this outage.
4. The CCAS shall be considered available under the following conditions:
 - a. Loss of the primary central processor or any on-line memory section or I/O controller attributable specifically to hardware malfunction if backup units or features are automatically activated and all lost functions are successfully transferred to an operating unit without disruption of any real-time functions of the CCAS.
 - b. Loss of either 1 printer or 1 VDT at the SCC attributable specifically to hardware malfunction, if the other display/printing items are operational during the outage.
 5. Commencement of the Availability Test shall be mutually agreed upon, but in no event shall it start prior to DLH's receipt and review of all manuals, working drawings and software documentation, unless prior waiver is obtained from DLH. In addition, the test shall not begin until training of DLH's operating personnel has been completed, recommended spare parts purchased by DLH are in stock and all scheduled preventive maintenance has been completed.
 6. In the event that the AOT exceeds 22 hours, the start time shall be shifted to delete some of the earliest outages until the accumulated outages during the 1,440-hour test no longer exceed 20 hours. The shifted start date time shall be mutually agreed upon between DLH and the Contractor. No time shift shall be permitted until at least 25 percent (1100 hours) of the test has been completed.
 7. A new test shall be started if major modifications are required to either hardware or software in order to conform to specified functional requirements.
 8. The CCAS shall be maintained (parts and labor included) by the Contractor at its expense until completion of a successful Availability Test.
 9. The Contractor shall provide a service representative on call 24 hours a day, 7 days a week for the duration of the Availability Test. The contractor has an option for on site availability of service representative or other appropriate means to ensure successful availability test as specified.
 10. The CCAS must be operating at 100 percent at the end of the test.
 11. During the Availability Test:

- a. Alterations to software shall not be permitted unless required to correct an error and DLH's approval is obtained.
- b. Alterations to the hardware shall not be permitted unless required to correct a failure or, if in the opinion of the Contractor, such changes will improve system reliability.
- c. DLH shall be permitted to verify system performance as specified.
- d. Any redesign or modification to the system that is a result of the Availability Test shall be made to and documented for all equipment supplied under the Contract.

3.4 TRAINING AND INSTRUCTION

A. General

1. The Contractor shall provide on-site training for operating, servicing and programming personnel designated by DLH and end-users (employees and tenant personnel).
 - a. Operating personnel shall receive detailed instruction in operating procedures, routine preventive maintenance and routine servicing of console and terminal equipment. The training of operating personnel shall be completed prior to the start of the Availability Test.
 - b. Servicing personnel shall receive detailed instruction in principles of operation, setup, adjustment, routine preventive maintenance, diagnosis and corrective repair of all CCAS equipment. The training of servicing personnel shall be completed at least 180 days prior to the end of the maintenance period.
 - c. Programming personnel shall receive detailed instruction in software architecture, addressing and instructions, device capabilities and program capabilities. The training of programmers shall be completed at least 180 days prior to the end of the maintenance period.
 - d. End-users shall receive detailed instruction in the operation and use of CCAS access point equipment.
2. Training shall be conducted by experienced, knowledgeable personnel, supported by modern training aids and shall utilize the actual system being supplied as much as possible. Participants shall receive individual copies of all pertinent technical manuals and documentation which apply specifically to the CCAS hardware and software.
3. Each training program shall be video-recorded by the Contractor for use by DLH for future training. Record each session on DVD and include 2 copies with the OEAM submittal.
4. DVD shall be of sufficient video quality such that all personnel and equipment involved with the training can be seen. In addition, the audio quality should be of sufficient quality such that all voices can clearly be heard throughout the recording. If these conditions are not met, the contractor will be required to perform the training and videotaping until these conditions are met.
5. Training shall be scheduled at the convenience of DLH.

B. Operator Training

1. Operating personnel must be familiar with the scope, operation and capabilities of the CCAS. This training shall include system concepts, general design features and detailed familiarization with the man machine interface. This training must be reinforced with hands-on experience on all

equipment. All operator courses shall be conducted at the site and must be structured to minimize the length of the instructional periods. It shall be necessary to repeat each course several times to accommodate all personnel on each shift.

2. The Contractor shall provide the operator training for up to 20 of DLH's personnel. This course shall have a duration of at least one (1) week.

C. Maintenance Training

1. DLH's servicing personnel shall attend courses designed to instruct them in the internal operations of the CCAS hardware and in diagnostic software. It is expected that the courses will be divided into a series pertinent to maintenance and troubleshooting on the console and terminal equipment including the central processors, peripherals and communications hardware and a series pertaining to field devices (IFPs, card readers, CCTV cameras etc.). This will permit selective assignment of personnel by DLH to optimize the skills of the maintenance staff.
2. Maintenance training courses shall include operation and troubleshooting using both test hardware and diagnostic programs and failure repair of actual system hardware. If actual system hardware is not available, an equivalent hardware system which simulates as closely as possible the system supplied, may be used in the training process.
3. The maintenance training program offered by the Contractor shall familiarize DLH's personnel with a comprehensive preventive maintenance program structured specifically for the system supplied.
4. The Contractor shall provide the hardware training for up to 20 DLH personnel.

D. Software Training

1. The Contractor's software training program shall familiarize DLH's programming personnel with off-line and on-line procedures for generation and modification of programs and the database, operation of peripherals, use of documentation, use of the Programmer's terminal, start-up and shut-down procedures, the use of off-line and on-line diagnostics and other pertinent operating, maintenance and development procedures. The courses shall include:
 - a. A course offering a detailed study of the specialized software supplied by the Contractor and the detailed logical structure of all standard software used by the system.
 - b. A course detailing the programming required to expand the database to include new monitored points, new security area access points and new types of I/O devices.
2. The Contractor shall provide the software training for up to 20 of DLH's personnel.

E. End-user Training

1. Airport employees and tenant personnel shall attend courses designed to instruct them in the proper operation of each access point type and in the use of its associated CCAS equipment. The course shall cover normal and emergency access procedures.
2. The end-user course shall be repeated a sufficient number of times to accommodate all individuals assigned an ID badge / keycard.

F. ID Badge / keycard Preparation Training

1. DLH personnel shall attend courses designed to instruct them in the preparation, encoding, printing, and controlling ID badges and Keycards.
2. The training shall have a minimum duration of one (1) week, and shall occur sixty (60) days prior to activation of the system.
3. The Contractor shall provide the ID badge / keycard preparation training for up to 20 of DLH's personnel.

3.5 MAINTENANCE SERVICES (WARRANTY)

- A. The Contractor shall provide "on-call" warranty maintenance service for all equipment supplied under this Contract for two (2) years after acceptance of the entire CCAS (hardware and software) by DLH. The service shall consist of all material, labor and travel expenses, as indicated in paragraph 1.10 "Maintenance Services" of this section.

END OF SECTION 13700

**NEW PASSENGER TERMINAL
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**SECTION 13743 – VIDEO
DISPLAY**

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Display Devices

1.2 ABBREVIATIONS

ADA	Americans with Disabilities Act
AODB	Airport operational database
ASP	Application Service Provider
CUTE	Common use terminal equipment
DDC	Device display controller
DLH	Duluth International Airport
FIDS	Flight Information Display System
GB	Gigabyte (approximately one billion bytes of memory)
GUI	Graphical user interface
IVA	Integrated voice announcement system
IVR	Interactive voice response system
LAN	Local area network
LCD	Liquid crystal display
LED	Light emitting diode
MB	Megabyte (approximately one million bytes of memory)
MUFIDS	Multi-User Flight Information Display System
MUSE	Multi-user system environment
SNMP	Simple Network Management Protocol
SQL	Structured Query Language
VPN	Virtual Private Network
WYSIWYG	What-you-see-is-what-you-get
XML	Extensible Markup Language
XSL	Extensible Style sheet Language

1.3 PERFORMANCE REQUIREMENTS

- A. The Video Displays shall be LCD Commercial Widescreen integrated full high-definition type with LED backlighting. Screen size shall be as specified on the plans.
- B. Provide all supports and hardware required to install all devices in neat and workman-like manner. All exposed wiring to the devices shall be limited to final connection points to the devices.
- C. Provide housing and cabinets for display devices as shown on the drawings.

1.4 REFERENCES

- A. Electronic Industries Assn / Telecommunications Industries Assn (EIA/TIA)
 - 1. EIA/TIA 568 Commercial Building Communications Wiring Standards

2. EIA/TIA 569 Commercial Building Standard for Telecommunications Pathways and Spaces
 3. EIA/TIA 606A Administrative Standard for Commercial Telecommunications Infrastructure
 4. EIA/TIA 607 Commercial Building Bonding and Grounding Requirements for Telecommunications
- B. National Fire Protection Association (NFPA)
1. NFPA 70 National Electric Code (NEC)
- C. Underwriters Laboratories (UL)
1. UL 969 Marking and Labeling Systems

1.5 SUBMITTALS

- A. Shop Drawings: Submit complete including:
1. System components detailed drawings and engineering data.
 2. Installation instruction for each piece of equipment.
 3. 1/8-inch scale, floor plan drawings, rack layouts and riser diagrams indicating detail wiring and system components.
- B. Product data in manufacturers catalog cuts, description and drawing components.
- C. Display Cabinets: Provide a 1/4" scale shop drawing for the display cabinet. Provide all details indicating the mounting of the specified monitors.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Firm shall have at least five years successful installation experience with similar video systems. Personnel shall be trained and certified by manufacturer of equipment required for this project.
- B. Compliance: Comply with the applicable requirements of the referenced standards and specifications.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.7 DELIVERY AND STORAGE

- A. Deliver all materials in manufacturer's packing in undamaged condition.
- B. Store all materials in clean, dry place and protect them from dirt, fumes, water, and physical damage.
- C. Handle components carefully to avoid damage to materials and finish.

1.8 WARRANTY AND SUPPORT

- A. The contract shall include a 12 month (one year **minimum**) warranty for all system software and hardware commencing with completion of the successful test. Warranty shall include OEM return-to-factory repair, overnight parts replacement, and emergency on-site service.
- B. The video display provider shall coordinate return-to-factory repair, if applicable.
- C. Provide 24 months (two years) of warranty service in addition to the one year of full warranty on installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. A. Subject to compliance with requirements, provide video displays by one of the following (See plans for model numbers):
 1. LG Electronics U.S.A.
 2. NEC
 3. Sony
 4. Or approved equal.

2.2 DISPLAY OVERVIEW

- A. Display Description
 1. Whenever possible, the equipment shall be off-the-shelf products from recognized sources in the industry
 2. Equipment shall be commercial quality.
 3. Display shall be thin profile with diagonal dimension as specified on the plans with a thin black bezel.
 4. Displays shall be wall mounted with VESA standard mounting to adjustable tilt brackets at locations shown on the plans.
 5. The flat panel displays shall not cause any permanent image burn-in. The displays shall have multi-screen capabilities and full motion video.
- B. Display Specification
 1. Display shall be LCD type with LED backlighting.
 2. Native resolution shall be 1920 x 1080 in true 16:9 aspect ratio.
 3. The dynamic contrast ratio shall be 3,000,000:1 or better with a 178° vertical and horizontal viewing angle and automatic brightness control.
 4. 120 Hz refresh rate
- C. System Management and Support
 1. The system shall include system capability management tools, including Simple Network Management Protocol (SNMP)-compliant hardware and application-level support software. Approved tools include HP Openview or WhatsUp Gold.
- D. Broadcast Display
 1. Video displays used for TV shall include a broadcast tuner and audio options.
- E. Inputs / Outputs
 1. Include the following connections:

RF In
 AV In
 Component Video & L/R audio
 HDMI /HDCP Input
 RS232 In / out
 USB 2.0

PART 3 - EXECUTION

3.1 PLANNING

- A. Prior to beginning of the work detailed planning and lay-out shall be performed to meet schedule and ensure proper installation.
- B. The Contractor shall plan conduit layout, power requirements, exact termination of the conduit and wiring to provide clean installation. No surface mounted conduit shall be installed without prior approval of Architect / Engineer.

3.2 COORDINATION

- A. The Contractor shall coordinate all work efforts with the Owner, A/E and other trades. The phasing-in schedule for the new system shall be submitted within 30 days of the contract award for approval.
- B. Conduit pathways and cable identification shall be coordinated with other contractors and A/E.

3.3 EQUIPMENT INSTALLATION

- A. The contractor shall provide all supports and installation hardware for the equipment furnished under the contract. The installation shall be in neat and workmanlike manner. The exact monitor location, height and other items shall be field coordinated with the A/E and owner.
- B. Locations of all cutting and patching shall be approved by the Architect / Engineer and Owner. All repairs must match the surrounding surfaces.
- C. Install all equipment in accordance with the manufacturer's written instructions.

3.4 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 16 Section "Electrical Identification."
- B. Provide 'as-built' record of wiring pathways and cable identification in dwf or dwg CAD format on CD.

3.5 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations,

including connections, and to assist in testing. Field tests shall be witnessed by Design Engineer or designated alternate.

- B. Visual Inspection: Conduct visual inspection prior to testing.

3.6 TRAINING

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain the system.

END OF SECTION 13743

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**SECTION 13755 – INTEGRATED EXIT LANE
BREACH CONTROL SYSTEM**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.

1.2 SUMMARY

- A. This Section includes all materials and labor required for the installation, testing, commissioning, and documentation of a complete Integrated Exit Lane Breach Control System (IEBCS) as indicated on the Drawings and specified herein. The scope of the work is described in three configuration options:
 - 1. Option A consists of Self-Contained Breach Control System units.
 - 2. Option B consists of motion detection systems combined with two sets of automatic entrances.
 - 3. Option C consists of motion detecting optical turnstiles combined with one automatic entrance.
- B. Related Sections: The following sections contain requirements that relate to this section:
 - 1. Division 08 Specification Section 08411 – “ALUMINUM-FRAMED STOREFRONTS AND ENTRANCES”
 - 2. Division 08 Specification Section 08460 – “AUTOMATIC ENTRANCE DOORS”
 - 3. Division 08 Specification Section 08801 – “INTERIOR GLAZING”.
 - 4. Division 13 Specification Section 13700 – “PART 1542 COMPUTER CONTROLLED ACCESS SYSTEM (CCAS)”.
 - 5. Division 16 Specification Section 16050 – “BASIC ELECTRICAL MATERIALS AND METHODS”
 - 6. Division 16 Specification Section 16060 – “GROUNDING AND BONDING”
 - 7. Division 16 Specification Section 16075 – “ELECTRICAL IDENTIFICATION”
 - 8. Division 16 Specification Section 16080 – “ELECTRICAL TESTING”
 - 9. Division 16 Specification Section 16120 – “CONDUCTORS AND CABLES”
- C. Design Intent: The project documentation is, in general, diagrammatic and/or developed to communicate general design intent. The Contractor shall provide a complete IEBCS system design to meet the performance criteria contained herein. All Work necessary to provide such a System shall be performed.

1.3 DEFINITIONS AND ABBREVIATIONS

- A. The Integrated Exit Lane Breach Control System (IEBCS) are hereby defined as systems using CCTV cameras, motion detectors and/or infrared pulsed beam

optical sensors and software-based analysis to detect wrong-way motion, sound an alarm, initiate visual signals, capture image of person(s), digitally record and store alarm events, send an alarm signal to the Computer Controlled Access System (CCAS) and activate closure of automatic entrances to prevent or deter persons or objects from entering into a secured exit-way from the wrong direction.

- B. AAADM – American Association of Automatic Door Manufacturers.
- C. CCAS - Computer Controlled Access System.
- D. CCTV - Closed Circuit Television.
- E. COTS - Commercial off the Shelf.
- F. FAA – Federal Aviation Administration.
- G. IEBCS - Integrated Exit Lane Breach Control System.
- H. LAN – Local Area Network.
- I. TSA – Transportation Security Administration of the U.S. Department of Homeland Security.

1.4 REFERENCES:

- A. ADAAG - Americans with Disabilities Act Accessibility Guidelines.
- B. BHMA A156.10 – Power Operated Door Standard.
- C. FAA TSR 1542 – Airport Security.
- D. FAA TSR 1544 – Aircraft Operator Security.
- E. FAA TSR 1546 – Foreign Air Carrier Operator.
- F. FAA TSR 1548 – Indirect Air Carrier Security.
- G. NFPA 70 – National Electrical Code (NEC).
- H. NFPA 101 Life Safety Code.
- I. OSHA 2206 - General Industry Safety and Health Standards.
- J. Applicable Federal, state and local laws, regulations, ordinances and codes.

1.5 SYSTEM PERFORMANCE REQUIREMENTS

- A. The Integrated Exit Lane Breach Control System shall accommodate a throughput of no less than 30 passengers per minute in an un-manned mode acceptable to the TSA.

- B. The IEBCS shall utilize all commercial off the shelf (COTS) equipment for all active electronic components, and all IEBCS equipment shall be furnished by the IEBCS contractor as a complete and tested system.
- C. All components required for IEBCS shall be furnished and tested by the IEBCS manufacturer in order to assure system compatibility, and a complete and functional Integrated Exit Lane Breach Control System.

1.6 BID SUBMITTALS

- A. Bids may be submitted on the basis of any of the three (3) system options described in this specification and on the drawings. Bidders shall submit Systems Proposals with their bids containing detailed descriptions of the systems proposed including descriptions of all major components, sequences and modes of operation, passenger flow rates and means of interface with the CCAS.
 - 1. Bidders shall provide a list of previous installations of similar size and scope. Indicate those installations that have been approved by TSA for un-manned operation.
 - 2. The Bidders must identify any substantive differences between the systems proposed and the specified options or any deviation from the performance criteria contained herein.

1.7 ACTION SUBMITTALS

- A. Product Data for each principal component or product.
 - 1. Indicate capacities, sizes, performance and operating characteristics, features of control system, finishes, and similar information.
 - 2. Indicate any variations from specified performance criteria.
- B. Shop Drawings:
 - 1. Include dimensioned drawings showing plans, elevations, sections and large-scale details indicating relationships with other construction, locations of equipment and anchoring methods.
 - a. Indicate locations of door activation and safety devices.
 - 2. Provide wiring diagram detailing wiring for power, signal and control systems; differentiating clearly between manufacturer-installed wiring and field installed wiring.
 - a. Indicate maximum and average power demands.
 - b. Each device on wiring diagram shall be properly identified by name, letter, or standard symbol identical with markings on devices or controller panel.
 - 3. Submit layout of graphics components for coordination by the Architect.
 - 4. Submission of manufacturer's "generic" non-project-specific shop drawings, not showing actual project conditions will be considered nonresponsive and returned.
- C. Samples for Initial Selection: For finishes involving color selection.

- D. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

1.8 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Manufacturer and Installer.
- B. Manufacturer's Literature: Provide manufacturer's standard literature, covering all equipment included in the system. All references to equipment not supplied on this Project shall be crossed out.
- C. Product Certificates: For automatic entrances.
- D. Field quality-control reports.
- E. Sample Warranty: For special warranty.

1.9 CLOSEOUT SUBMITTALS

- A. Maintenance Manuals: The Contractor shall provide four (4) complete maintenance and operation manuals on the completed system for the purpose of system operation and maintenance during and after the warranty period. It is intended that the operation and maintenance manuals be exhaustive in the coverage of the system to the extent that they may be used as the sole guide to the troubleshooting, identification and repair of defective parts.
 - 1. The maintenance manuals shall contain specifications, adjustment procedures, circuit schematics, component location diagrams, and replacement parts identification.
 - 2. The manuals shall include basic wiring diagrams, schematics, and functional details. It is required that everything in the system be neatly labeled and easily identifiable.
 - 3. Include cost lists of manufacturer's recommended spare parts to maintain the equipment with a minimum of down time. This list shall include part names, part numbers, and source for additional purchase. The parts list shall be cross-referenced to the manufacturer's literature and the product data.
- B. Drawings: The Contractor shall provide one (1) set of all Drawings in reproducible format, and where the Drawings are CAD generated, provide the drawing files in machine-readable CAD format.
- C. Maintenance manuals and drawing sets shall be compiled after system fabrication and testing, and shall incorporate any changes made after Shop Drawing submittal.

1.10 QUALITY ASSURANCE

- A. Manufacturer Qualifications: The Manufacturer of the Integrated Exit Lane Breach Control System shall be regularly engaged in manufacture of Breach Control Systems, system components and accessories of types, capacities and characteristics similar to those required herein, and whose products have been in satisfactory use in similar service for not less than ten (10) years. The proposed

system shall have been previously approved by TSA for use as an un-manned exit control system at a U.S. commercial airport.

1. Manufacturer shall have experience in production of three systems in last five years of similar scope and complexity. At least two installations shall be at a commercial service airport.
 2. Manufacturers of automatic entrances shall have a company certificates issued by AAADM.
- B. Installer Qualifications: Manufacturer or an authorized representative who is trained and approved by manufacturer and who has completed installations similar in material, design, and extent to that indicated for Project which have resulted in installations with a record of successful in-service performance. The installer shall submit evidence of such qualifications upon request.
1. Installer shall have at least five (5) years experience in installation of the equipment type used.
- C. Document Verification: in order to discover and resolve conflicts or lack of definition which might create problems, review contract documents for compatibility with proposed product prior to bidding.
- D. Inspection and testing: Installer shall obtain and pay for all required inspections, tests, permits and fees.
1. Final tests and inspection shall be held in the presence of Architect/Engineer's and Owner's representatives and to their satisfaction. The Contractor shall supply personnel and required auxiliary equipment for this test without additional cost.
 2. Conduct reliability test for two months to indicate compliance with 99 percent system reliability requirements. The reliability shall be determined as follows:
 - a. The Contractor shall demonstrate a continuous operation of the IEBCS at the site over a period of 720 hours (30 days) with an availability of 99.0 percent or more to include all supplied hardware and software. This shall be demonstrated after the Acceptance Test of the Access controls system.
 - b. Availability (A) shall be calculated as follows:

 - c. Test Duration Time (TDT) is the total elapsed time from start of the test to completion of the test. This time shall be a minimum of 1,440 hours.
 - d. Accumulate Outage Time (AOT) is the total amount of time after start of the test when any part of the system or its function are not available (downtime) as specified below.
 3. Downtime shall be calculated according to the following rules:
 - a. The duration of any outage shall be calculated from the time that a functional deficiency is first recognized to the time the

- deficiency has been corrected to the satisfaction of the Owner.
 - b. If an intermittent failure (those which occur and then disappear 3 or more times) occurs, the problem shall be isolated and repaired. The system shall be considered unavailable while corrective maintenance is being performed.
 - c. Central processor failure not specifically attributed to system hardware malfunctions shall be considered a system failure and downtime shall be accumulated when it occurs at any rate greater than once per week.
 - d. Central processor failure not specifically attributed to system hardware malfunctions shall be considered a system failure and downtime shall be accumulated when it occurs at any rate greater than once per week.
 - e. No minimum time shall be charged against any occurrence.
 - f. All time shall be recorded to the nearest minute.
- 4. In the event of the failure of existing equipment, site conditions and/or accidental operator damage to the equipment caused by actions of the Owner, its agents or employees, the effect of which is to render the equipment unavailable as described above, the testing shall cease. Upon return to normal operation, the testing shall resume again. No downtime shall be accumulated during this outage.
- E. Source Limitations for Automatic entrances: Obtain automatic entrances from single source from single manufacturer.
- F. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review methods and procedures related to automatic entrances including, but not limited to, the following:
 - a. Structural load limitations.
 - b. Construction schedule. Verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - c. Coordination with electrical, glazing, and other trades.
 - d. Required testing, inspecting, and certifying procedures

1.6 INTELLECTUAL PROPERTY

- A. Patents: Should patented articles, methods, materials apparatus, etc., be used in this Work, the Contractor shall acquire the right to use the same. The Contractor shall hold Owner and its agents harmless for any delay, action, suit, or cost growing out of the patent rights for any device on this Project.
- B. Copyrights: Should copyrighted software be used in this Work, the Contractor shall acquire the right to use the same. The Contractor shall hold the Owner and its agents harmless for any delay, action, suit, or cost growing out of the copyrights for any software on this Project.

- C. License to use: All software required for the complete operation of the equipment as specified herein shall be delivered with either full ownership transferred to the Owner or a License to use at this site, including the right to make backup copies.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle materials, components and equipment in manufacturer's protective packaging.
- B. Store materials, components, and equipment off of ground, under cover, in a dry location and protected from construction activities.

1.8 COORDINATION

- A. Coordinate with other Work, including electrical wiring Work, as necessary to interface installation of IEBCS with the CCAS and CCTV System installation.
- B. Sequence IEBCS installation Work with other Work to minimize possibility of damage and soiling system during remainder of construction period.

1.9 WARRANTY

- A. General Warranty: The warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- B. Period: The Contractor shall warranty all labor, workmanship, and materials for a period of one (1) year from the date of final acceptance. Should a failure occur to the equipment within the first year, the Contractor shall provide all labor and materials necessary to restore the system to the condition required for the final test and acceptance for this Contract, at no cost to the Owner.
- C. Special Project Warranty: Provide special project warranty, signed by Contractor, installer, and manufacturer, agreeing to replace, repair, or restore defective materials and workmanship during warranty period. This warranty shall be in addition to, and not a limitation of, other rights the Owner may have against the Contractor under the Contract Documents.
 - 1. "Defective" is hereby defined to include, but not by way of limitation, operation or control system failures, performances below required minimums, excessive wear, excessive deflection of framing or door components, faulty operation of operators, controls, and hardware unusual deterioration or aging of materials or finishes, unsafe conditions, the need for excessive maintenance, and similar unusual, unexpected, and unsatisfactory conditions.
 - 2. Warranty period is twelve (12) months starting on date of Substantial Completion.
- D. Warranties: Provide coincidental product warranties where available for major components of elevator work. Submit with maintenance manuals.

1.10 MAINTENANCE SERVICE

- A. Initial Maintenance Service: Provide full maintenance service for period of 12 months following Date of Substantial Completion. Include 24-hours-per-day, 7-days-per-week emergency callback service with a response time of 2 hours or less. Exclude only repair or replacement due to misuse, abuse, accidents, or neglect caused by persons other than installer's personnel.
 - 1. The maintenance agreement shall include site visits at the 6th month, and 12th month to update software and restore system performance (total 2 trips).
 - 2. The Maintenance Service Agreement shall include "Help Desk Facility" for 24 hour hardware and software support, return to factory for repair of items under warranty, on-call emergency maintenance and overnight replacement warranty.
 - 3. The Contractor will remove faulty equipment and ship it for repair as well as re-install the equipment. The Contractor will not perform any on-site repair of the equipment. Out-of-service time shall be limited to five (5) calendar days. Interim replacement equipment shall be provided as needed.
 - 4. The upgrade of all software shall be performed at no cost to the Owner during the warranty and maintenance service period. The proposal shall include labor and material for three upgrades. The fixing of errors in the system shall not be considered an upgrade.
- B. Continuing Maintenance Service: Installer shall provide a continuing maintenance proposal to Owner, in the form of a standard yearly (or other period) maintenance agreement, starting on date construction contract maintenance requirements is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.

1.11 SPECIAL REQUIREMENTS

- C. Field Measurements: Before proceeding with the fabrication of the work, verify all dimensions and take such measurements as are required for proper fabrication and erection of the work.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Power: Any special power treatment, such as filtering or spike elimination that may be required for proper operation and protection of the system, shall be provided with the system.
- B. Backup Power: Equipment shall be supplied from an active online UPS system. The UPS shall provide backup power for a minimum of fifteen (15) minutes.

2.2 MANUFACTURERS

- A. Manufacturer: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. ADT Security Systems, Inc. ("X" Control).
2. Besam Entrance Solutions; Subsidiary of ASSA ABLOY Entrance Systems.
3. Boon Edam Inc.
4. Cernium Corporation (Exit Sentry)
5. Eagle Security Group, Inc. (Eagle 2)
6. Flight Services & Systems, Inc. (E-Lane)
7. Horton Automatics; a division of Overhead Door Corporation.
8. Record-USA (FlipFlow)
9. Stanley Access Technologies, LLC; Division of Stanley Security Solutions.

2.3 GENERAL REQUIREMENTS

- A. System Requirements – The system shall detect persons or objects that pass through the alarmed area in the disallowed direction, regardless of the amount of traffic moving the correct direction in the exit lane. The following features shall be included in the system:
 1. Pre-alarm: The system shall have a pre-alarm function that will warn people to stop before entering the alarm area. The pre-alarm is intended to reduce the number of nuisance alarms. Upon pre-alarm, an audible announcement will be played warning people that they are about to violate the area. The announcement shall be included as a part of the system, but must be able to be changed easily. The pre-alarm shall extend out in front of the actual alarm zone.
 2. Alarm: The system shall alarm upon detecting a person or object passing through the alarm zone in the disallowed direction
- B. Motion Detection: The system shall be capable of detecting a moving object the size of a standard sized tennis ball (2.63" diameter) minimum.
- C. Equipment: The system active equipment shall be comprised of industrial quality Commercial-Off-The-Shelf (COTS) equipment for all active electronic components. The equipment shall not be proprietary.
- D. System Controls: The system controls shall be able to be remote to allow the equipment to be located in the Security Screening Checkpoint area or Airport Security Office as directed by the Owner. The equipment located remotely shall be capable of viewing alarm events, seeing video from the area, and resetting the equipment either from the checkpoint or locally at the controlled point.
 1. The controls for the unit shall be intuitive and easily operated with a minimum of training. The controls shall be clearly marked and shall have large, clear buttons that are easily operated. If physical pushbuttons are utilized, the buttons shall be color-coded for various functions and the buttons shall have guards for any critical buttons to prevent the accidental pressing of a button.
 2. The Exit Lane Breach Control System shall not require computer training or skills for basic operation.
- E. System Logging: The system shall log all events that occur on the system. This log shall record all events that occur on the system including, but not limited to,

alarms, logins to configurations, alarm resets, and the alarm frame stored along with the alarm event record. The log shall be kept for a minimum of 2 weeks.

- F. Outputs: The system shall be capable of having outputs that can be tied into the CCAS. The system shall have auxiliary outputs and inputs available for various uses including remote system bypass.
- G. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.4 MATERIALS AND COMPONENTS

- A. Option A – Self-Contained Breach Control System Units: automatic high capacity anti-pass back system consisting of glass enclosed tunnel section with glass doors at each end. Within the tunnel section, detection devices shall monitor the movement of persons and objects within and effectively prevent their passage from the non-secured side to the secured side.
 - 1. Units shall be fabricated using self-supporting aluminum framed construction with transparent side panels of laminated security glass.
 - 2. Units shall incorporate interior lighting providing a minimum of 25 foot-candles at the finish floor surface.
 - 3. Operational status of units shall be indicated by luminous red/green signals adjacent to both entry and exit doors.
 - 4. Units shall be capable of normal operation in two modes:
 - a. Flow Mode:
 - 1) Sensor opens entrance door.
 - 2) Users proceed into the anti-pass-back tunnel.
 - 3) The entrance door closes if there is no movement detected, or if the door opening is free and no object presence been detected in the door leaf swinging area.
 - 4) The users proceed through the tunnel.
 - 5) The exit door opens, activated by the exit sensor.
 - 6) The anti-pass-back tunnel is then exited.
 - 7) Green traffic light signals correct walking direction.
 - b. Interlock Mode:
 - 1) Sensor opens entrance door.
 - 2) Users proceed into the anti-pass-back tunnel.
 - 3) The entrance door closes if there is no movement detected, or if there has been 3 to 4 persons counted.
 - 4) The users wait in the tunnel to exit until the entrance door has been fully closed and secured (air lock).
 - 5) The exit door opens automatically once the entrance door is secured.
 - 6) The complete tunnel is monitored unless the last person has left before the exit door will close and lock. After that, the entrance door will open automatically so that users can enter for exit again.
 - 7) Green traffic light signals correct walking direction.
 - 5. Units shall be capable of interior monitoring and object detection including:

- a. Detection of stationary objects (tennis ball size) at the floor.
 - b. Volumetric inside monitoring, allowing unauthorized persons remaining inside the tunnel to be monitored.
 - 6. Units shall be provided with glass side rails and low height stainless steel swing barriers at exit to deter blockage of exit doors and act as a visual deterrence to attempts to enter the units from the exit side.
 - 7. Units shall be provided with electro-magnetic lock at exit doors with manual override in the event of power failure.
 - 8. Units shall incorporate audio and visual alarms triggered by incorrect use. Alarm messages shall be dispatched to the CCAS.
 - 9. A service display module shall be provided for use by service technicians with the following features:
 - a. Adjustment and modification of operational mode parameters.
 - b. Adjustment of various timers according to customer's requirements.
 - c. Display status of digital inputs and relay outputs.
 - d. Display error messages in user-friendly text.
 - e. Password protected access levels
- B. Option B - Motion Detection System combined with two sets of automatic entrances at the ends of the Deplaning Corridor as depicted on the Drawings. Between the pairs of automatic entrances, the motion detection devices shall monitor the movement of persons and objects within the corridor and effectively prevent their passage from the non-secured side to the secured side by controlling the operation of the doors.
- 1. Motion Detection System: Provide motion detection system to monitor Deplaning Corridor traffic direction. System shall include:
 - a. Motion Detection: The system shall be capable of detecting an moving object the size of a standard sized baseball (2.9" diameter) minimum.
 - b. Alarm Zone: The size of the alarm zone shall be programmable. The system shall include a masking function to allow definition of the alarm zone from the head-end without requiring the adjustment of equipment.
 - c. System Recording: The primary recording of alarm event video shall utilize a digital video recorder (DVR) integral to the system computer. The Exit Lane Breach Control System shall maintain at least 2000 uncompressed video loops (minimum six second loop) at 15 fps of alarm events with time/date stamp in the system history log. All cameras available from the system shall be simultaneously recorded on the Airport Operations Center CCTV system.
 - d. Alarms: The system shall include stroboscopic visual alarms units and audio alarms, and interface with door controls for preventing the advance of an attempted breach into the concourse.
 - e. System Video: The video from any cameras shall be capable of being tied into the Airport Operations Center CCTV system to allow distribution or remote viewing of cameras. All equipment shall be included to allow the output of the video signals in the correct format.

- f. Video Diagnostics: The system shall automatically assess and confirm the video signal from all Exit Lane Breach Control System cameras at least twice in a 24-hour period for each camera.
 - g. Video Loop: Upon alarm, the system shall display a video loop comprised of captured images from before and after the alarm event. The times or frames from before and after the alarm event shall be configurable. Also, the speed of the video loop playback shall be user configurable. The video loop shall be able to be stopped and the frames shall be viewable individually. The frames shall be printable using a printer included as part of the system.
 - h. System Configuration Utility: The system shall contain a configuration utility. The utility shall be password protected. The log-ins shall determine the access possible for the system. All log-ins and access levels shall be configurable by a person with the highest level log-in access. The utility shall be able to view alarm events and logging, enter configuration screens to edit the parameters noted in the above sections, and shall be able to add and delete users and change access levels.
 - i. Remote Access: The system shall be remote accessible via modem to allow configuration changes to the system remotely. The modem shall be an external type modem with a power switch so that the modem can be powered off under normal conditions to prevent unauthorized access to the system. All remote access shall be logged in the logging function of the system.
2. Automatic Entrances: Provide swinging, power-operated automatic entrances including doors, framing, headers, door operators, controls, and accessories required for a complete installation, as indicated on the Drawings.
- a. Delegated Design: Engage a qualified professional engineer, as defined in Section 01400 "Quality Requirements," to design automatic entrances.
 - b. Structural Performance: Automatic entrances shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated in Section 08411 "Aluminum-Framed Storefronts and Entrances."
 - c. Materials: As indicated in Section 08411 "Aluminum-Framed Storefronts and Entrances."
 - d. Configuration: Pair of swinging doors with transom and sidelites.
 - 1) Traffic Pattern: One way.
 - 2) Mounting: Between jambs.
 - e. Operator Features:
 - 1) Power opening and power-assist spring closing.
 - 2) Adjustable opening and closing speeds.
 - 3) Adjustable hold-open time between zero and 30 seconds.
 - 4) Adjustable backcheck and latching.
 - b. Controls: Activation and safety devices according to BHMA standards.
 - 1) Activation Device: Motion sensor mounted on ingress side of door header to detect pedestrians in activating zone and to open door.

- 2) Safety Device: Presence sensor mounted on door header to detect pedestrians in presence zone and to prevent door from closing.
 - c. Framing Members: Extruded aluminum, minimum 0.125 inch thick and reinforced as required to support imposed loads.
 - 1) Nominal Size: 1-3/4 by 4-1/2 inches.
 - 2) Extruded Glazing Stops and Applied Trim: Minimum 0.062-inch wall thickness.
 - d. Stile and Rail Doors: 1-3/4-inch-thick, glazed doors with minimum 0.125-inch-thick, extruded-aluminum tubular stile and rail members. Mechanically fasten corners with reinforcing brackets that are welded, or incorporate concealed tie-rods that span full length of top and bottom rails.
 - 1) Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and preformed gaskets.
 - 2) Stile Design: Narrow stile, 2-1/8-inch nominal width.
 - 3) Rail Design: 5-inch nominal height.
 - e. Sidelite(s) and Transom: 1-3/4-inch-deep sidelite(s) and transom with minimum 0.125-inch-thick, extruded-aluminum tubular stile and rail members matching door design.
 - 1) Glazing Stops and Gaskets: Same materials and design as for stile and rail door.
 - f. Headers: Fabricated from minimum 0.125-inch-thick extruded aluminum and extending full width of automatic entrance units to conceal door operators and controls. Provide hinged or removable access panels for service and adjustment of door operators and controls. Secure panels to prevent unauthorized access.
 - g. Brackets and Reinforcements: High-strength aluminum with nonstaining, nonferrous shims for aligning system components.
 - h. Finish: Finish framing, door(s), and header with Class I, clear anodic finish.
 - i. Signage: As required by cited BHMA standard.
- C. Option C - Motion Detecting Optical Turnstiles combined with one automatic entrance at the secure end of the Deplaning Corridor as depicted on the Drawings. On the non-secure side of the automatic entrance, two rows of optical turnstiles shall monitor the movement of persons and objects within the corridor and effectively prevent their passage from the non-secured side to the secured side by controlling the operation of the doors.
- 1. Motion Detection: Provide motion detecting optical turnstiles to monitor Deplaning Corridor traffic direction. System shall include:
 - a. Optical Turnstiles: Basis of Design is Boon Edam "Speedlane 2048" Non-Barrier Security Optical Turnstile. Features shall include:
 - 1) Construction: Casing and top plate to be manufactured from 18 ga. Minimum thickness stainless steel with #4 brushed satin finish.
 - 2) Units to have a minimum of 12 optical sensors using pulsed infrared beams to allow for operation in direct sunlight. Sensors shall be arranged in three rows, approximately 37",

- 23" and 9" above the finish floor. Units shall be capable of operating up to 42" apart.
- b. Configuration: Two rows of optical turnstiles define the Pre-Alarm Zone and the Alarm Zone, respectively. A person or object detected by the first row of optical turnstiles when approached from the non-secure end of the Deplaning Corridor will activate the pre-alarm warnings. A person or object detected by the second row of optical turnstiles when approached from the non-secure end of the Deplaning Corridor will activate the alarm warnings causing the automatic entrance to close.
 - c. Alarms: The system shall include stroboscopic visual alarms units and audio alarms, and interface with door controls for preventing the advance of an attempted breach into the concourse.
 - d. System Video: The video from CCTV cameras shall be capable of being tied into the Airport Operations Center CCTV system to allow distribution or remote viewing of cameras. All equipment shall be included to allow the output of the video signals in the correct format.
 - e. Video Diagnostics: The system shall automatically assess and confirm the video signal from all Exit Lane Breach Control System cameras at least twice in a 24-hour period for each camera.
 - f. Video Loop: Upon alarm, the system shall display a video loop comprised of captured images from before and after the alarm event. The times or frames from before and after the alarm event shall be configurable. Also, the speed of the video loop playback shall be user configurable. The video loop shall be able to be stopped and the frames shall be viewable individually. The frames shall be printable using a printer included as part of the system.
 - g. System Configuration Utility: The system shall contain a configuration utility. The utility shall be password protected. The log-ins shall determine the access possible for the system. All log-ins and access levels shall be configurable by a person with the highest level log-in access. The utility shall be able to view alarm events and logging, enter configuration screens to edit the parameters noted in the above sections, and shall be able to add and delete users and change access levels.
 - h. Remote Access: The system shall be remote accessible via modem to allow configuration changes to the system remotely. The modem shall be an external type modem with a power switch so that the modem can be powered off under normal conditions to prevent unauthorized access to the system. All remote access shall be logged in the logging function of the system.
2. Automatic Entrance: Provide a swinging, power-operated automatic entrance including doors, framing, headers, door operators, controls, and accessories required for a complete installation, as indicated on the Drawings.
- a. Delegated Design: Engage a qualified professional engineer, as defined in Section 01400 "Quality Requirements," to design automatic entrances.
 - b. Structural Performance: Automatic entrances shall withstand the effects of gravity loads and the following loads and stresses within

- limits and under conditions indicated in Section 08411 "Aluminum-Framed Storefronts and Entrances."
- c. Materials: As indicated in Section 08411 "Aluminum-Framed Storefronts and Entrances."
 - d. Configuration: Pair of swinging doors with transom and sidelites.
 - 1) Traffic Pattern: One way.
 - 2) Mounting: Between jambs.
 - e. Operator Features:
 - 4) Power opening and power-assist spring closing.
 - 5) Adjustable opening and closing speeds.
 - 6) Adjustable hold-open time between zero and 30 seconds.
 - 4) Adjustable backcheck and latching.
 - c. Controls: Activation and safety devices according to BHMA standards.
 - 1) Activation Device: Motion sensor mounted on ingress side of door header to detect pedestrians in activating zone and to open door.
 - 2) Safety Device: Presence sensor mounted on door header to detect pedestrians in presence zone and to prevent door from closing.
 - j. Framing Members: Extruded aluminum, minimum 0.125 inch thick and reinforced as required to support imposed loads.
 - 1) Nominal Size: 1-3/4 by 4-1/2 inches.
 - 2) Extruded Glazing Stops and Applied Trim: Minimum 0.062-inch wall thickness.
 - k. Stile and Rail Doors: 1-3/4-inch-thick, glazed doors with minimum 0.125-inch-thick, extruded-aluminum tubular stile and rail members. Mechanically fasten corners with reinforcing brackets that are welded, or incorporate concealed tie-rods that span full length of top and bottom rails.
 - 1) Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and preformed gaskets.
 - 2) Stile Design: Narrow stile, 2-1/8-inch nominal width.
 - 3) Rail Design: 5-inch nominal height.
 - l. Sidelite(s) and Transom: 1-3/4-inch-deep sidelite(s) and transom with minimum 0.125-inch-thick, extruded-aluminum tubular stile and rail members matching door design.
 - 1) Glazing Stops and Gaskets: Same materials and design as for stile and rail door.
 - m. Headers: Fabricated from minimum 0.125-inch-thick extruded aluminum and extending full width of automatic entrance units to conceal door operators and controls. Provide hinged or removable access panels for service and adjustment of door operators and controls. Secure panels to prevent unauthorized access.
 - n. Brackets and Reinforcements: High-strength aluminum with nonstaining, nonferrous shims for aligning system components.
 - o. Finish: Finish framing, door(s), and header with Class I, clear anodic finish.
 - p. Signage: As required by cited BHMA standard.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Prior to commencing IEBCS installation, examine areas into which the system components are to be installed. Verify all critical dimensions. Notify the Owner's Representative in writing of any dimensional discrepancies or other conditions detrimental to the proper installation or performance of work. Do not proceed with installation until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

3.2 INSTALLATION

- A. Schedule: The Contractor shall plan the Exit Lane Breach Control System installation such that the system is installed on a satisfactory schedule developed between the Contractor and the Owner's representative.
- B. Manufacturer's Instructions: Install Exit Lane Breach Control System in accordance with Manufacturer's written instructions.
- C. Coordination: Coordinate IEBCS work with work of other trades for proper time and sequence to avoid construction delays.
- D. Identification: Identify junction boxes, conductors, and termination blocks related to the installation.

3.3 FIELD QUALITY CONTROL

- A. System Testing: Test Exit Lane Breach Control System, including all described subsystems and components to the minimum test requirements of manufacturer and TSA/FAA guidelines. Provide a mechanical and electrical system test as recommended by Manufacturer. Receive TSA's approval after the installation.
 - 1. Advise Construction Manager, Owner, Architect, and inspection department of governing agencies in advance of dates and times tests are to be performed.
- B. Problem Correction: Any problems encountered including damage to Airport owned equipment during this test will be documented and brought to the attention of Owner's Representative and corrected at Contractor's expense. The Contractor shall promptly correct all problems encountered, providing field service personnel appropriately trained for the types of problems encountered.
- C. Test Documentation: The Contractor shall supply forms to be used during these tests for authorization and initialing by the Owner and the Contractor. This form shall clearly define the items tested, leaving room for the date, equipment designation, and initials. All Exit Lane Breach Control System functions shall be demonstrated to ensure operation as required by these Specifications and Drawings.
- D. Make a final check of operation with Owner's Representative present and just prior to date of Substantial Completion. Determine that control systems and operating devices are functioning properly.

3.4 ACCEPTANCE

- A. Acceptance will be withheld until the successful completion of the following:
 - 1. Provide TSA's acceptance letter for the system.
 - 2. Acceptance of all submittals.
 - 3. Delivery of final documentation (including as-built documents).
 - 4. Successful testing.
 - 5. Successful demonstration, including equipment operation, training and documentation review.

3.5 ADJUSTING AND CLEANING

- A. Field Adjustments: Set field-adjust system components as recommended by Manufacturer.
- B. Touch-Up Work: Touch-up scratched and marred surfaces to match original finishes; remove dirt and construction debris.

3.6 PROTECTION

- A. At time of Substantial Completion of IECBS work (or portion thereof), provide suitable protective coverings, barriers, devices, signs, or such other methods or procedures to protect elevator work from damage or deterioration. Maintain protective measures throughout remainder of construction period.

3.7 TRAINING

- A. Instruct Owner's personnel in proper use, operations, and maintenance of entire system. Two (2) categories of system training shall be provided:
 - 1. System operational training shall be provided for a minimum of four (4) operations personnel.
 - 2. Administration/maintenance training shall be provided for a minimum of three (3) maintenance personnel.
- B. Training shall be provided during working hours, with specific days, work shifts, and hours for training to be selected by the Owner.
- C. The Contractor shall provide four (4) sets of system operations manuals for Exit Lane Breach Control System operation training. Provide training materials for each attendee to use at each training session and keep for reference. Provide three (3) copies of each piece of training material used at each session and three complete sets of system keys to the Owner at the completion of training.

END OF SECTION 13755

**NEW PASSENGER TERMINAL
DULUTH INTERNATIONAL AIRPORT
DULUTH, MINNESOTA**

**SECTION 13915 - FIRE PROTECTION
SUPPRESSION PIPING**

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes general requirements for valves, piping and appurtenances for the following water based fire suppression systems:
 - 1. Standpipe, sprinkler and combined risers and cross mains.
 - 2. Sprinkler main and branch piping downstream of the floor control valve.
 - 3. Automatic, semi-automatic, and manual water based suppression systems including wet-pipe, dry-pipe and pre-action systems.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Related Sections include the following:
 - 1. Division 2 Section 02510 "Water Distribution".
 - 2. Division 7 Section 07270 "Firestopping".
 - 3. Division 9 Section 09910 "Painting".
 - 4. Division 13 Section 13050 "General Requirements".
 - 5. Division 13 Section 13060 "Fire Protection Hangers and Supports".
 - 6. Division 13 Section 13075 "Fire Protection Identification".
 - 7. Division 13 Section 13520 "Fire-Protection Cabinets".
 - 8. Division 13 Section 13921 "Electric-Drive, Horizontal Fire Pumps".
 - 9. Division 13 Section 13926 "Vertical-Turbine Fire Pumps".
 - 10. Division 16 Section "Fire Alarm Systems" for alarm devices not in this Section.

1.3 DEFINITIONS

- A. Hose Connection: Valve with threaded outlet matching fire hose coupling thread for attaching fire hose.
- B. Hose Station: Hose connection, fire hose rack, and fire hose.
- C. Working Plans: Documents, including drawings, calculations, and material specifications prepared according to NFPA 13 and NFPA 14 for obtaining approval from authorities having jurisdiction.

D. The following are industry abbreviations for plastic materials:

1. ABS: Acrylonitrile-butadiene-styrene plastic.
2. CPVC: Chlorinated polyvinyl chloride plastic.
3. PE: Polyethylene plastic.
4. PVC: Polyvinyl chloride plastic.

E. The following are industry abbreviations for rubber materials:

1. EPDM: Ethylene-propylene-diene terpolymer rubber.
2. NBR: Acrylonitrile-butadiene rubber.

1.4 SYSTEM PERFORMANCE REQUIREMENTS

- A. Design standpipes piping according to Section 13975 "Standpipes and Hoses".
- B. Design sprinkler piping according to Section 13916 "Fire-Suppression Sprinklers".
- C. Components and Installation: Capable of producing piping systems with **175-psig (1200-kPa)** minimum working-pressure rating, unless otherwise indicated, or as required by Local Code.

1.5 SUBMITTALS

A. Product Data: For the following:

1. Pipe and fitting materials and methods of joining for standpipe piping.
2. Valves, including specialty valves, accessories, and devices.
3. Alarm devices. Include electrical data.
4. Air compressors. Include electrical data.
5. Fire department connections. Include type; number, size, and arrangement of inlets; caps and chains; size and direction of outlet; escutcheon and marking; and finish.
6. Hose connections. Include size, type, and finish.
7. Hose stations. Include size, type, and finish of hose connections; type and length of fire hoses; finish of fire hose couplings; type, material, and finish of nozzles; and finish of rack.
8. Transition fittings.
9. Dielectric fittings.
10. Mechanical sleeve seals.
11. Escutcheons.

B. Welding certificates.

C. Fire-Hydrant Flow Test Report: As specified in Section 13050, "General Requirements".

- D. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13 and NFPA 14. Include "Contractor's Material and Test Certificate for Aboveground Piping" and "Contractor's Material and Test Certificate for Underground Piping."

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has designed and installed fire-suppression piping similar to that indicated for this Project and obtained design approval and inspection approval from authorities having jurisdiction.
- B. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code–Steel."
- C. Manufacturer Qualifications: Firms whose equipment, specialties, and accessories are listed by product name and manufacturer in UL's "Fire Protection Equipment Directory" and FM's "Fire Protection Approval Guide" and that comply with other requirements indicated.
- D. Standpipe and Sprinkler Components: Listing/approval stamp, label, or other marking by a testing agency acceptable to authorities having jurisdiction.
- E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.
- F. NFPA Standards: Equipment, specialties, accessories, installation, and testing complying with the following, in addition to local code and other applicable sections of Division 13:
 - 1. NFPA 13, "Installation of Sprinkler Systems."
- G. Applicator: Company specializing in piping installation with seven years minimum experience.
- H. Systems, installation, equipment and materials shall conform to requirements of the local Building Code, Owners Insurance Underwriters, Factory Mutual, Industrial Risk Insurers, local Fire Department, NFPA, ANSI/ASME B31.9 "Building Service Piping" and all authorities having jurisdiction. Equipment and materials Underwriters listed, labeled and approved as required.

1.7 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.
 - 2. Substitutions will not be permitted unless approved by the engineer.

2.2 PIPE, TUBE, AND FITTINGS

- A. Refer to individual Division 13 Specialty Sections 13915 "Suppression Piping" for pipe, tube, and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.3 JOINING MATERIALS

- A. Refer to individual Division 13 Specialty Sections for special joining materials not listed below.
- B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
 - 1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch (3.2-mm) maximum thickness unless thickness or specific material is indicated.
 - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
 - 2. AWWA C110, rubber, flat face, 1/8 inch (3.2 mm) thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.
- C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- E. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.
- F. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.4 TRANSITION FITTINGS

- A. AWWA Transition Couplings: Same size as, and with pressure rating at least equal to and with ends compatible with, piping to be joined.
 - 1. Manufacturers:
 - a. Cascade Waterworks Mfg. Co.
 - b. Dresser Industries, Inc.; DMD Div.
 - c. Ford Meter Box Company, Incorporated (The); Pipe Products Div.
 - d. JCM Industries.
 - e. Smith-Blair, Inc.
 - f. Viking Johnson.
 - 2. Underground Piping **NPS 2 (DN 50)** and Larger: AWWA C219, metal sleeve-type coupling.
 - 3. Aboveground Pressure Piping: Pipe fitting.

2.5 DIELECTRIC FITTINGS

- A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.
- B. Insulating Material: Suitable for system fluid, pressure, and temperature.
- C. Dielectric Unions: Factory-fabricated, union assembly, for **250-psig (1725-kPa)** minimum working pressure at **180 deg F (82 deg C)**.
 - 1. Manufacturers:
 - a. Capitol Manufacturing Co.
 - b. Central Plastics Company.
 - c. Eclipse, Inc.
 - d. Epco Sales, Inc.
 - e. Hart Industries, International, Inc.
 - f. Watts Industries, Inc.; Water Products Div.
 - g. Zurn Industries, Inc.; Wilkins Div.
- D. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 300-psig **(2070-kPa)** minimum working pressure as required to suit system pressures.
 - 1. Manufacturers:
 - a. Capitol Manufacturing Co.
 - b. Central Plastics Company.
 - c. Epco Sales, Inc.
 - d. Watts Industries, Inc.; Water Products Div.

- E. Dielectric-Flange Kits: Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
 - 1. Manufacturers:
 - a. Advance Products & Systems, Inc.
 - b. Calpico, Inc.
 - c. Central Plastics Company.
 - d. Pipeline Seal and Insulator, Inc.
 - 2. Separate companion flanges and steel bolts and nuts shall have 300-psig (2070-kPa) minimum working pressure where required to suit system pressures.

2.6 SLEEVES AND MECHANICAL SEALS

- A. Refer to Division 13 Section 13053 "General Materials and Methods".

2.7 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Specialty Valves and Devices:
 - a. Badger Fire Protection, Inc.
 - b. Firematic Sprinkler Devices, Inc.
 - c. Reliable Automatic Sprinkler Co., Inc.
 - d. Tyco Sprinkler Corp.
 - e. Viking Corp.
 - f. Victaulic Co. of America.
 - 2. Water-Flow Indicators and Supervisory Switches:
 - a. Potter Electric Signal Co.
 - b. Reliable Automatic Sprinkler Co., Inc.
 - c. Viking Corp.
 - d. System Sensor Div. Pittaway Corp.
 - e. Victaulic Co. of America.
 - 3. Sprinkler, Drain and Alarm Test Fittings:
 - a. Tyco Sprinkler Corp.
 - b. Croker Corp.
 - c. Grinnell Corp.
 - d. Victaulic Co. of America.
 - 4. Sprinkler, Branch-Line Test Fittings:
 - a. Elkhart Brass Mfg. Co., Inc.
 - b. Fire-End and Croker Corp.
 - c. Smith Industries, Inc.; Potter-Roemer Div.
 - d. Potter Roemer.
 - e. Tyco Sprinkler Corp.
 - f. Victaulic Co. of America.

5. Sprinkler, Inspector's Test Fittings:
 - a. Croker Corp.
 - b. AFG Manufacturing, Inc.
 - c. Tyco Sprinkler Corp.
 - d. Victaulic
6. Fire Department Connections:
 - a. Elkhart Brass Mfg. Co., Inc.
 - b. Croker Corp.
 - c. Reliable Automatic Sprinkler Co., Inc.
 - d. Potter Roemer.
7. Hose Connections and Hose Stations:
 - a. Elkhart Brass Mfg. Co., Inc.
 - b. Croker Corp.
 - c. Guardian Fire Equipment, Inc.
 - d. Potter Roemer.
8. Roof Hose Cabinets:
 - a. Croker Corp.
 - b. Metal Cabinet Co.
 - c. Potter Roemer.
9. Indicator Posts and Indicator-Post, Gate Valves:
 - a. American Cast Iron Pipe Co.; Waterous Co.
 - b. Grinnell Corp.
 - c. Clow Valve Co. Div.
 - d. Kennedy Valve Div.
 - e. Nibco, Inc.
 - f. Stockham Valves & Fittings, Inc.
 - g. Potter Roemer.
10. Indicator Valves:
 - a. Tyco Fire, Inc.
 - b. Grinnell Corp.
 - c. Kennedy Valve Div.
 - d. Milwaukee Valve Co., Inc.
 - e. Nibco, Inc.
 - f. Victaulic Co. of America.
 - g. Potter Roemer.
11. Fire-Protection-Service Valves:
 - a. Tyco Fire, Inc.
 - b. Grinnell Corp.
 - c. Kennedy Valve Div.
 - d. Nibco, Inc.
 - e. Stockham Valves & Fittings, Inc.
 - f. Victaulic Co. of America.
12. Keyed Couplings for Steel Piping:
 - a. Grinnell Corp.
 - b. Victaulic Co. of America.

13. Keyed Couplings for Ductile-Iron Piping:
 - a. Victaulic Co. of America.
14. Keyed Couplings for Copper Tubing:
 - a. Grinnell Corp.
 - b. Victaulic Co. of America.
15. Press-Seal Fittings for Steel Piping:
 - a. Victaulic Co. of America.

2.8 PIPING MATERIALS

- A. Provide the following pipe materials in accordance with the piping material schedule on drawing and as required in other Division 13 Sections.
- B. Materials indicated are subject to approval of local governing authorities. All piping and fittings shall be metal, and plastic.
- C. Each pipe length shall have the manufacturer's name cast, stamped or rolled on.
- D. Each fitting shall have the manufacturer's symbol and pressure rating cast, stamped or rolled on, and shall be pressure rated and suitable for the system it is being used for.
- E. Steel pipe (Stl.): Welded or seamless, with maker's name stamped or rolled into each length. Pipe shall be black steel ANSI B125.1 and B125.2.
- F. Copper tubing seamless drawn or extruded tubing Type "L" or Type "K" as scheduled hard temper in accordance with ASTM Specification B-88, with brazed end fittings.

2.9 PIPES AND TUBES

- A. Ductile-Iron Pipe: Comply with UL 213 and AWWA C606 for ductile iron pipe dimension. AWWA C115 or C151, with cement-mortar lining and seal coat according to AWWA C104.
 1. Push-on-joint type; Include rubber gasket according to AWWA C111.
 2. Mechanical-joint type: Include gland, rubber gasket, and bolts and nuts according to AWWA C111.
 3. Factory or field radius-cut grooved according to AWWA C606.
- B. Steel Pipe: Comply with UL 213 and AWWA C606 for steel pipe dimensions.
 1. Standard-Weight: Comply with ASTM A 53, ASTM A 135, or ASTM A 795; Schedule 40 in **NPS 6 (DN150)** and smaller, and Schedule 30 in **NPS 8 (DN200)** and larger.
 2. Schedule 30 Thinwall: For wall thickness less than Schedule 40 and greater than Schedule 10. Comply with ASTM A 135 or ASTM A 795.
 3. Schedule 10: For Schedule 10 in **NPS 5 (DN125)** and smaller and NFPA 13 specified wall thickness in **NPS 6 to NPS 10 (DN150 to DN250)**. Comply with ASTM A 135 or ASTM A 795,
- C. Copper Tube: Comply with ASTM B 88 (**ASTM B 88M**), Type K or Type L water tube, drawn temper. Tube ends may be factory or field expanded to steel-pipe OD.

2.10 PIPE JOINTS AND FITTINGS:

- A. Use the following pipe joints and fittings in accordance with the Pipe Material Schedule shown on the drawings and referenced in other Sections of Division 13.
- B. Joints between lengths of steel pipes: Screwed, flanged or victaulic approved type only. Make screwed joints without the use of lampwick or filler, except "utility compound" or Permacel teflon tape applied to make threads only.
- C. Flanged fittings: Cast iron, ductile iron, bronze or cast steel, of required working pressure, as scheduled.
- D. Mechanical victaulic type joint
 - 1. For steel pipe victaulic type 77, 75, 72 and zero flex are the only approved coupling to be used with grooved piping. Couplings shall be galvanized when used with galvanized piping. All grooves on piping that is galvanized shall be properly cleaned and provided with zinc chromate primer. See pipe material schedule.
- E. Brazed joints for copper tubing make with Handy and Harmon Jil-Fos, silver solder or approved and oxyacetylene flame. Brazing temperature 1300°F. Make the installation as per manufacturers recommendation.
- F. Ductile-Iron Fittings: Comply with UL 213 and AWWA C606 for ductile-iron pipe dimensions.
 - 1. Push-on-joint: AWWA C110 or ductile-iron or cast-iron; or AWWA C153, ductile-iron, compact type. Include cement-mortar lining and seal coat according to AWWA C104 and rubber gaskets according to AWWA C111.
 - 2. Mechanical-Joint: AWWA C110, ductile-iron or cast-iron type; or AWWA C153, ductile-iron, compact type. Include cement-mortar lining and seal coat according to AWWA C104 and glands, rubber gaskets, and bolts and nuts according to AWWA C111.
 - 3. Groove End: **ASTM A 47 (ASTM A 47M)**, malleable-iron or ASTM A 536, ductile-iron casting complying with AWWA pipe size; with ends factory grooved according to AWWA C606. Include cement-mortar lining and seal coat according to AWWA C104 or epoxy, interior coating according to AWWA C550.
 - 4. Keyed Couplings: Include ASTM A 536, ductile-iron housing, rubber gaskets, and steel bolts and nuts.
 - 5. Flanged Joints: AWWA C115, ductile-iron or gray-iron pipe flanges, rubber gaskets, and steel bolts and nuts.
- G. Cast-Iron:
 - 1. Threaded Flanges: ASME B16.1.
 - 2. Threaded Fittings: ASME B16.4.
- H. Malleable-Iron Threaded Fittings: ASME B16.3.
- I. Steel: Comply with UL 213 and AWWA C606, for Steel-Pipe Dimensions.
 - 1. Threaded Couplings: ASTM A 865.
 - 2. Welding Fittings: ASTM A 234/A 234M, ASME B16.9, or ASME B16.11.
 - 3. Flanges and Flanged Fittings: ASME B16.5.

4. Grooved-End Fittings: UL-listed and FM-approved, **ASTM A 47 (ASTM A 47M)**, malleable iron or ASTM A 536, ductile iron; with dimensions matching steel pipe and ends factory grooved according to AWWA C606.
5. Steel, Keyed Couplings: Include ASTM A 536, ductile-iron housing, rubber gaskets, and steel bolts and nuts. Include listing for dry-pipe service for couplings for dry piping.
6. Press-Seal Fittings: UL 213 and FM-approved for use with Schedule 5, plain-end, steel pip, **175-psig (1200-kPa)** pressure rating; with steel housing, butylene O-rings, and pipe stop. Include UL 45-listed fitting manufacturer's pressure-sealing tools.

J. Cast-Copper:

1. Cast Alloy Fittings: ASME B16.18.
2. Wrought-Copper Fittings: ASME B16.22.
3. Cast-Bronze Flanges: ASME B16.24.
4. Copper, Grooved-End Fittings: **ASTM B 75 (ASTM B 75M)**, copper tube or ASTM B 584, bronze castings. Fittings may be copper tube with ends factory or field expanded to steel-pipe OD.
5. Copper, Keyed Couplings: UL 213 and equivalent to AWWA C606, for copper-tube dimensions. Include **ASTM A 47 (ASTM A 47M)**, malleable-iron or ASTM A 536, ductile-iron housing with copper-colored enamel finish, rubber gaskets, and steel bolts and nuts.

- K. Transition Couplings: AWWA C219, sleeve type, or other manufactured fitting the same size as, with pressure rating at least equal to, and with ends compatible with piping to be joined.

2.11 JOINING MATERIALS

- A. Refer to Division 13 Section 13053 "Fire Protection General Materials and Methods" for pipe-flange gasket materials and welding filler metals.
- B. Brazing Filler Metals: AWS A5.8, Classification BCuP-3 or BCuP-4.

2.12 POLYETHYLENE ENCASEMENT

- A. Polyethylene Encasement for Ductile-Iron Piping: ASTM A 674 or AWWA C105, film, **0.008-inch (0.20-mm)** minimum thickness, tube or sheet.

2.13 GENERAL DUTY VALVES

- A. Refer to Division 13 Section 13053 "Fire Protection General Materials and Methods" for gate, ball, butterfly, globe, and check valves not required to be UL listed and FM approved.

2.14 FIRE PROTECTION SERVICE VALVES

- A. General Requirements:
 1. Listings: UL Listed and FM Approved.

2. Working Pressure: As required for intended service but not less than 175-psig (1200 kpa) non-shock rating.
 3. Valves for ground-end piping may be furnished with grooved ends instead of type of ends specified.
- B. Gate Valves:
1. NPS 2 (DN50) and Smaller: UL 262; cast-bronze, threaded ends; solid wedge; OS&Y; and rising stem.
 2. NPS 2-1/2 (DN65) and Larger: UL 262, iron body, bronze mounted, taper wedge, OS&Y, and rising stem. Include replaceable, bronze, wedge facing rings and flanged ends.
- C. Indicating Valves:
1. NPS 2-1/2 (DN65) and Smaller: UL 1091; butterfly or ball-type, bronze body with threaded ends; and integral indicating device. Indicator: Visual with electrical 115-V ac, prewired, two-circuit, supervisory switch.
- D. Indicator-Post:
1. Gate Valves: UL 262, iron body, bronze mounted, solid-wedge disc, and nonrising stem with operating nut and flanged ends.
 2. Indicator Posts: UL 789, horizontal, wall type, cast-iron body, with windows for target plates that indicate valve position, extension rod and coupling, locking device, and red enamel finish. Provide operating wrench or handwheel.
- E. Swing Check Valves
1. NPS 2 (DN50) and Smaller: UL 312 or MSS SP-80, Class 150; bronze body with bronze disc and threaded ends.
 2. NPS 2-1/2 (DN65) and Larger: UL 312, cast-iron body and bolted cap, with bronze disc or cast-iron disc with bronze-disc ring and flanged ends.
- F. Check Valves Split-Clapper NPS 4 (DN100) and Larger: UL 312, cast-iron body with rubber seal, bronze-alloy discs, and stainless-steel spring and hinge pin.

2.15 SPECIALTY VALVES

- A. Dry-Pipe Valves: UL 260; differential type; 175-psig (1200-kPa) working pressure; with cast-iron flanged inlet and outlet, bronze seat with O-ring seals, and single-hinge pin and latch design. Include UL 1486, quick-opening devices, trim sets for air supply, drain, priming level, alarm connections, ball drip valves, pressure gages, priming chamber attachment, and fill-line attachment.
1. Option: Grooved-end connections for use with keyed couplings.
 2. Air-Pressure Maintenance Devices: Automatic device to maintain correct air pressure in piping. Include shutoff valves to permit servicing without shutting down sprinkler piping, bypass valve for quick filling, pressure regulator or switch to maintain pressure, strainer, pressure ratings with 14- to 60-psig (95- to 410-kPa) adjustable range, and 175-psig (1200-kPa) maximum inlet pressure.
 3. Air Compressor: Fractional horsepower, 120-V ac, 60 Hz, single phase.
- B. Ball Drip Valves: UL 1726, automatic drain valve, NPS 3/4 (DN20), ball check device with threaded ends.

2.16 HOSE CONNECTIONS

- A. Description: UL 668, **300-psig (2070-kPa)** minimum pressure rating, brass, hose valve for connecting fire hose. Include 90-degree angle pattern design; female NPS inlet and male hose outlet; and lugged cap, gasket, and chain. Include **NPS 2-1/2 (DN40 or DN65)** as indicated, and hose valve threads according to NFPA 1963 and matching local fire department threads.
1. Valve Operation: Nonadjustable type.
 2. Finish: Rough brass.
 3. Finish: Rough chrome-plated.

2.17 FIRE DEPARTMENT CONNECTIONS

- A. Wall, Fire Department Connections: UL 405; cast-brass body with brass, wall, escutcheon plate; brass, lugged caps with gaskets and brass chains; and brass, lugged swivel connections. Include inlets with threads according to NFPA 1963 and matching local fire department sizes and threads, outlet with pipe threads, extension pipe nipples, check devices or clappers for inlets, and escutcheon plate with marking "AUTO SPKR & STANDPIPE."
1. Type: Flush mounting.
 2. Type: Exposed, projecting mounting.
 3. Escutcheon Plate: Round.
 4. Escutcheon Plate: Square.
 5. Escutcheon Plate: Rectangular.
 6. Finish: Polished chrome-plated.
 7. Finish: Rough chrome-plated.
 8. Finish: Polished brass.

2.18 ALARM DEVICES

- A. General: Types matching piping and equipment connections.
- B. Water-Flow Indicators: UL 346; electrical-supervision, vane-type water-flow detector; with **250-psig (1725-kPa)** pressure rating; and designed for horizontal or vertical installation. Include two single-pole, double-throw, circuit switches for isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover that sends signal if removed.
- C. Pressure Switches: UL 753; electrical-supervision-type, water-flow switch with retard feature. Include single-pole, double-throw, normally closed contacts and design that operates on rising pressure and signals water flow.
- D. Valve Supervisory Switches: UL 753; electrical; single-pole, double throw; with normally closed contacts. Include design that signals controlled valve is in other than fully open position.

- E. Indicator-Post Supervisory Switches: UL 753; electrical; single-pole, double throw; with normally closed contacts. Include design that signals controlled indicator-post valve is in other than fully open position.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Refer to Division 13 Section 13050 "Fire Protection General Requirements".

3.2 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. Install piping according to the following requirements and Division 13 Sections specifying piping systems. See Section 13053 "Fire Protection General Materials".
- B. No pipes, valves or other apparatus shall be installed so as to interfere in any way with the full swing of the doors.
- C. Where so shown, or required, piping shall be installed concealed in building construction.
- D. All screwed pipe throughout the job shall be reamed smooth before being installed. Pipe shall not be split, bent, flattened nor otherwise injured either before or during the installation.
- E. Where piping is required to be hung from other than stone concrete slabs, such as pre-cast or metal decking, submit proposed method of support to the structural engineer for approval prior to installation. See Division 13 Section 13060 "Fire Protection Hangers and Supports" for additional requirements.
- F. Piping may be hung from structural steel by means of beam attachments. All auxiliary steel required for support shall be provided by this trade. See Division 13 Section 13060 "Fire Protection Hangers and Supports" for additional requirements.
- G. Do not hang piping from ductwork, except a 1" drop branch to a maximum of two heads.
- H. The Contractor may coordinate with other contractors to use common means of support. Submit for approval all pertinent design data relating to the support as well as verification of the responsibility for the support. See Division 13 Section 13060 "Fire Protection Hangers and Supports" for additional requirements.
- I. Install fittings for changes in direction and branch connections.
- J. Install piping to allow application of insulation as required.
- K. Select system components with pressure rating equal to or greater than system operating pressure.

3.3 PIPING APPLICATIONS

- A. Do not use welded joints with galvanized steel pipe.
- B. Flanges, unions, and transition and special fittings with pressure ratings the same as or higher than system's pressure rating may be used in aboveground applications, unless otherwise indicated.
- C. Piping between Fire Department Connections and Check Valves: Use galvanized, standard-weight steel pipe with threaded ends; cast- or malleable-iron threaded fittings; and threaded joints.
- D. Piping between Fire Department Connections and Check Valves: Use galvanized, standard-weight steel pipe with grooved ends; steel, grooved-end fittings; steel, keyed couplings; and grooved joints.
- E. Underground Service-Entrance Piping: Use ductile-iron, push-on-joint pipe and fittings and restrained joints.
- F. Underground Service-Entrance Piping: Use ductile-iron, mechanical-joint pipe and fittings and restrained joints.
- G. Underground Service-Entrance Piping: Use ductile-iron, grooved-end pipe and fittings; ductile-iron, keyed couplings; and grooved joints.
- H. Standpipes: See Division 13 Section 13975 "Fire Protection Standpipes and Hoses".
- I. Sprinkler Piping shall be per Section 13916 "Fire Suppression Sprinklers".

3.4 VALVE APPLICATIONS

- A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
 - 1. Fire-Protection-Service Valves: UL listed and FM approved for applications where required by NFPA 13 and NFPA 14.
 - a. Shutoff Duty: Use gate valves.
 - 2. General-Duty Valves: For applications where UL-listed and FM-approved valves are not required by NFPA 13 and NFPA 14.
 - a. Shutoff Duty: Use gate, ball, or butterfly valves.
 - b. Throttling Duty: Use globe, ball, or butterfly valves.

3.5 PIPING JOINT CONSTRUCTION

- A. Refer to Division 15 Section 13053 "Fire Protection General Materials and Methods" for basic piping joint construction.

- B. Join pipe and fittings according to the following requirements and Division 21 Sections specifying piping systems.
- C. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- D. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- E. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.
- F. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.
- G. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.21.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- H. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.
- I. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
- J. Ductile-Iron-Piping, Grooved Joints: Use ductile-iron pipe with radius-cut-grooved ends; ductile-iron, grooved-end fittings; and ductile-iron, keyed couplings. Assemble joints with couplings, gaskets, lubricant, and bolts according to coupling manufacturer's written instructions.
- K. Steel-Piping, Grooved Joints: Use Schedule 40 steel pipe with cut or roll-grooved ends and Schedule 30 or thinner steel pipe with roll-grooved ends; steel, grooved-end fittings; and steel, keyed couplings. Assemble joints with couplings, gaskets, lubricant, and bolts according to coupling manufacturer's written instructions. Use gaskets listed for dry-pipe service for dry piping.
- L. Copper-Tubing, Grooved Joints: Use copper tube with roll-grooved ends; copper, grooved-end fittings; and copper, keyed couplings. Assemble joints with couplings, gaskets, lubricant, and bolts according to coupling manufacturer's written instructions. Use gaskets listed for dry-pipe service for dry piping.
- M. Brazed Joints: Use AWS A5.8, BCuP-3 or BCuP-4 filler metals.
- N. Press-Seal-Fitting Joints: Use UL-listed tool and procedure and follow fitting manufacturer's written instructions. Include use of specific equipment, pressure-sealing tool, and accessories.

- O. Locking-Lug-Fitting, Twist-Locked Joints: Follow fitting manufacturer's written instructions.
- P. Dissimilar-Piping-Material Joints: Construct joints using adapters or couplings compatible with both piping materials. Use dielectric fittings if both piping materials are metal. Refer to Division 13 Section 13053 "Fire Protection General Materials and Methods" for dielectric fittings.

3.6 SERVICE-ENTRANCE PIPING

- A. Connect fire suppression piping (standpipe and sprinkler) to water-service piping of size and in location indicated for service entrance to building. Refer to Division 2 Section "Water Distribution" for exterior piping.
- B. Install shutoff valve, backflow preventer, pressure gage, drain, and other accessories indicated at connection to water-service piping. Refer to Division 13 Section 13122 "Fire Protection Meters and Gages" for backflow preventers.
- C. Install shutoff valve, check valve, pressure gage, drain, and other accessories at connection to water service.

3.7 WATER-SUPPLY CONNECTION

- A. Connect fire suppression piping (standpipe and sprinkler) to building interior water distribution piping. Refer to Division 15 Section "Water Distribution Piping" for interior piping.
- B. Install shutoff valve, backflow preventer, pressure gage, drain, and other accessories indicated at connection to water distribution piping. Refer to Division 15 Section "Plumbing Specialties" AND Section 13916 Fire Suppression Sprinklers and Section 13975 Standpipe and Hoses for backflow preventers.
- C. Install shutoff valve, check valve, pressure gage, drain, and other accessories at connection to water service.

3.8 PIPING INSTALLATION

- A. Refer to Division 13 Section 13053 "Fire Protection General Materials and Methods" for basic piping installation.
- B. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated, as far as practical.
 - 1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect before deviating from approved working plans.
- C. Install underground service-entrance piping according to Local Code and NFPA 24 and with restrained joints.

- D. Use approved fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.
- E. Make connections according to the following, unless otherwise indicated:
 - 1. Install unions, in piping NPS 2 (DN 50) and smaller, adjacent to each valve and at final connection to each piece of equipment.
 - 2. Install flanges, in piping NPS 2-1/2 (DN 65) and larger, adjacent to flanged valves and at final connection to each piece of equipment.
 - 3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
 - 4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.
- F. Install piping with drains for complete system drainage.
- G. Install ball drip valves to drain piping between fire department connections and check valves. Drain to floor drain or outside building.
- H. Install alarm devices in piping systems. As required by Local Codes, NFPA 13, 14, 20 and as called for in other sections of Division 13.
- I. Hangers and Supports: See Section 13060 "Fire Protection Hangers and Supports".
- J. Install piping with grooved joints according to manufacturer's written instructions. Construct rigid piping joints, unless otherwise indicated.
- K. Install pressure gages on riser or feed main, at each sprinkler test connection, and at top of each standpipe as called for in other sections of Division 13. Include pressure gages with connection not less than **NPS 1/4 (DN8)** and with soft metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal, and install where they will not be subject to freezing.

3.9 VALVE INSTALLATION

- A. Refer to Division 13 Section 13053 "Fire Protection General Materials and Methods" for installing general-duty valves. Install fire-protection specialty valves, trim, fittings, controls, and specialties according to Local Code Requirements, NFPA 13 and NFPA 14, manufacturer's written instructions, and authorities having jurisdiction.
- B. Gate Valves: Install fire-protection-service valves supervised-open, located to control sources of water supply except from fire department connections. Provide permanent identification signs indicating portion of system controlled by each valve.
- C. Valves for Wall Fire Hydrants: Install gate valve with nonrising stem in supply pipe.
- D. Install check valve in each water-supply connection. Install backflow preventers instead of check valves in potable-water supply sources.
- E. Pre-Action and Dry-Pipe Valves: Install deluge valve and trim sets for air supply, drain, priming level, alarm connections, ball drip valves, pressure gages, priming chamber attachment, and fill-line attachment. See other sections of Division 13 for additional information.

3.10 LABELING AND IDENTIFICATION

- A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13 and NFPA 14 and in Division 13 Section 13075 "Fire Protection Identification".

3.11 FIELD QUALITY CONTROL

- A. Flush, test, and inspect all piping according to Division 13 Section 13050 "Fire Protection General Requirements".
- B. Replace piping system components that do not pass test procedures and retest to demonstrate compliance. Repeat procedure until satisfactory results are obtained.
- C. Report test results promptly and in writing to Architect and authorities having jurisdiction.

3.12 PROTECTION AND CLEANING

- A. Clean dirt and debris from piping.
- B. See Section 13050 "Fire Protection General Requirements".

3.13 COMMISSIONING

- A. Verify that specialty valves, trim, fittings, controls, and accessories are installed and operate correctly.
- B. Verify that specified tests of piping are complete.
- C. Verify that potable-water supplies have correct types of backflow preventers.
- D. Drain dry system piping.
- E. Verify that hose connections and fire department connections have threads compatible with local fire department equipment.
- F. Fill wet-pipe systems with water. Contractor shall restrict the fill rate to avoid water hammer within the fire suppression systems.

END OF SECTION 13915

**NEW PASSENGER TERMINAL
DULUTH INTERNATIONAL AIRPORT
DULUTH, MINNESOTA**

**SECTION 13916 - FIRE SUPPRESSION
SPRINKLERS**

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes fire-suppression sprinklers, piping, and equipment for the following building systems:
 - 1. Wet and dry, fire-suppression sprinklers, including piping, valves, specialties, automatic sprinklers, air compressor, and accessories.
- B. Work Included:
 - 1. The system shall include all fire department connections, roof manifolds, hose stations, fire department outlets, fire, jockey pumps & controllers valves, wet sprinklers, dry sprinklers, etc. sprinkler heads, piping drain risers, cabinets, alarms as required for a complete system. Building or area will be fully sprinkled (exception only as per local code).
 - 2. All areas will be supplied from a combination standpipe or sprinkler riser system.
 - 3. Areas exposed to freezing will have a dry type sprinkler system.
 - 4. Before any work is commenced, shop drawings shall be carefully prepared and submitted for approval. It is required that the sprinkler systems be sized hydraulically in accordance with NFPA standards. Submit hydraulic calculation of each system with shop drawings showing balanced system delivery, and balanced supply and demand for the appropriate hazard class as defined in NFPA 13, latest edition accepted by local authority having jurisdiction. Such drawings and calculations must be reviewed and approved by all governing authorities, Fire Department, Owners Insurance Underwriters, Factory Mutual and/or Industrial Risk Insurers before any work is commenced at the jobsite.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Related Sections include the following:
 - 1. Division 13 Section 13053 "Fire Protection General Materials and Methods."
 - 2. Division 13 Section 13060 "Fire Protection Hangers and Supports."
 - 3. Division 13 Section 13071 "Fire Protection Vibration and Seismic Control."
 - 4. Division 13 Section 13075 "Fire Protection Identification."
 - 5. Division 13 Section 13083 "Fire Protection Piping Insulation."
 - 6. Division 13 Section 13921 "Fire Protection Electric-Drive, Horizontal Fire Pumps."
 - 7. Division 13 Section 13926 "Fire Protection Vertical-Turbine Fire Pumps."
 - 8. Division 16 Section "Fire Alarm Protective Systems" for alarm devices not in this Section

1.3 DEFINITIONS

- A. CPVC: Chlorinated polyvinyl chloride plastic.
- B. Working Plans: Documents, including drawings, calculations, and material specifications prepared according to NFPA 13 for obtaining approval from authorities having jurisdiction.
- C. Automatic: As applied to fire protection devices, is a device or system providing an emergency function without the necessity for human intervention and activated as a result of a predetermined temperature rise, rate of temperature rise, or combustion products.
- D. Automatic Sprinkler System: A sprinkler system, for fire protection purposes, is an integrated system of underground and overhead piping designed in accordance with fire protection engineering standards. The system includes a suitable water supply. The portion of the system above the ground is a network of specially sized or hydraulically designed piping installed in a structure or area, generally overhead, and to which automatic sprinklers are connected in a systematic pattern. The system is usually activated by heat from a fire and discharges water over the fire area.
- E. Deluge System: A sprinkler system employing open sprinklers attached to a piping system connected to a water supply through a valve that is opened by the operation of a detection system installed in the same areas as the sprinklers. When this valve opens, water flows into the piping system and discharges from all sprinklers attached thereto.
- F. Detector, Heat: A fire detector that senses heat produced by burning substances. Heat is the energy produced by combustion that causes substances to rise in temperature.
- G. Fire Protection System: Approved devices, equipment and systems or combinations of systems used to detect a fire, activate an alarm, extinguish or control a fire, control or manage smoke and products of a fire or any combination thereof.
- H. Initiating Device: A system component that originates transmission of a change-of-state condition, such as in a smoke detector, manual fire alarm box, or supervisory switch.
- I. Listed: Equipment, materials or services included in a list published by an organization acceptable to the code enforcement official and concerned with evaluation of products or services that maintains periodic inspection of production of listed equipment or materials or periodic evaluation of services and whose listing states either that the equipment, material or service meets identified standards or has been tested and found suitable for a specified purpose
- J. Record Drawings: Drawings ("as built") that document the location of all devices, appliances, wiring, sequences, wiring methods, and connections of the components of a fire alarm system as installed.
- K. Smoke-proof Enclosure: An exit stairway designed and constructed so that the movement of the products of combustion produced by a fire occur ring in any part of the building into the enclosure is limited.

1.4 SYSTEM PERFORMANCE REQUIREMENTS

- A. Design sprinkler piping according to Local Code and to the following and obtain approval from authorities having jurisdiction:
1. Include 10 percent margin of safety for available water flow and pressure.
 2. Include losses through water-service piping, valves, and backflow preventers.
 3. Sprinkler Occupancy Hazard Classifications: Shall be per Local Code, NFPA, and Requirements of the Authority having Jurisdiction. In the absence of more restrictive requirements, the following classifications shall apply:
 - a. Building Service Areas: Ordinary Hazard, Group 1.
 - b. Electrical Equipment Rooms: Ordinary Hazard, Group 1.
 - c. General Storage Areas (Not over 12 ft.): Ordinary Hazard, Group 1.
 - d. General Storage Areas (Over 12 ft.): Ordinary Hazard, Group 2 or per NFPA 13.
 - e. Mechanical Equipment Rooms: Ordinary Hazard, Group 2.
 - f. Office and Public Areas: Light Hazard.
 - g. Passenger areas: Ordinary Hazard, Group 1.
 - h. Baggage Handling: Ordinary Hazard, Group 2.
 4. Minimum Density for Automatic Wet-Pipe Sprinkler Design: Shall be as follows:
 - a. Light-Hazard Occupancy: 0.10 gpm over 1500-sq. ft. (6.3 mL/s over 139-sq. m) area.
 - b. Ordinary-Hazard, Group 1 Occupancy: 0.15 gpm over 1500- sq. ft. (9.5 mL/s over 139-sq. m) area.
 - c. Ordinary-Hazard, Group 2 Occupancy: 0.20 gpm over 1500- sq. ft. (12.6 mL/s over 139-sq. m) area.
 5. Minimum density for dry pipe sprinkler systems shall be per wet-pipe sprinkler density with 30% larger area of application.
 6. Minimum Density for Deluge-Sprinkler Piping Design: As follows:
 - a. Ordinary-Hazard, Group 2 Occupancy: 0.20 gpm (12.6 mL/s) over entire area.
 7. Maximum Protection Area per Sprinkler: Shall be in accordance with the sprinkler heads listing or as follows:
 - a. Office Space: 225 sq. ft. (20.9 sq. m).
 - b. Storage Areas: 130 sq. ft. (12.1 sq. m) or as required by Local Code and NFPA.
 - c. Mechanical Equipment Rooms: 130 sq. ft. (12.1 sq. m).
 - d. Electrical Equipment Rooms: 130 sq. ft. (12.1 sq. m).
- B. Components and Installation: Capable of producing piping systems with 175-psig (1200-kPa) minimum working-pressure rating, unless otherwise indicated.
- C. The sprinkler heads in all areas are to be installed in the center of the tile or centered with lights, diffusers or similar elements as indicated on the architectural reflected ceiling drawings. Sprinkler heads must also be installed on a true axis line in both directions with a maximum deviation from the axis line of ½" plus or minus. At the completion of the

installation, if any heads are found to exceed the above mentioned tolerance, same shall be removed and reinstalled by this Contractor at no additional cost to the Owner.

- D. Provide all sprinkler heads and work in strict conformance with approved shop drawings. The Architect and/or Design Engineer reserves the right to reject any and all work not in accordance with the approved shop drawing.
- E. Whether or not the system shown on the Contract Drawings meets the requirements of the National Fire Protection Association, these specifications require the furnishing and installation of sprinkler systems complete in all details and in accordance with the standards of the National Fire Protection Association.
- F. Perform the following in areas where painting occurs or when sprinkler piping is painted. As soon as sprinkler heads are in place and the Contractor shall cover each head with a small bag of an Underwriter's approved type, which shall be removed only after all painting is complete. After the bag is removed, all heads shall be cleaned and polished.
- G. Hydraulic Calculations: Submit hydraulic calculations as part of the shop drawings. Prepare hydraulic calculations in accordance with NFPA 13 and the design criteria indicated on the drawings with the following exceptions:
 - 1. Minimum operating pressure of any sprinkler head shall be according to NFPA 13 and UL listed or/FM approved.
 - 2. Pipe friction losses may be calculated by using the nearest foot for all piping over one foot in length. Horizontal lengths less than one foot may be neglected. Vertical length less than one foot shall be included for elevation purposes only.
 - 3. Flows shall be calculated to the nearest whole gallon.
 - 4. Velocity pressures may be neglected.
 - 5. Velocities in all piping shall not exceed 30 feet per second. Velocities in standpipes must be calculated based on the sprinkler flow and hose flow.
 - 6. The sprinkler/standpipe risers shall accommodate the sprinkler and standpipe hose stream flows. Each riser shall accommodate 250 gallons per minute flow for standpipe hose stream.
 - 7. Provide a minimum 20 psi differential (when applicable) between the available water supply and total system demand of the calculated sprinkler flow plus hose demand at residential pressure required for system.
 - 8. Refer to sprinkler design criteria on drawings for additional information.

1.5 SUBMITTALS

- A. Product Data: In addition to the requirements of Section 13050 "Fire Protection General Requirements" provide the following:
 - 1. Pipe and fitting materials and methods of joining for sprinkler piping.
 - 2. Pipe hangers, supports and restraints.
 - 3. Valves, including specialty valves, accessories, and devices.
 - 4. Alarm devices. Include electrical data.
 - 5. Air compressors. Include electrical data.
 - 6. Fire department connections. Include type; number, size, and arrangement of inlets; caps and chains; size and direction of outlet; escutcheon and marking; and finish.
 - 7. Sprinklers, escutcheons, and guards. Include sprinkler flow characteristics, mounting, finish, and other pertinent data.

- B. Fire-Hydrant Flow Test Report: See Section 13050 "Fire Protection General Requirements" for additional information.
- C. Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13, that have been approved by authorities having jurisdiction. Include hydraulic calculations, for all applicable systems.
- D. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13. Include "Contractor's Material and Test Certificate for Aboveground Piping" and "Contractor's Material and Test Certificate for Underground Piping."
- E. Product Requirement Data: For each type of sprinkler specialty to include in maintenance manuals specified in Division 1 Section 01600 and Division 13 Section 13050.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has designed and installed fire-suppression piping similar to that indicated for this Project and obtained design approval and inspection approval from authorities having jurisdiction.
- B. Engineering Responsibility: Preparation of working plans, calculations, and field test reports by a qualified professional engineer. Base calculations on results of fire-hydrant flow test.
- C. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of fire-suppression piping that are similar to those indicated for this Project in material, design, and extent.
- D. Manufacturer Qualifications: Firms whose equipment, specialties, and accessories are listed by product name and manufacturer in UL's "Fire Protection Equipment Directory" and FM's "Fire Protection Approval Guide" and that comply with other requirements indicated.
- E. Sprinkler Components: Listing/approval stamp, label, or other marking by a testing agency acceptable to authorities having jurisdiction. All components shall be domestically produced by reputable manufacturer with all certificates in place. Components of questionable quality or origin shall not be used.
- F. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.
- G. NFPA Standards: In addition to Local Code Requirements, all Equipment, specialties, accessories, installation, and testing complying with the following:
 - 1. NFPA 13, "Installation of Sprinkler Systems."
 - 2. NFPA 10 Extinguishers

3. NFPA 14 Stand Pipes
4. NFPA 20 Fire Pumps
5. NFPA 415 "Air Port Terminals"

1.7 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Sprinkler Cabinets: Finished, wall-mounting steel cabinet and hinged cover, with space for a minimum of six spare sprinklers plus sprinkler wrench. Include the number of sprinklers required by NFPA 13 and wrench for sprinklers. Include separate cabinet with sprinklers and wrench for each type of sprinkler on Project. Unless otherwise noted the cabinet shall be located in the fire pump or incoming fire service valve room.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Specialty Valves and Devices:
 - a. Globe Fire Sprinkler Corp.
 - b. Grinnell Corp.
 - c. Reliable Automatic Sprinkler Co., Inc.
 - d. Tyco Sprinkler Corp.
 - e. Viking Corp.
 2. Water-Flow Indicators and Supervisory Switches:
 - a. Gamewell Co.
 - b. Grinnell Corp.
 - c. Pittway Corp.; System Sensor Div.
 - d. Potter Electric Signal Co.
 - e. Reliable Automatic Sprinkler Co., Inc.
 - f. System Sensor Div. Pittaway Corp.
 - g. Viking Corp.
 - h. Watts Industries, Inc.; Water Products Div.
 3. Sprinkler, Drain and Alarm Test Fittings:
 - a. Central Sprinkler Corp.
 - b. Fire-End and Croker Corp.

- c. Grinnell Corp.
 - d. Victaulic Co. of America.
- 4. Sprinkler, Branch-Line Test Fittings:
 - a. AFG Manufacturing, Inc.
 - b. Elkhart Brass Mfg. Co., Inc.
 - c. Fire-End and Croker Corp.
 - d. Potter Roemer.
- 5. Sprinkler, Inspector's Test Fittings:
 - a. Croker Corp.
 - b. Victualic Co. of America.
- 6. Sprinklers:
 - a. Globe Fire Sprinkler Corp.
 - b. Reliable Automatic Sprinkler Co., Inc.
 - c. Viking Corp.
 - d. Victaulic
 - e. Tyco, Inc.

2.2 PIPING MATERIALS

- A. Refer to Division 13 Section 13915 for applications of pipe, tube, fitting, and joining materials.
- B. Piping, sprinkler heads and hangers within an MRI room shall be non-ferrous material.

2.3 PIPES AND TUBES

- A. Refer to Division 13 Section 13915 "Fire Protection Suppression Piping".

2.4 PIPE AND TUBE FITTINGS

- A. Refer to Division 13 Section 13915 "Fire Protection Suppression Piping".

2.5 JOINING MATERIALS

- A. Refer to Division 13 Section 13915 "Fire Protection Suppression Piping".

2.6 GENERAL-DUTY VALVES

- A. Refer to Division 13 Section 13053 "Fire Protection General Materials and Methods" for gate, ball, butterfly, globe, and check valves not required to be UL listed and FM approved.

2.7 FIRE-PROTECTION-SERVICE VALVES

- A. General: UL listed and FM approved, with minimum **175-psig (1200-kPa)** nonshock working-pressure rating. Valves for grooved-end piping may be furnished with grooved ends instead of type of ends specified.
- B. Refer to Division 13 Section 13915 "Fire Protection Suppression Piping".
- C. Provide Supervisory Tamper switches on all control valves.
- D. See schedule on drawings for models and types of valves. All valves shall be listed for Fire Protection service.
- E. Control valves of O.S. & Y. pattern gate valves with equalizing bypass for valves 6" and larger in size.
- F. Provide on all control and sectional valves, 120 volt closed circuit supervisory tamper switches, shop mounted in accordance with Underwriters IRI, and F.M. standards. Wiring to alarm panel is under other sections of the work.
- G. Pressure Reducing Valves for Fire Hose Valves
 - 1. Provide adjustable pressure reducing valve on each hose valve where required by Code and local fire department. Refer to riser diagram for locations.
 - 2. Where hydrostatic pressure exceeds 100 psi, adjust to 100 psi discharge pressure.

2.8 DRY PIPE VALVES:

- A. Provide Reliable Automatic Sprinkler Co., Model D, Central, Viking or other approved. Dry pipe valves and standard trimmings, including priming chamber, Reliable Model B Accelerator, priming water level test facilities, alarm testing by-pass, alarm switch to actuate electric alarm gongs and provide alarm signal at alarm panel and necessary test and drain piping and fitting to make a complete installation.

2.9 DRY PIPE AIR COMPRESSORS:

- A. Provide sprinkler type air compressors of sufficient capacity to meet the demands of the dry pipe sprinkler system. Air compressors shall be specifically listed for Fire Protection services. Coordinate with electrical trade for available electrical service.
- B. Provide manual starter and automatic start-stop pressure switch control in accordance with N.F.P.A. standards.
- C. Compressor shall include suction muffler filter, MVD with cooling fan, flywheel and centrifugal unloader, inter-cylinder manifold with single inlet connection, NEMA open drip-proof motor, motor slide rails all assembled on steel base and mounted on housekeeping pad. Provide automatic air maintenance device with required trim.
- D. Provide in compressed air piping a low pressure alarm switch wired to alarm panel by Electrical Trade.

- E. Provide compressed air piping system with type "L" copper tubing, valves and all required accessories.

2.10 WATER-FLOW INDICATOR:

- A. Provide where indicated, Potter Electric Switch Company, or other approved Type VSR-D Detector with flexible vane and retarding device to prevent false alarms from line surges.
- B. Wiring to Central Control & Surveillance System will be provided by the Electrical Trade.

2.11 SPRINKLER CONTROL RIG:

- A. See detail on drawings.
- B. Sprinkler control rigs shall contain all controls, test alarms, and drain apparatus at sprinkler tap points, at the combination riser.

2.12 SPRINKLER DRAINS AND TEST CONNECTION:

- A. Provide all necessary drain valves, drain risers, capped nipples, auxiliary piping, etc., as required to drain the system risers and mains and all trapped portions of the system. Drain valves which are not connected to drain pipes leading to floor drains shall be hose end type.
- B. Main drains and test connections shall be piped to waste, or as shown on drawings.
- C. Provide all piping required to spill the drains and test connections to the floor, funnel or other drainage connections provided under the Plumbing Contract, or arrange with the Plumbing Trade to provide additional drainage facilities, in which case pay all charges related to the additional Plumbing Construction work.
- D. Provide Inspectors Test connections at end of systems in accordance with Section 3082 of N.F.P.A. Pamphlet No. 13, and as required by Local Fire Department or authorities having jurisdiction. Pipe to waste and include sight connection as necessary.

2.13 SPRINKLER HEADS:

- A. Provide approved automatic spray sprinkler heads of Reliable Automatic Sprinkler Co., or other approved manufacturer.
- B. Head locations, type and finish as scheduled on the drawings.
- C. Dry pendant type heads shall be listed and provided with 1" vertical pipe to horizontal branch, in all area's subject to freezing with hung ceilings or soffits on dry pipe systems.
- D. All heads shall be of the proper temperature rating for the locations in which they are installed.
- E. Provide sprinkler guards where sprinkler heads are located 7'-0" AFF or where heads are subject to damage.

- F. Provide stock of extra sprinkler heads, sprinkler wrenches in accordance with Article 3660 of N.F.P.A. Pamphlet No. 13. Cabinets shall be Reliable or other approved.

2.14 ALARM GONGS:

- A. Provide ACME or other approved, WSVB electric, weatherproof, underdome vibration alarm gongs.

2.15 LADDERS:

- A. Steel ladders to all valves located 7 ft. or as required by local authorities above finished floor will be provided by others.
- B. This Trade shall furnish a location list of all required ladders to the installing trade.

2.16 SPRINKLERS

- A. Sprinkler Types and Categories: Nominal 1/2-inch (12.7-mm) orifice for "Ordinary" temperature classification rating, unless otherwise indicated or required by application.
- B. Sprinkler types, features, and options include the following:
 - 1. Concealed ceiling sprinklers, including cover plate.
 - 2. Flush ceiling sprinklers, including escutcheon.
 - 3. Institution sprinklers, made with small, breakaway projection.
 - 4. Pendent sprinklers.
 - 5. Pendent, dry-type sprinklers.
 - 6. Quick-response sprinklers.
 - 7. Recessed sprinklers, including escutcheon.
 - 8. Upright sprinklers.
- C. Sprinkler Finishes: Chrome-plated, bronze, or factory painted as directed by the Architect.
- D. Sprinkler Escutcheons: Materials, types, and finishes for the following sprinkler mounting applications, unless alternate finish is specified by architect. Escutcheons for concealed, flush, and recessed-type sprinklers are specified with sprinklers.
 - 1. Ceiling Mounting: Chrome-plated steel, one piece, flat.
 - 2. Ceiling Mounting: Chrome-plated steel, two piece, with 1-inch (25-mm) vertical adjustment.
 - 3. Ceiling Mounting: Plastic, white finish, one piece, flat.
- E. Sprinkler Guards: Wire-cage type, including fastening device for attaching to sprinkler.

2.17 SPECIALTY SPRINKLER FITTINGS

- A. Specialty Fittings: UL listed and FM approved; made of steel, ductile iron, or other materials compatible with piping.

- B. Dry-Pipe-System Fittings: Corrosion Resistant, UL listed for dry-pipe service.
- C. Locking-Lug Fittings: UL 213, ductile-iron body with locking-lug ends.
- D. Mechanical-T Fittings: UL 213, ductile-iron housing with pressure-responsive gasket, bolts, and threaded or locking-lug outlet.
- E. Mechanical-Cross Fittings: UL 213, ductile-iron housing with pressure-responsive gaskets, bolts, and threaded or locking-lug outlets.
- F. Drop-Nipple Fittings: UL 1474, with threaded inlet, threaded outlet, and seals; adjustable.
- G. Sprinkler, Drain and Alarm Test Fittings: UL-listed, cast- or ductile-iron body; with threaded inlet and outlet, test valve, and orifice and sight glass.
- H. Sprinkler, Branch-Line Test Fittings: UL-listed, brass body; with threaded inlet and capped drain outlet and threaded outlet for sprinkler.
- I. Sprinkler, Inspector's Test Fittings: UL-listed, cast- or ductile-iron housing; with threaded inlet and drain outlet and sight glass.

2.18 FIRE DEPARTMENT CONNECTIONS

- A. Refer to Division 13 Section 13915 "Fire Protection Suppression Piping".

2.19 ALARM DEVICES

- A. General: Provide types matching piping and equipment connections.
- B. Refer to Division 13 Section 13915 "Fire Protection Suppression Piping".
- C. Water-Flow Indicators: UL 346; electrical-supervision, vane-type water-flow detector; with **250-psig (1725-kPa)** pressure rating; and designed for horizontal or vertical installation. Include two single-pole, double-throw, circuit switches for isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover that sends signal if removed.
- D. Pressure Switches: UL 753; electrical-supervision-type, water-flow switch with retard feature. Include single-pole, double-throw, normally closed contacts and design that operates on rising pressure and signals water flow.
- E. Valve Supervisory Switches: UL 753; electrical; single-pole, double throw; with normally closed contacts. Include design that signals controlled valve is in other than fully open position.
- F. Indicator-Post Supervisory Switches: UL 753; electrical; single-pole, double throw, with normally closed contacts. Include design that signals controlled indicator-post valve is in other than fully open position.

2.20 PRESSURE GAGES

- A. Pressure Gages: UL 393, 3-1/2- to 4-1/2-inch- (90- to 115-mm-) diameter dial with dial range of 0 to 250 psig (0 to 1725 kPa), or to two times (2x) the working pressure.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Perform fire-hydrant flow test according to NFPA 13, 415 and NFPA 291. Use results for system design calculations required in "Quality Assurance" Article in Part 1 of this Section.
- B. Report test results promptly and in writing.

3.2 EARTHWORK

- A. Refer to Division 2 Section 02300 "Earthwork" for excavating, trenching, and backfilling.

3.3 PIPING APPLICATIONS

- A. Do not use welded joints with galvanized steel pipe.
- B. Flanges, unions, and transition and special fittings with pressure ratings the same as or higher than system's pressure rating may be used in aboveground applications, unless otherwise indicated.
- C. Piping between Fire Department Connections and Check Valves:
 - 1. Use galvanized, standard-weight steel pipe with threaded ends; cast- or malleable-iron threaded fittings; and threaded joints.
 - 2. Use galvanized, standard-weight steel pipe with grooved ends; steel, grooved-end fittings; steel, keyed couplings; and grooved joints.
- D. Underground Service-Entrance Piping:
 - 1. Use ductile-iron, push-on-joint pipe and fittings and restrained joints.
 - 2. Use ductile-iron, mechanical-joint pipe and fittings and restrained joints.
- E. Sprinkler Feed Mains and Risers: Use the following:
 - 1. NPS 4 (DN100) and Smaller:
 - a. Standard-weight steel pipe with threaded ends, cast- or malleable-iron threaded fittings, and threaded joints.
 - b. Standard-weight steel pipe with grooved ends; steel, grooved-end fittings; steel, keyed couplings; and grooved joints.
 - c. Standard-weight steel pipe with plain ends, steel welding fittings, and welded joints.
 - d. Galvanized, standard-weight steel pipe with threaded ends; cast- or malleable-iron threaded fittings; and threaded joints.
 - e. Galvanized, standard-weight steel pipe with grooved ends; steel, grooved-end fittings; steel, keyed couplings; and grooved joints.

- f. Schedule 30 steel pipe with threaded ends, cast- or malleable-iron threaded fittings, and threaded joints.
- g. Schedule 30 steel pipe with roll-grooved ends; steel, grooved-end fittings; steel, keyed couplings; and grooved joints.
- h. Schedule 30 steel pipe with plain ends, steel welding fittings, and welded joints.
- i. Schedule 10 steel pipe with roll-grooved ends; steel, grooved-end fittings; and grooved joints.
- j. Schedule 10 steel pipe with plain ends, steel welding fittings, and welded joints.

2. **NPS 5 and NPS 6 (DN125 and DN150):**

- a. Standard-weight steel pipe with threaded ends, cast- or malleable-iron threaded fittings, and threaded joints.
- b. Standard-weight steel pipe with grooved ends; steel, grooved-end fittings; steel, keyed couplings; and grooved joints.
- c. Standard-weight steel pipe with plain ends, steel welding fittings, and welded joints.
- d. Galvanized, standard-weight steel pipe with threaded ends; cast- or malleable-iron threaded fittings; and threaded joints.
- e. Galvanized, standard-weight steel pipe with grooved ends; steel, grooved-end fittings; steel, keyed couplings; and grooved joints.
- f. Schedule 10 steel pipe with roll-grooved ends; steel, grooved-end fittings; and grooved joints.
- g. Schedule 10 steel pipe with plain ends, steel welding fittings, and welded joints.

F. **Sprinkler Branch Piping Wet-Pipe Systems: Use the following:** (EDIT)

- 1. Sprinkler-Piping Option: For **NPS 2 (DN50) and smaller**, mechanical-T bolted-branch-outlet fittings, may be used downstream from sprinkler zone valves.
- 2. Sprinkler-Piping Option: For **NPS 2 (DN50)** and smaller, specialty sprinkler fittings, including mechanical-T fittings, may be used downstream from sprinkler zone valves.
- 3. **NPS 1-1/2 (DN40) and Smaller:**
 - a. Standard-weight steel pipe with threaded ends, cast- or malleable-iron threaded fittings, and threaded joints.
 - b. Standard-weight steel pipe with plain ends, locking-lug fittings, and twist-locked joints.
 - c. Standard-weight steel pipe with plain ends, steel welding fittings, and welded joints.
 - d. Galvanized, standard-weight steel pipe with threaded ends; cast- or malleable-iron threaded fittings; and threaded joints.
 - e. Galvanized, standard-weight steel pipe with plain ends; locking-lug fittings; and twist-locked joints.
 - f. Schedule 30 steel pipe with threaded ends, cast- or malleable-iron threaded fittings, and threaded joints.
 - g. Schedule 30 steel pipe with plain ends, locking-lug fittings, and twist-locked joints.
 - h. Schedule 30 steel pipe with plain ends, steel welding fittings, and welded joints.
 - i. Schedule 10 steel pipe with plain ends, steel welding fittings, and welded joints.

- j. **NPS 1-1/2 (DN40)** and Smaller: Schedule 5 steel pipe with plain ends; steel, press-seal fittings; and press-sealed joints.
4. **NPS 2 (DN50):**
- a. Standard-weight steel pipe with threaded ends, cast- or malleable-iron threaded fittings, and threaded joints.
 - b. Standard-weight steel pipe with plain ends, locking-lug fittings, and twist-locked joints.
 - c. Standard-weight steel pipe with grooved ends; steel, grooved-end fittings; steel, keyed couplings; and grooved joints.
 - d. Standard-weight steel pipe with plain ends, steel welding fittings, and welded joints.
 - e. Galvanized, standard-weight steel pipe with threaded ends; cast- or malleable-iron threaded fittings; and threaded joints.
 - f. Galvanized, standard-weight steel pipe with plain ends; locking-lug fittings; and twist-locked joints.
 - g. Galvanized, standard-weight steel pipe with grooved ends; steel, grooved-end fittings; steel, keyed couplings; and grooved joints.
 - h. Schedule 30 steel pipe with threaded ends, cast- or malleable-iron threaded fittings, and threaded joints.
 - i. Schedule 30 steel pipe with plain ends, locking-lug fittings, and twist-locked joints.
 - j. Schedule 30 steel pipe with grooved ends; steel, grooved-end fittings; steel, keyed couplings; and grooved joints.
 - k. Schedule 30 steel pipe with plain ends, steel welding fittings, and welded joints.
 - l. Schedule 10 steel pipe with roll-grooved ends; steel, grooved-end fittings; steel, keyed couplings; and grooved joints.
 - m. Schedule 10 steel pipe with plain ends, steel welding fittings, and welded joints.
5. **NPS 2-1/2 to NPS 3-1/2 (DN65 to DN90):**
- a. Standard-weight steel pipe with threaded ends, cast- or malleable-iron threaded fittings, and threaded joints.
 - b. Standard-weight steel pipe with grooved ends; steel, grooved-end fittings; steel, keyed couplings; and grooved joints.
 - c. Standard-weight steel pipe with plain ends, steel welding fittings, and welded joints.
 - d. Galvanized, standard-weight steel pipe with threaded ends; cast- or malleable-iron threaded fittings; and threaded joints.
 - e. Galvanized, standard-weight steel pipe with grooved ends; steel, grooved-end fittings; steel, keyed couplings; and grooved joints.
 - f. Schedule 30 steel pipe with threaded ends, cast- or malleable-iron threaded fittings, and threaded joints.
 - g. Schedule 30 steel pipe with roll-grooved ends; steel, grooved-end fittings; steel, keyed couplings; and grooved joints.
 - h. Schedule 30 steel pipe with plain ends, steel welding fittings, and welded joints.
 - i. Schedule 10 steel pipe with roll-grooved ends; steel, grooved-end fittings; and grooved joints.
 - j. Schedule 10 steel pipe with plain ends, steel welding fittings, and welded joints.

6. **NPS 4 (DN100)** and Larger:

- a. Standard-weight steel pipe with threaded ends, cast- or malleable-iron threaded fittings, and threaded joints.
- b. Standard-weight steel pipe with grooved ends; steel, grooved-end fittings; steel, keyed couplings; and grooved joints.
- c. Standard-weight steel pipe with plain ends, steel welding fittings, and welded joints.
- d. Galvanized, standard-weight steel pipe with threaded ends; cast- or malleable-iron threaded fittings; and threaded joints.
- e. Galvanized, standard-weight steel pipe with grooved ends; steel, grooved-end fittings; steel, keyed couplings; and grooved joints.
- f. Schedule 30 steel pipe with threaded ends, cast-or malleable-iron threaded fittings, and threaded joints.
- g. Schedule 30 steel pipe with roll-grooved ends; steel, grooved-end fittings; steel, keyed couplings; and grooved joints.
- h. Schedule 30 steel pipe with plain ends, steel welding fittings, and welded joints.
- i. Schedule 10 steel pipe with roll-grooved ends; steel, grooved-end fittings; and grooved joints.
- j. Schedule 10 steel pipe with plain ends, steel welding fittings, and welded joints.

G. Dry-Pipe Sprinklers: Use the following:

1. Sprinkler-Piping Option: For **NPS 2 (DN50)** and smaller, Mechanical-T bolted-branch-outlet fittings, may be used downstream from sprinkler zone valves.
2. Sprinkler-Piping Option: For **NPS 2 (DN50)** and smaller, Specialty sprinkler fittings, including mechanical-T fittings, may be used downstream from sprinkler zone valves.
3. **NPS 1-1/2 (DN40)** and Smaller:
 - a. Galvanized, standard-weight steel pipe with threaded ends; cast- or malleable-iron threaded fittings; and threaded joints.
 - b. Galvanized, standard-weight steel pipe with plain ends; locking-lug fittings; and twist-locked joints.
4. **NPS 2 (DN50)**:
 - a. Galvanized, standard-weight steel pipe with threaded ends; cast- or malleable-iron threaded fittings; and threaded joints.
 - b. Galvanized, standard-weight steel pipe with plain ends; locking-lug fittings; and twist-locked joints.
 - c. Galvanized, standard-weight steel pipe with grooved ends; steel, grooved-end fittings; steel, keyed couplings; and grooved joints.
5. **NPS 2-1/2** and Larger:
 - a. Galvanized, standard-weight steel pipe with threaded ends; cast- or malleable-iron threaded fittings; and threaded joints.
 - b. Galvanized, standard-weight steel pipe with grooved ends; steel, grooved-end fittings; steel, keyed couplings; and grooved joints.

3.4 VALVE APPLICATIONS

- A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Fire-Protection-Service Valves: UL listed and FM approved for applications where required by NFPA 13.
 - a. Shutoff Duty: Use gate valves.
 2. General-Duty Valves: For applications where UL-listed and FM-approved valves are not required by NFPA 13.
 - a. Shutoff Duty: Use gate, ball, or butterfly valves.
 - b. Throttling Duty: Use globe, ball, or butterfly valves.
- B. Refer to Division 13 Section 13915 "Fire Protection Suppression Piping".

3.5 JOINT CONSTRUCTION

- A. Refer to Division 13 Section 13053 "Fire Protection General Materials and Methods" for basic piping joint construction.
- B. Refer to Division 13 Section 13915 "Fire Protection Suppression Piping".
- C. Use gaskets listed for dry-pipe service for dry piping.
- D. Dissimilar-Piping-Material Joints: Construct joints using adapters or couplings compatible with both piping materials. Use dielectric fittings if both piping materials are metal. Refer to Division 13 Section 13053 "Fire Protection General Materials and Methods" for dielectric fittings.

3.6 SERVICE-ENTRANCE PIPING

- A. Connect sprinkler piping to water-service piping of size and in location indicated for service entrance to building. Refer to Division 2 Section "Water Distribution" for exterior piping.
- B. Install shutoff valve, backflow preventer, pressure gage, drain, and other accessories indicated at connection to water-service piping. Refer to Division 2 Section "Water Distribution" for backflow preventers.
- C. Install shutoff valve, check valve, pressure gage, drain, and other accessories at connection to water service.

3.7 WATER-SUPPLY CONNECTION

- A. Connect sprinkler piping to building interior water distribution piping. Refer to Division 15 Section "Water Distribution Piping" for interior piping.
- B. Install shutoff valve, backflow preventer, pressure gage, drain, and other accessories indicated at connection to water distribution piping. Refer to Division 15 Section "Plumbing Specialties" for backflow preventers.

- C. Install shutoff valve, check valve, pressure gage, drain, and other accessories at connection to water service.

3.8 PIPING INSTALLATION

- A. Refer to Division 13 Section "Fire Protection General Materials and Methods" for basic piping installation.
- B. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated, as far as practical.
 - 1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect before deviating from approved working plans.
- C. Install underground service-entrance piping according to Local Code and NFPA 24 and with restrained joints.
- D. Use approved fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.
- E. Install "Inspector's Test Connections" in sprinkler piping, complete with shutoff valve, sized and located according to NFPA 13.
- F. Install sprinkler piping with drains for complete system drainage.
- G. Install sprinkler zone control valves, test assemblies, and drain risers adjacent to sprinkler risers when sprinkler branch piping is connected to sprinkler risers.
- H. Install ball drip valves to drain piping between fire department connections and check valves. Drain to floor drain or outside building.
- I. Install alarm devices in piping systems.
- J. Hangers and Supports: Comply with Section 13060 "Fire Protection Hangers and Supports" and NFPA 13 for hanger materials and installation.
- K. Install piping with grooved joints according to manufacturer's written instructions. Construct rigid piping joints, unless otherwise indicated.
- L. Install pressure gages on riser or feed main and at each sprinkler test connection. Include pressure gages with connection not less than **NPS 1/4 (DN8)** and with soft metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal, and install where they will not be subject to freezing.

3.9 SPECIALTY SPRINKLER FITTING INSTALLATION

- A. Install specialty sprinkler fittings according to Section 13915 "Fire Protection Suppression Piping".

3.10 VALVE INSTALLATION

- A. For installing general-duty valves. Install fire-protection specialty valves, trim, fittings, controls, and specialties according to NFPA 13, manufacturer's written instructions, and authorities having jurisdiction.
- B. Service Control Valves: Install fire-protection-service valves supervised-open, located to control sources of water supply except from fire department connections. Provide permanent identification signs indicating portion of system controlled by each valve.
- C. Valves for Wall Fire Hydrants: Install gate valve with nonrising stem in supply pipe.
- D. Install check valve in each water-supply connection. Install backflow preventers instead of check valves in potable-water supply sources.
- E. Alarm Check Valves: Install valves in vertical position for proper direction of flow, including bypass check valve and retard chamber drain-line connection.
- F. Dry-Pipe Valves: Install trim sets for air supply, drain, priming level, alarm connections, ball drip valves, pressure gages, priming chamber attachment, and fill-line attachment.
 - 1. Air-Pressure Maintenance Devices for Dry-Pipe Systems: Install shutoff valves to permit servicing without shutting down sprinkler system; bypass valve for quick system filling; pressure regulator or switch to maintain system pressure; strainer; pressure ratings with 14- to 60-psig (95- to 410-kPa) adjustable range; and 175-psig (1200-kPa) maximum inlet pressure.
 - 2. Install air compressor and compressed-air supply piping.

3.11 SPRINKLER APPLICATIONS

- A. General: Use sprinklers according to the following applications, or as directed by the Architect.
 - 1. Rooms without Ceilings: Upright or pendent sprinklers, as indicated.
 - 2. Rooms with Suspended Ceilings: Pendent, recessed, flush, or concealed sprinklers, as indicated.
 - 3. Spaces Subject to Freezing: Upright; pendent, dry-type,, dry-type sprinklers.
 - 4. Sprinkler Finishes: Use sprinklers with the following finishes or as directed by the Architect.
 - a. Upright, Pendent, and Sidewall Sprinklers: Chrome-plated in finished spaces exposed to view; rough bronze in unfinished spaces not exposed to view; wax coated where exposed to acids, chemicals, or other corrosive fumes.
 - b. Concealed Sprinklers: Rough brass, with factory-painted white cover plate; Color by Architect.
 - c. Flush Sprinklers: White with painted white escutcheon; Color by Architect.
 - d. Recessed Sprinklers: White with bright chrome escutcheon; Color by Architect.

3.12 SPRINKLER INSTALLATION

- A. Sprinkler Heads: Space, locate, and position sprinkler heads in accordance with the reflected ceiling plans and the design criteria.

1. The sprinkler heads in all areas are to be installed on a true axis line in both directions with a maximum deviation from the axis line of $\frac{1}{2}$ " plus or minus from architects reflected ceiling plans. At the completion of the installation, if any heads are found to exceed the above mentioned tolerance, same shall be removed and reinstalled by this Contractor.
2. Install sprinklers in center of tiles.
3. Provide all sprinkler heads and work in strict conformance with approved shop drawings. The Architect reserves the right to reject any and all work not in accordance with the approved shop drawing.
4. Perform the following in areas where painting occurs or when sprinkler piping is painted. As soon as sprinkler heads are in place, the Contractor shall cover each head with a small bag of an Underwriter's approved type, which shall be removed only after all painting is complete. After the bag is removed, all heads shall be cleaned and polished.
5. Do not install pendant wet-type sprinklers in areas subject to freezing. Use dry type sprinklers. Locate water supply within heated space.

3.13 CONNECTIONS

- A. Connect water-supply piping and sprinklers to fire pumps. Include backflow preventers.
- B. Connect water supplies to sprinklers. Include backflow preventers.
- C. Install ball drip valves at each check valve for fire department connection. Drain to floor drain or outside building.
- D. Connect piping to specialty valves, specialties, fire department connections, and accessories.
- E. Electrical Connections: Power wiring is specified in Division 16.
- F. Connect alarm devices to fire alarm.
- G. Connect compressed-air supply to dry-pipe sprinkler piping.
- H. Connect air compressor to the following piping and wiring:
 1. Pressure gages and controls.
 2. Electrical power system.
 3. Fire alarm system devices, including low-pressure alarm.

3.14 LABELING AND IDENTIFICATION

- A. Install labeling and pipe markers on equipment and piping according to requirements of the Authority having Jurisdiction, NFPA 13 and Division 13 Section 13050 "Fire Protection General Materials and Methods."
- B. Install labeling and pipe markers on equipment and piping according to requirements as required by the Authority having Jurisdiction, NFPA 13 and Division 13 Section 13075 "Fire Protection Identification."

3.15 FIELD QUALITY CONTROL

- A. Flush, test, and inspect sprinkler piping according to the Authority having Jurisdiction, NFPA 13, Section 13050 "Fire Protection General Requirements", "System Acceptance" Chapter.
- B. Replace piping system components that do not pass test procedures and retest to demonstrate compliance. Repeat procedure until satisfactory results are obtained.
- C. Report test results promptly and in writing to Architect and authorities having jurisdiction.

3.16 CLEANING

- A. Clean dirt and debris from sprinklers.
- B. Remove and replace sprinklers having paint other than factory finish.

3.17 PROTECTION

- A. Protect sprinklers from damage until Substantial Completion.

3.18 COMMISSIONING

- A. Verify that specialty valves, trim, fittings, controls, and accessories are installed and operate correctly.
- B. Verify that air compressors and their accessories are installed and operate correctly.
- C. Verify that specified tests of piping are complete.
- D. Verify that damaged sprinklers and sprinklers with paint or coating not specified are replaced with new, correct type.
- E. Verify that sprinklers are correct types, have correct finishes and temperature ratings, and have guards as required for each application.
- F. Verify that potable-water supplies have correct types of backflow preventers.
- G. Drain dry-pipe sprinkler piping.
- H. Pressurize and check dry-pipe sprinkler piping air-pressure maintenance devices and air compressors.
- I. Verify that fire department connections have threads compatible with local fire department equipment.
- J. Fill wet-pipe sprinkler piping with water.
- K. Energize circuits to electrical equipment and devices.
- L. Start and run jockey pumps.

- M. Start and run air compressors.
- N. Adjust operating controls and pressure settings.
- O. Coordinate with fire alarm tests. Operate as required.
- P. Coordinate with fire-pump tests. Operate as required.

3.19 DEMONSTRATION

- A. Demonstrate equipment, specialties, and accessories. Review operating and maintenance information.
- B. Schedule demonstration with Owner with at least seven days' advance notice.

END OF SECTION 13916

**NEW PASSENGER TERMINAL
DULUTH INTERNATIONAL AIRPORT
DULUTH, MINNESOTA**

**SECTION 14950 - AIRCRAFT
PASSENGER BOARDING
BRIDGES**

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections apply to this section.

1.2 SUMMARY

- A. The scope of the work includes:
1. The turn-key installation of one (1) new “low range” Apron-Drive type Passenger Boarding Bridge (PBB) unit to connect the airport terminal building gate to the aircraft for the purpose of convenient and controlled method for passenger boarding as specified herein and as indicated on the data sheets.
 2. The relocation of two (2) “low range” Apron-Drive type PBB units recently acquired by the Airport from their current locations at the existing passenger terminal to the new passenger terminal.
 3. The relocation of one (1) refurbished Apron-Drive type PBB unit at the existing passenger terminal to the new passenger terminal.
 4. Relocations shall include the provision of new structural support columns as required for the new PBB locations.
 5. Four (4) fixed bridge corridors connecting the PBB’s to the terminal as indicated on the drawings.
- B. Related Sections: The following sections contain requirements that relate to this section:
1. Division 14 Section 14951 – “Passenger Boarding Bridge Refurbishment” for refurbishment of existing PBBs.
 2. Division 14 Section 14955 – “Baggage Lifts” for baggage lifts.
- C. The proposer shall verify all field conditions prior to bidding and is responsible for any engineering, purchasing, co-ordination, obtaining permits and other related items in order to provide a total of four (4) complete, installed, and operational PBB’s.

1.3 ACTION SUBMITTALS

- A. The Contractor shall submit complete and detailed shop drawings and specifications for the new PBB units and items to be refurbished in the existing PBB unit to the Architect-Engineer for review. An index prepared in sequential order listing all drawings, sketches, details, and materials to be submitted shall

be provided. All drawings, sketches, details and materials shall be submitted in English language, in United States units, including dimensions, volumes, weights and forces. The use of the metric or SI units is not acceptable.

B. Shop drawings shall show the following:

1. Loading bridge dimensions and general arrangement drawings.
2. Interior elements:
 - a. Interior scheme of each bridge model including all components.
 - b. Transition details.
 - c. Wall finish attachment.
 - d. Light fixture details and layout.
 - e. Joint details.
 - f. Tunnel floor finish.
 - g. Cab floor finish.
 - h. Rotunda floor finish.
 - i. Fixed walkway floor finish
 - j. Interior walls and ceilings finishes.
 - k. Carpet edging details, including lines of demarcation between carpeted and hard surfaced floor at wall areas and treatment at doors, thresholds and doors to terminal building.
3. Exterior elements:
 - a. General bridge layout.
 - b. Exterior sketch of each bridge element.
 - c. Paint finishes.
 - d. Handrails and ladder to roof.
 - e. Flashing (building to passenger loading bridge).
 - f. Flashing (bridge segments).
 - g. Cab door seal.
 - h. Ramp service stairway.
4. Cab features:
 - a. Operator's cone of visibility from control console.
 - b. Control panel location and functional layout.
 - c. View panels.
 - d. Safety devices.
 - e. Interface with aircraft.
 - f. Modifications necessary for appropriate mating with required aircraft types (including auto-leveling devices).
 - g. Safety strips.
 - h. Signage (exterior).
 - i. Signage and plaques (interior).
 - j. Electric heater
5. Appearance and Safety Markings:
 - a. Color and finish, exterior.
6. Finish Samples:
 - a. Provide samples of all interior and exterior passenger boarding bridge finishes.

C. Engineering Calculations: The Contractor shall submit to the Architect-Engineer structural calculations and power requirement computations including the following:

1. Electrical power and control schematic diagrams.
2. Hydraulic schematics.
3. Structural drawings including all pertinent calculations which shall be signed and sealed by a professional Engineer licensed in the State of Minnesota.
4. Interface requirements for existing foundations and buildings supplied utilities.

D. Electrical Disconnect and Control Panels:

1. Provide complete details on the electrical disconnect and controls panel.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Manuals:

1. The Contractor shall provide 30 days prior to acceptance inspections of each loading bridge, 2 copies of technical manuals per each loading bridge. The shop drawings and manuals shall reflect the exact construction (not typical construction) of each unit including manufacturer's part number and pictorial drawings for each item.
2. The technical manuals shall contain the following information:
 - a. Description and operation.
 - b. Maintenance instructions including troubleshooting / diagnostics guidelines.
 - c. Overhaul instructions.
 - d. Equipment layout and complete wiring and control diagrams.
 - e. List of parts and part numbers including manufacturer's name and part number, as well as the supplier's name and part number.
 - f. Illustrated parts list.
 - g. Recommended spare parts list and source.
3. Manual shall be compact and produced in such a manner that the maintenance personnel can easily refer to any of its pages or schematics while standing on the apron while subjected to jet blast, wind, etc. All binder punch holes shall be reinforced by proper material to prevent tearing.
4. Electrical drawings shall reflect the wiring for each unit as it has been constructed and not general drawings. Place 1 set of drawings in control console of the bridge and 1 in the manual.

1.5 PERFORMANCE REQUIREMENTS

A. Industry Standards: The Passenger Boarding Bridge (PBB) shall be designed in accordance with good engineering practices and the standards developed and adopted by the passenger boarding bridge industry. Particular attention will be given to keeping components simple rugged and easily accessible for routine maintenance, including lubrication component exchange and ease of adjustment. All access panels and openings shall be sized to accommodate the component

being changed or adjusted, as well as the equipment and personnel necessary to accomplish the work.

- B. The PBBs as designed must be capable of reaching all specified aircraft types and aircraft parking positions as designed on the Aircraft Layout Plans. The bridge cab shall have sufficient flexibility to enable it to mate with the aircraft passenger-boarding door when the aircraft is parked at the gate. The bridge shall have sufficient vertical travel to accommodate all aircraft indicated.
- C. The PBB shall be designed to accommodate the mounting of point-of-use gate equipment to be provided and installed by Others. The PBB Contractor shall coordinate with the suppliers of the following to ascertain loading requirements and attachment provisions:
 - 1. Pre-Conditioned Air Systems and associated Hose Management Systems.
 - 2. 400 Hz and 28 VDC Solid State Ground Power Units.
- D. Structural Loads:
 - 1. The PBB shall be designed to support the following loads. The design shall be based on the load combination that imposes the most adverse loading. In addition to the dead loads and strain caused by movement, the entire passenger boarding bridge shall support:
 - a. Floor Live Loads: 30 pounds per square foot (191 kg per square meter).
 - b. Wind Loads:
 - 1) Retracted and stowed: 25 pounds per square foot (120 kg per square meter).
 - 2) Operational: 12.5 pounds per square foot (61 kg per square meter).
 - c. Seismic Loads: The PBB shall be designed to withstand the earthquake induced forces.
 - d. Roof Live Loads: 25 pounds per square foot.
 - e. Design Snow Loads: Per 2006 Edition International Building Code.
 - 2. The structural design shall provide sufficient torsional rigidity to avoid excessive sway when the passenger boarding bridge is brought to a stop.
 - 3. All mechanisms for actuating, guiding and restraining the passenger boarding bridge and its components shall be designed so that no noise, sway or sense of insecurity is apparent to passengers. No operating vibrations or loads shall be transmitted to the terminal building.
- E. The PBB is to drain all water entering the PBB to the exterior. All "water entering joints, condensation, and migrating moisture shall be drained to the exterior of the PBB.
- F. All electrical systems must be protected/guarded from damage that may be caused by falling objects or collision with aircraft service equipment and other moving ground vehicles.

- G. Cabs, tunnel sections, service stairs and landings, rotundas, and all electrical items shall be interconnected by a continuous grounding conductor. The main grounding conductor shall be provided with the power supply feeder.
- H. Environmental Considerations:
 - 1. Passenger boarding bridge shall operate satisfactorily under ambient temperature conditions of –40 degrees F (-40 degrees C) to 125 degrees F (52 degrees C), with wind up to 60 mph (96.56 kph).
 - 2. All components and materials shall be individually and collectively designed or selected for long service life under such conditions.
- I. Power Characteristics:
 - 1. The passenger boarding bridge shall operate on 480 V.A.C., 3 phase, 60 Hz. Electrical power, and separate ground (4 wire). The 480 V.A.C. shall be transformed to 120/240 V.A.C. for lighting and controls.

1.6 QUALITY ASSURANCE

- A. Manufacturer: Minimum of ten years successful experience in the design, fabrication and installation of similar passenger boarding bridges.
- B. Installer: Either passenger boarding bridge manufacturer or a licensee of the manufacturer with no less than 10 years experience in the installation of comparable passenger boarding bridges.
- C. Regulatory Requirements: Conform to the following codes and standards:
 - 1. AISC – American Institute of Steel Construction.
 - 2. ASME – American Society of Mechanical Engineers.
 - 3. ASTM A36 – Specification for Carbon Structural Steel.
 - 4. ASTM A53 – Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 - 5. ASTM A307 – Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
 - 6. ASTM A311 Grade 1018 and Grade 1144 Hinge Pins.
 - 7. ASTM A325 – Specification for Structural Bolts, Steel, Heat-Treated, 120/105 ksi Minimum Tensile Strength or SAE-J429 Grade 5 or 8.
 - 8. ASTM A490 – Specification for Heat-Treated Steel, Structural Bolts, 150 ksi Minimum Tensile Strength.
 - 9. ASTM A500 – Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
 - 10. ASTM A514 and A517– Specification for High-Yield Strength, Quenches and Tempered Alloy Steel Plate, Suitable for Welding.
 - 11. ASTM A1011 – Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon Structural, High-Strength Low-Alloy with Improved Formability.
 - 12. AWS – American Welding Society.
 - 13. NEC – National Electric Code.
 - 14. NEMA – National Electrical Manufacturers Association.
 - 15. NPA – National Plywood Association.
 - 16. SAE – Society of Automotive Engineers.

17. SSPC – Structural Steel Painting Council.
18. Society of Automotive Engineers (SAE) Standards.
19. National Fire protection Association (NFPA — 70, 415 and 417).
20. Occupational Safety and Health Administration (OSHA).
21. Sheet Metal and Air Conditioning Contractors National Association (SMACNA).
22. Underwriters Laboratories (UL).
23. Institute of Electrical and Electronic Engineers (IEEE).
24. Air Transportation Association (ATA) — Specification 101 — Manufacturer's Technical Data.
25. International Building Code, 2006 Edition.
26. Code of Federal Regulations (CFR).
 - a. 36 CFR 1191 — Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities.
 - b. 14 CFR 382 — Nondiscrimination on the Basis of Disability in Air Travel.
 - c. 28 CFR 36 — Nondiscrimination on the Basis of Disability by Public Accommodation and in Commercial Facilities.

1.7 WARRANTY

- A. Warranty shall include all parts, labor, travel time, and expenses necessary for remedial repairs or replacement of defective or malfunctioning bridge units or defective system components.
- B. Manufacturer shall guarantee all components and accessories comply fully with the Contract Documents and are free from defects in material and workmanship, under normal use, for a period of twelve (12) months from the date of acceptance by the Owner with the following exceptions.
 1. The design of the PBB structure, shell, mechanical assemblies, and electrical systems shall be designed with a life expectancy of twenty (20) years with the exception of normal maintenance components.
 2. Paint coatings shall not peel, blister, chip, crack, check, and shall not chalk more than represented by a No. 8 rating based on ASTM D659 for a period of ten (10) years.
 3. Vertical Drive components and assemblies shall have a minimum of a ten (10) year design life and associated warranty.
 4. Door closures shall have an extended warranty as provided by the manufacturer, with a design life of ten (10) years against failure. Extended warranty shall be included in the Operation and Maintenance Manual.
 5. Warranty shall include the performance of all Service Bulletins by the PBB manufacturer issued by the manufacturer during the warranty period.
- C. All work by the Contractor within this warranty period shall be provided without cost to the Owner and shall include all labor and necessary materials required to replace defective material and workmanship. If a component is replaced, the warranty period begins again as if the part were new.
- D. Contract shall warrant that the equipment and all components and accessories furnished in connection therewith, shall comply fully with contract documents; be

free of any defect in design, material, or workmanship; be new and of good quality; and free and clear from any liens, encumbrances and title defects.

1.7 MAINTENANCE

- A. Preventive maintenance: Prior to formal acceptance and during the on-airport storage and installation, the Contractor shall be responsible for the preventive maintenance and general protection from deterioration of the passenger loading bridge. After formal acceptance, the Owner shall be responsible for all preventive maintenance, in accordance with manufacturer's manual.
- B. Corrective maintenance: The Contractor shall be responsible for all corrective maintenance, under the terms of the guarantee - (parts and labor) for one (1) year from date of acceptance of the passenger loading bridge. Corrective maintenance shall include all maintenance except minor and routine adjustments and lubrication. In the event that the Contractor fails to respond within twenty-four (24) hours to correct a maintenance occurrence (and expediently perform whatever repairs necessary to restore the loading bridge into service), the Owner reserves the right to perform (with its own maintenance forces or otherwise) such corrective maintenance work and the Contractor shall reimburse the Owner whatever expenses incurred by the Owner in performing such corrective maintenance work.
- C. The Contractor shall provide the maintenance personnel of the Owner with service bulletins outlining product improvement data resulting from continuing field operation experiences.

1.8 PERMITS

- A. Project Permits: The PBB Contractor shall be responsible to apply for and obtain all required permits, including the FAA Crane Permit, if a deviation from the current permit is desired. The FAA Crane permit may entail a 30 to 60 day lead time, so immediate application is required by the PBB Vendor. All airport required special permit requirements/conditions are the responsibility of the PBB manufacturer.

1.9 AIRPORT SECURITY

- A. The PBB Contractor shall be responsible for determining and complying with Airport Security, Badging and Vehicle access requirements. PBB Contractor shall not rely on Owner's representatives for airport access/escorts. No extension of the performance period will be allowed due to the Contractor's ability to comply with Airport Security requirements.

1.10 PROJECT / SITE CONDITIONS

- A. The Contract Documents indicate the location of each passenger loading bridge foundation and types of aircraft at each gate. The Contractor shall be responsible to verify all locations (rotunda foundation, aircraft position, for the various types of aircraft serviced at each gate, etc.) and advise the Architect-Engineer of any conflict or code violation (such as excessive slope, etc.) prior to beginning the fabrication of the passenger loading bridges.

- B. Contractor shall visit the site and familiarize himself regarding the existing conditions at the project site. The Contractor shall be responsible for verifying all field conditions including, but not limited to the following:
 - 1. Foundation Heights/Locations/Supports.
 - 2. Foundations Bolt Patterns.
 - 3. Terminal Door Sill Heights.
 - 4. Existing Electrical Power.
 - 5. Aircraft Ramp Elevations at Aircraft Parking Positions.
 - 6. Any and all other Special Conditions that may affect the installation of the bridge(s).
- C. Foundation anchor nuts shall be provided by PBB Manufacturer, coordinate anchor bolt size and pattern with existing terminal building.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following, or approved equal:
 - 1. Passenger Boarding Bridge:
 - a) JBT Aerotech – Jetway Systems
 - b) ThyssenKrupp Airport Systems

2.2 PASSENGER BOARDING BRIDGE (PBB)

- A. General: Passenger Boarding Bridge (PBB) specified shall be complete with requirements of this section.
 - 1. The PBB shall be apron drive type with two or three tunnels as indicated on the drawings.
- B. Rotunda Assembly: The rotunda assembly shall be made up of a corridor, rotunda and support pedestal. The assembly shall be designed so that it does not transmit any live or dead loads or vibrations to the terminal building.
 - 1. The rotunda assembly shall be designed at the terminal end pivot for passenger boarding bridge's vertical and horizon motion. As the main pivot for passenger boarding bridge, the rotunda assembly shall allow the passenger boarding bridge to rotate a total of 175 degrees, 87 ½ degrees clockwise and 87 ½ degrees counter clockwise for the corridor center line.
 - 2. Slope, over-travel and operational swing limits shall be located on the rotunda assembly. Slope limits shall be adjustable up to 8.33 percent for both up and down slopes. This limit shall be adjustable to meet local operating conditions and requirements.

3. Over-travel swing limit shall be provided. When activated, limit switch shall cut off all power preventing bridge from traveling further. Rotunda frame shall be equipped with rubber bumper type mechanical stops, or electrical limit switches, to prevent collapse of telescoping tunnel sections.
4. A potentiometer, or limit switches, shall be provided at rotunda, which senses the position of the passenger boarding bridge and sounds a warning buzzer at control console prior to activation of the over-travel swing limit. Actuation of the warning buzzer shall be adjustable within the over-travel limit envelope and shall signal rotational operational limits.
5. The fixed bridge/corridor interface between the rotunda and the terminal building shall have a minimum inside clear width of 4'-11" and minimum clear height of 7'-6". The connection to the terminal shall allow installation of flexible weather seals and floor threshold to the face of the building with no transfer of structural loads.
6. Rotunda floor shall remain stationary and level at all times and provide a smooth transition between the fixed bridge/corridor and telescoping tunnels. Flap type seals shall be provided for weather protection between the rotunda and the hinged telescoping tunnel section.
7. The rotunda support pedestal shall provide the structural support for the passenger boarding bridge and fixed bridge/corridor. The support column shall rest on a foundation and anchor bolt pattern that is supplied by others. The pedestal shall be custom built to meet specific site conditions.
8. The electrical disconnect panel, mounted on the pedestal, shall provide the electrical disconnects and transformers required to adapt specified terminal power to the passenger boarding bridge's electrical requirements.

C. Tunnel Assembly: The tunnel assembly connects the rotunda assembly and aircraft cab assembly.

1. Telescoping tunnels shall be rectangular in cross section. The tunnel with the largest cross section shall be closest to the aircraft.
2. The exterior roof, and floor panels of the telescoping tunnel sections shall be manufactured from corrugated, or galvanized flat steel panels attached to a framework of angle and tubing. These panels are formed, welded, sealed and painted to form the tunnel enclosure. Roof shall be flat to prevent the collection of water.
3. Solid-Sided PBB: The exterior sides of the telescoping tunnel sections shall be manufactured from corrugated, or galvanized flat steel panels attached to a framework of angle and tubing. These panels are formed, welded, sealed and painted to form the tunnel enclosure.
4. Hinged transition ramps shall accommodate the difference in elevation where telescoping tunnel sections overlap.
5. Minimum interior clear dimensions are as follows:
 - Minimum Floor Width: 4'-10".
 - Minimum Interior Height: 6'-11".
 - Minimum Inter-Tunnel Ramp Width: 4'-8".
 - Minimum Corridor Width: 4'-4-1/2".
6. The telescoping tunnels shall be equipped with an under-bridge or side-mounted exterior electrical cable conveyance system. This system is

accessible to maintenance personnel for inspection or cable addition at all passenger boarding bridge positions and operations conditions. Access to the conveyance system shall not impede passenger traffic or passenger boarding bridge operation. The system shall be capable of supporting a combination of cables and hoses with a maximum weight of 12 pounds per square foot and a maximum cross-sectional area of 12 square inches consisting of two 6 square inch areas. The largest tunnel shall be equipped with an aluminum or galvanized wire way to continue electrical cable routing beyond the electrical cable conveyance system

D. Aircraft Cab:

1. The aircraft cab shall be designed to rotate 135 degrees. Rotation is 95 degrees counterclockwise and 40 degrees clockwise from tunnel centerline.
2. The cab shall be rotated at a speed of 138 degrees per minute (2.41 degrees/sec). Limit switches and physical stops shall control the rotation limits.
3. The cab shall be equipped with a forward facing control console. The console shall be located behind laminated glass windows. Operation of the PBB shall be possible without opening the weather door. Visibility shall be provided with vision panels in the cab side-coiling curtains and windows located in front and to the left and right of the operator.
4. Cab Mirrors shall be mounted to allow the operators to view the apron area from their console. If cracked or damaged, mirrors shall be replaced new. Provide 3 mirrors as follows:
 - a. A wheel-bogie mirror shall be installed and positioned in such a manner that the operator can constantly view the wheel bogies from the control console while the cab is in a left rotation position.
 - b. A mirror shall be located to allow the operator to view the service stairs and the ramp around the service stair area.
 - c. A mirror shall be positioned to allow the operator to view the other side of the bridge (opposite side than the service station).
5. An electric roll up weather door is to be provided on the right side of the operators control console to secure the passenger boarding bridge from unauthorized access and seal in the interior of the passenger boarding bridge from adverse weather conditions when the door is closed. The minimum clear width of the weather door is 5'-0" and the minimum door height is 7'-8 1/2".
6. A full width spacer shall be located at the aircraft end of the cab floor. The spacer material shall meet the fire protection specifications of NFPA-415 shall be flexible and non-abrasive to prevent scratching or other damage to aircraft fuselage. Spacers shall be properly equipped to drain so as to not retain precipitation or moisture.
 - a. Since the PBB shall have docking capabilities for regional aircraft, the spacer must be continuous in all applications. For example, if slots are incorporated into the design for mating with a small regional aircraft with stairs and handrails, the spacer must be able to be re-positioned to allow a continuous surface (no holes or gaps) when docked with larger aircraft.
 - b. The spacer must be designed to not cause damage to any fuselage protrusion such as antenna or pitot tubes, etc.

7. The aircraft end of the cab shall be equipped with a cab floor that adjusts to the optimum relative to the aircraft doorsill. The floor shall be actuated and independently adjustable to adapt to all aircraft doorsills. It shall be designed to level automatically and shall be equipped with a manual override control switch. The floor shall be capable of providing a level surface adjacent to the aircraft doorsill for passenger boarding bridge slopes from -10% to +10%.
 8. A double hinge floor shall be included in the system to provide a smooth transition between the level floor and the tunnel section. The transition floor shall provide a smooth platform sloped in the direction of the passenger traffic flow. No raised surfaces which may introduce a tripping hazard to the passenger shall be permitted.
 9. Exterior floodlights shall be provided for nighttime operation to illuminate the apron area ahead of the passenger boarding bridge. A floodlight shall also be provided to illuminate the drive column wheel bogey area. This light shall be located under the tunnel section.
 10. A weatherproof fluorescent fixture shall be provided outside the weather doors to illuminate the cab-aircraft interface.
 11. A ventilator shall be mounted on the cab bubble roof, which exhausts hot air from the passenger boarding bridge. The damper shall be gravity operated. The exhaust fan control shall be console operated. Ventilator shall be 1500 CFM model.
 12. A thermostat controlled electric cab heater shall be provided.
 13. Provide electric cab floor de-icer.
 14. The cab area shall be equipped with a fire extinguisher. The fire extinguisher shall be 10 lb. dry chemical.
- E. Aircraft Closure: The aircraft end of the cab shall be equipped with a folding bellows aircraft closure. The closure, when fitted against the fuselage, shall surround both the open aircraft door and the doorway to protect passengers from the elements. Covering shall not absorb water, shall be highly tear resistant and shall remain flexible from -31 degrees F (-35 degrees C) to 127 degrees F (52.8 degrees C). The aircraft enclosure color shall be black or dark gray.
1. Each side of the aircraft closure shall independently seal against aircraft contours.
 2. If necessary, pressure sensitive switches shall be incorporated into the closure mechanisms to prevent excessive pressure on the aircraft.
 3. The contacting seal shall be a soft material to prevent scratching or damage to the aircraft skin. The seals that contact the aircraft shall be designed for easy replacement.
- F. Service Access: A service door, landing and stair leading to the apron areas shall constitute the service access. Service access shall be located on the right hand side of the cab end of the passenger boarding bridge; it provides access between the passenger boarding bridge and apron for authorized personnel.
1. Service door shall be steel, hollow core with wire glass window, and meets or exceeds the 3/4-hour fire rating per ASTM E 152. The minimum door width is 3 feet 0 inches, (914 mm) wide and 6 feet 8 inches (2032mm) high. Door shall be equipped with heavy-duty commercial-type hardware (Best Brand core) and automatic door closure. The door shall

- open outward onto the service stair landing. A cipher lock is to be provided on the exterior and knob on the interior. A 30-inch (762mm) stainless steel kick plate shall cover the lower inside portion of both interior and exterior sides of the door.
2. Service stair landing shall be parallel to the adjacent tunnel floor. The landing shall be made of hot dipped galvanized steel, open mesh grating. The landing shall be protected on the open sides by galvanized steel handrails, which meet OSHA standards. A switch operated, full cut-off luminaire shall be provided above the landing.
 3. Service stair shall be equipped with self-adjusting risers and treads made from expanded metal with a serrated edge for a gripping surface. All steps shall have an equal rise. The tread width shall be 28 inches (711 mm) and the maximum tread height shall be 9-1/2 inches (241 mm). The service stair shall be protected on each side by handrails designed to meet OSHA standards. The entire service stair assembly shall be galvanized steel. The service stair assembly accessible to ramp service personnel at all operational heights and positions of the passenger boarding bridge.
 4. Maintenance Access: An OSHA standard ladder (with OSHA standard cage) must be supplied order to access vertical drive components.
- G. Control Station: The control station shall be located at the aircraft end of the passenger boarding bridge. It shall provide the operator with a control console, service utilities, and control interlocks required to accomplish passenger boarding bridge operation. Station shall be positioned on the left side of the cab and oriented to position the operator facing forward in full view of the aircraft during maneuvering and docking operations.
1. Control Console: The control console shall be located –in the operator compartment and shall be protected from the outside environment.
 - a. Controls: All passenger boarding bridge motion controls shall be momentary contact type (deadman) controls. All of the motion controls shall be designed to be relative to the function of the passenger boarding bridge being controlled, i.e., raise and lower functions, the “raise” push button will be located above the “lower” push button. The control console shall include the following controls-
 - 1) A three-position master key switch used to select "OFF", "OPERATE", or "AUTO" (automatic leveling). The key may be removed only in the "OFF" or "AUTO" positions,
 - 2) A 4- way lever arm or "joystick" to control forward and reverse and steering motions. As the joystick is moved progressively forward or back, passenger boarding bridge speed increases proportionally with the position of the joystick. Steering, left or right, may be accomplished at the same time as forward and reverse motions. An interlock shall prevent the passenger boarding bridge from being driven forward when the aircraft closure is deployed.
 - 3) Push button switches for raising and lowering the cab end of the passenger boarding bridge.
 - 4) Push button switches for cab rotation, left or right.
 - 5) Push button(s) to deploy the bellows-type aircraft closure.

- 6) Switch for floodlights that illuminate the apron area under the aircraft and drive column undercarriage.
- 7) Digital position indicator
- 8) Switch to change the cab floor level adjustment from an automatic operation to a manual operation,
- 9) Relative motion push-button switch to control the cab floor level adjustment while in the manual mode.
- 10) Emergency stop button, which shuts down all passenger boarding bridge movement when pressed.
- 11) Lamp test button to allow function testing of all indicator lights.
- 12) Switch for cab light to illuminate the area forward of the cab door.
- 13) Horn button to alert that the bridge is about to move.
- b. Indicators: The control console shall have indicators that display the current passenger boarding bridge status. The passenger boarding bridge status indicators shall be as follows:
 - 1) Digital position indicator to display the relative vertical position of the lift column. This indicator is used to vertically pre-position the passenger boarding bridge prior to the arrival of the aircraft.
 - 2) Wheel position indicator, which displays wheel orientation with respect to the operator's position. A wheel position indicator maintains correct wheel orientation while cab is being rotated.
 - 3) An amber light to indicate auto-leveling system is energized and functioning.
 - 4) A red light and audible warning to indicate the auto leveler sustained travel timer has tripped.
 - 5) A red light to indicate the passenger boarding bridge has reached the operational horizontal rotation limits. This light is preceded by an audible warning.
 - 6) A red light to indicate drive wheels have reached an over steer condition.
 - 7) A red light to indicate aircraft closure is deployed.
 - 8) A red light to indicate vertical drive column fault (for electromechanical lift).
 - 9) A green light to indicate power is on.
- c. A flashing amber beacon shall be mounted under the cab. The beacon shall indicate that power is on and the passenger boarding bridge may move at any moment.
- d. An audible warning bell shall be mounted on the underside of the cab and shall ring when the passenger boarding bridge is moving. The bell sound loudness shall be at least 92 db at 10 feet.

2. Utilities:

- a. A six pair (twelve conductor) wire outlet for the installation of telephone or intercom equipment shall be located on left side wall adjacent to the control console.
- b. Duplex outlets (unswitched 120 volt, single phase, 15 ampere) shall be located on the side wall of the control console, on the lower portion of the drive column (GFI), and in the rotunda corridor.

3. Control Features and Interlocks
 - a. Mechanical interlocks shall be provided to prevent damage to control circuits or passenger boarding bridge components by selecting opposite motions simultaneously. For example, depressing the up button prevents depressing the down button.
 - b. When the master key switch is in the "OFF" or "AUTO" position, the controls for horizontal and vertical movement, steering, aircraft closure and cab rotation shall be inoperative.

- H. Automatic Leveling: The passenger boarding bridge shall be equipped with an automatic leveling system, allowing the passenger, boarding bridge to adjust to changes in the aircraft elevation that occur during aircraft loading and unloading, The system shall function with equal reliability for all aircraft contours. The auto leveler shall be located on the right side of the cab and in full view of the operator at the control console
 1. The auto leveler shall be engaged when the master key switch is positioned to "AUTO".
 2. The auto leveler circuit shall include a sustained travel timer, Timer shall limit auto level operation shall be adjustable from 1.6 seconds to a maximum of 6 seconds. If the operation exceeds the set time limit a fault condition is assumed, all motor power shall be disconnected; audible and visual alarms shall be energized.
 3. The main auto level-sensing switch is activated by a 5-degree or more auto level wheel rotation.

- I. Drive Column- The drive column shall provide the vertical and horizontal motion for the passenger boarding bridge. The drive column and control systems shall be designed for smooth, quiet operation. The vertical and horizontal movements shall be operable at the same time. The drive column shall be divided into two major components: Vertical Drive and Horizontal Drive.
 1. Vertical Drive - Hydraulic Lift System: The passenger boarding bridge shall move vertically by means of two extra capacity hydraulic ram assemblies.
 - a. Each ram is independent of the other and shall be capable of supporting the passenger boarding bridge under full design load. The design shall provide 100% redundancy,
 - b. The lift cylinders are equipped with internally mounted pilot operated check valves that prevent the bridge from descending in the event of fluid loss or other system failure,
 - c. Mechanical stops in the cylinders shall be provided to prevent over-travel of the lift column. The system shall not be damaged if the bridge is raised or lowered into the cylinder stops
 - d. The vertical travel speed shall be 2.5 feet per minute, measured at the spacer.

 4. Vertical Drive - Electro-Mechanical Lift System:
 - a. The lift mechanism shall consist of two (2) re-circulating ball bearing screw assemblies. Each assembly shall be independent of the other, with individual motors, and be capable of supporting the bridge under full design load and raising and lowering the

bridges at and approximate speed of 2 feet, 6 inches per minute measured at the cab bumper. The ball nut of this assembly shall be equipped with wiper brushes to remove grit or dirt from screw threads and a self-locking Acme type thread to prevent unit collapse in the event of a ball nut failure.

- b. The vertical drive motors shall be fitted with spring-applied brakes that release only when electric power is applied and vertical motion, up or down, is signaled from operator's console or the auto-leveler system.
- c. The brakes shall hold securely at all elevations, without creeping, whether the bridge is in operation or not.
- d. The fault detector circuit shall shut down the electrical power to the vertical drive motors and set the brakes independently of the operator. This shall occur if the bridge is in the vertical operate mode and there is differential motion at the ball screws.

5. Horizontal Drive: A variable speed, electromechanical drive system shall provide horizontal travel.

- a. Drive wheels shall be driven independently by electric motors with integral brakes. A solid-state controller shall be provided for drive wheel speed control. Horizontal speed shall vary from 0 to 90 feet (27.4m) per minute.
- b. A steer angle of 180 degrees shall be possible.
- c. A regenerative braking system shall allow the passenger boarding bridge to come to smooth controlled stops. Integral spring-applied electrically released brakes shall be provided with each drive motor. The brakes shall lock the passenger boarding bridge in place when it is not being driven horizontally.
- d. Horizontal drive motors shall be equipped with manual brake releases, allowing the passenger boarding bridge to be towed in the event of a power failure.
- e. The bogeys shall be equipped with supports capable of supporting the PBB in the event of tire failure.
- f. Tow lugs shall be a component of the lower wheel frame.

J. Interior Finishes: The interior finish of the passenger boarding bridge shall be designed to be durable and easy to clean.

- 1. Ceiling should be plank type panels made from continuous coil coat painted galvanized sheets or 0.020" thick aluminum with a baked-on enamel finish. Planks shall run perpendicular to the tunnel centerline and continuously from wall to wall,
- 2. Interior light fixtures shall be recessed linear fluorescent type and blend with the ceiling design; Light fixtures shall run perpendicular at 6'-0" ft on center (maximum). Fixtures shall be 1'-0" wide (maximum) by 3'-0" long (minimum). The average light intensity at the floor shall be 18-foot candles (194 lux) (minimum). Fixture trim shall be painted black or shall match ceiling finish,
- 3. Light fixture in the rotunda shall be a flush mounted fluorescent type.
- 4. Single three-way switches shall be located in the rotunda and on wall near the service door at the aircraft cab. These switches shall control

interior tunnel, bubble and rotunda lights and the weatherproof fluorescent cab floodlight.

5. To the ends of the ceiling panels and the top edge of the wall panels, aluminum corner molding shall be used.
6. Insulation in the ceiling shall be 1 1/2-inch (12.7mm) thick, fire resistant
7. Sub floor in the cab and bubble area shall be smooth galvanized steel or 3/4 inch (19mm) marine grade plywood with high resistance to moisture and moisture damage. Sub floor in the remainder of the passenger boarding bridge 3/4-inch (19mm) thick moisture resistant, fire retardant plywood or oriented strand board-exposure 1, made with exterior phenolic resin adhesive, or smooth galvanized steel.
8. The cab finish floor shall consist of ribbed rubber 3/16 inch (4.76mm) thick.
9. Passenger boarding bridge interior floor covering, other than covered in the cab and bubble area shall be carpet tile, color and pattern to be selected by the Architect from manufacturer's standards, provided and installed by the passenger boarding bridge manufacturer.
10. The tunnel wall treatment shall consist of panels composed of 20 ga. galvanized steel sheet with baked-on enamel finish laminated to 1/2" rigid insulation or high-pressure phenolic laminate facing on medium-density fiberboard. Panels shall be supported by clear anodized aluminum trim with black plastic accent strips at each vertical joint. Wall treatments in the pivoting sections (rotunda and cab support) shall be galvanized steel slats.

K. Other Surfaces Exposed to Passengers: The coating system shall be specifically designed to provide long-term protection from the harmful effects of corrosion on passenger boarding bridges:

1. A prime coat of Epoxy followed by a topcoat of Polyurethane for a combined average dry film thickness of 7 mils (175 microns).
2. A topcoat Polyurethane that is available in a wide variety of standard colors. Custom colors are also available per contractual agreement.
3. Normal life expectancy is 10-15 years with proper maintenance, which consists of monthly inspection and repair of scratches, broken film, or delamination. Semi-annual power washing is also recommended.
4. These coatings are environmentally friendly due to very low VOC (Volatile Organic Compounds) in the primer and the topcoat.

I. INTERIOR COATING SYSTEM – Surface Preparation

1. Clean area to be painted in accordance with SSPC-SP1, solvent cleaning. This specification calls for the removal of all visible oil, grease, dirt, loose mill scale, rust, and loose paint.
2. Surface must be dry immediately prior to application of paint. There must also be at least a 5 point differential between the atmospheric temperature and dew point before painting can commence.

J. Coating Description

1. American Coatings Rustlok 8000 Series
2. American Coatings SU Series Polyurethane

- a. 60% solids color base (Part A)
- b. 60% solids urethane catalyst (Part B)
- c. Mix just prior to application per manufacturer's instructions

K. Application Requirements.

- 1. Apply to a total dry film thickness of 6-7 mils (150-175 microns).
- 2. Allow to dry per manufacturer's instructions prior to application of topcoat.

I. Inspection Criteria

- 1. Take five random film build readings per 100 square feet (9.3 sq. meters) of coverage area to verify correct millage.
- 2. Minimum acceptable dry film thickness is 3 mils (75 microns).

2.3 EXTERIOR COATING SYSTEM

A. Surface Preparation – Hot Roll / Cold Roll Steel Only

- 1. Clean area to be coated in accordance with SSPC-SP6, commercial blast cleaning. This specification calls for the removal of all rust, mill scale, paint, and other foreign matter except for any slight staining of same in less than one third of each square inch of blasted area.
- 2. The anchor pattern shall be no less than 1.5 mils (37.5 microns) or more than 2.5 mils (62.5 microns).
- 3. Surface must be dry and free of any foreign matter to include blast debris prior to coating.

B. Surface Preparation – Galvanized Steel Panels Only

- 1. Clean area to be coated in accordance with SSPC-SP1, solvent cleaning.
- 2. Do not blast or utilize any chemical cleaning product that could inhibit proper adhesion to the galvanized surface.
- 3. Surface must be dry prior to coating application. There must be at least a 5 point differential between the atmospheric temperature and dew point.

C. Coating Description – Primer - Hot Roll / Cold Roll Steel Only

- 1. 80% volume of solids Epoxy Primer
- 2. American Coatings Rustlock 8000 Series Epoxy (Two Components)
 - a. 80% solids epoxy primer base (Part A)
 - b. 80% solids epoxy catalyst (Part B)
 - c. Mix just prior to application per manufacturer's instructions.

D. Application Requirements

- 1. Apply to a total dry film thickness of 3-5 mils (75-125 microns).
- 2. Allow to dry per manufacturer's instructions prior to topcoat application.

E. Inspection Criteria

- 1. Take five random millage readings per 100 square feet (9.3 meters) of coverage area.

2. Minimum average dry film thickness is 4 mils (100 microns).

F. Coating Description – Topcoat – All Surfaces

1. Aliphatic Polyurethane color coat with satin gloss finish (60-65 @ 60 degree gloss meter).
2. American Coatings SU Series High Solids Polyurethane
 - a. High solids urethane color coat (Part A)
 - b. High solids urethane catalyst (Part B)
 - c. Mix just prior to application per manufacturer's instructions.

G. Application Requirements

1. Apply to a total dry film thickness of 2-4 mils (50-100 microns).
2. Allow to dry per manufacturer's instructions.

H. Inspection Criteria

1. Take five random millage readings per 100 square feet (9.3 meters) of coverage area
2. Minimum total average dry film thickness is 7 mils (175 microns) for carbon steel surfaces and 7 mils (175 microns) for galvanized steel surfaces.

2.4 PRE-PAINTED ITEMS

- A. Purchased components that are factory painted shall be repainted. Typical items include the hydraulic power unit, cab rotate drive motor, hydraulic drive motor, control power transformer, control console, limit switches, electrical junction boxes, conduit, etc.
- B. The finish color for the above items will be the individual manufacturer's standard.
- C. The finish color of the hydraulic unit is gray.
- D. The finish color of the control console is beige.

2.5 FIRE PROTECTIVE COATING – Fixed and Rotating Cab Floors only

A. Surface Preparation

1. Cab floors must be primed per exterior coating application procedures.
2. Surface must be dry prior to coating application. There must be at least a 5 point differential between the atmospheric temperature and dew point.

B. Coating Description

1. Fire Protective Epoxy Coating
2. Thermo Lag 220

C. Application Requirements

1. Apply to a total dry film thickness of 7-8 mils (175-250 microns).
2. Allow to dry per manufacturer's instructions prior to topcoat application.

D. Inspection Criteria

1. Take five random millage readings per 100 square feet (9.3 meters) of coverage area.
2. Minimum average dry film thickness is 13 mils (325 microns).

2.6 COATING REPAIR PROCEDURE

A. Surface Preparation

1. Prepare area to be painted using wire brush or power tool to remove any loose paint or other foreign matter.
2. Clean area to be painted by wiping with a general cleaning solution to minimize presence of rust, oil, grease, or other contaminants.
3. Surface must be dry prior to paint application.

B. Application Requirements

1. If damage is to bare metal, apply Rustlock primer in accordance with above sections. An alternative primer selection is American Coatings' AK 11187 Phenolic primer if recoat time is a consideration.
2. Apply urethane topcoat in accordance with above sections.
3. Verify total film builds meet specification requirements.

2.7 TOW BAR ATTACHMENT

- A. The PBB shall have provision for attaching a standard tow bar to move the bridge in the event of motor / power failure.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that the following are of proper size and type to receive the Passenger Boarding Bridge (PBB):
1. Foundations including anchor bolt patterns,
 2. Electrical work including electrical Power, emergency power and circuit protection.
 3. Location of assigned gates and aircraft parking positions,
- B. Report conditions detrimental to proper and timely completion of the installation of the passenger boarding bridge.

3.2 PREPARATION

- A. Furnish all anchors, inserts and the like required to install the passenger boarding bridges

- B. Arrange for temporary electrical power for installation through the Owner.

3.3 INSTALLATION / APPLICATION / ERECTION

- A. Installation shall be provided either by the passenger boarding bridge manufacturer or a licensee of the manufacturer.
- B. Coordinate installation of passenger boarding bridge with Owner and General Contractor.
- C. Installation shall be provided in strict compliance with all governing regulations.
- D. Installation shall conform to the manufacturer's recommendations and to the standards established by the industry.
- E. All permanent utility connections shall be the responsibility of the installer, connections will be provided in a weather tight condition.
- F. The rotunda corridor of the passenger boarding bridge will be flashed to the exterior face of the concourse. The flashing will provide a neat and weather tight condition.
- H. Structural Support Elements
 - 1. Verify the design dimensions from the top of the foundation to the floor of the terminal building door sill at each gate location.
 - 2. All anchor bolts shall be properly protected from bending and damage during and after construction. All anchor bolts shall be double nutted, with 3 full threads minimum showing. The Contractor shall install anchor and leveling nuts, provide an appropriate size flat washer to cover the slotted opening in PBB support column base plate and provide proper installation of the nuts as required to complete the installation. After installation, tack weld the anchor nuts to the base. All zinc coating removed or damaged by welding or by any other reason shall be cleaned and repaired with galvanizing repair primer meeting the requirements of Federal Specifications TT-P-641 G (1), Type II. Anchor bolts are provided by others.
 - 3. An approved non-shrinking grout shall be used underneath the column base plate and leveling plate and fill all anchor bolt pipe sleeves. Grout shall be nonferrous to avoid unsightly rust marks. Form all grout pours. The grouting shall be done to ACI standards. Grouting by dry packing and filling the center area with bags and blocks is not acceptable.

3.4 FIELD QUALITY CONTROL

- A. Acceptance testing: perform tests with the Owner present prior to placing the passenger boarding bridge in service.
- B. Adjust the passenger boarding bridge for proper and smooth operation.

- C. Install all work, meeting the requirements of the Contract Conditions and in accordance with product manufacturer's instructions and recommendations, NFPA requirements, and requirements as specified herein
- D. Workmanship: Install all equipment, materials, specialties, etc., in accordance with the best practice and standards for this type of work.
- E. Surface Finishes: All surfaces and edges of miscellaneous steel, etc. shall be smooth and free of marks, burrs, roughness, and other defects. Finish welds to match parent material. Where possible, grind welds smooth; remove flux, oxide, splatter or any other residue from the weld and adjacent areas of exterior and interior surfaces.

3.5 PROTECTION AND CLEANING

- A. Protect the passenger boarding bridge from time of installation until acceptance by the Owner.
- B. All finish surfaces shall be delivered to the Owner free of any soil or damage.
- C. Repair or replace any damage to the passenger boarding bridge prior to Owner acceptance.

3.6 MANUALS

- A. Operation and Maintenance Manuals shall be provided and be prepared in accordance with Air Transport Association (ATA) Specification 101. Included in the manuals shall be preventative maintenance requirements and problem solving procedures.
- B. Manuals shall be Furnished According to the Following Schedule:
 - 1. One passenger boarding bridge: Three Operation and Maintenance Manuals.
 - 2. Two passenger boarding bridges: Four Operation and Maintenance Manuals.
 - 3. Three boarding bridges or more: Five Operation and Maintenance Manuals

3.7 DEMONSTRATION AND TRAINING

- A. The Contractor shall provide as a minimum 8 hours of operator and 8 hours of maintenance training, in separate sessions by a qualified Manufacturer's representative. Training shall be conducted at the installation site and in classrooms as designated and provided for by the Owner and airlines. Maintenance training shall include proper demonstration of cut-away models of critical parts, full instruction on proper maintenance and trouble shooting, instructions on proper use of manuals, etc. Operation training shall include proper training of the operators on correct bridge operations to avoid damaging the equipment by improper use of the controls. The Contractor shall provide a complete operation training program and maintenance training program both

recorded on separate video tapes to enable the Owner to train additional employees in the future.

- B. Training shall be conducted by the Contractor utilizing prepared texts, slides, actual passenger boarding bridges and other instructional material as appropriate.
- C. The Contractor shall, upon completion of the training program, provide the airline and Owner with 2 operating instruction manuals and 2 maintenance manuals for each passenger boarding bridge.
- D. Training dates shall be mutually agreed upon by the Contractor, airlines and the Owner and shall be at dates prior to bridges going into regular operational service.
- E. The airlines and Owner will assign persons or companies to be trained.

3.8 SPARE PARTS

- A. The Contractor shall furnish, not less than forty-five (45) days prior to completion of a passenger loading bridge, a list of suggested spare parts, including prices and sources, to the Architect / Engineer for review by the Owner. Spare parts as recommended in this context are those items which are necessary to maintain in stores in order to maintain service availability of bridges.

3.9 APPENDIX "A"

- A. See attached Appendix "A" for standard performance and procedure checklist. Contractor shall perform standard performance testing procedure and document on the checklist and procedure checklist during the "punchlist" phase in the presence of an Owner's Representative; see Section 3.7.A for further requirements. Contractor shall submit performance and procedure checklists specifically intended for PBB models installed.

END OF SECTION 14950

APPENDIX "A"
STANDARD PERFORMANCE
AND
ACCEPTANCE TEST PROCEDURES
FOR APRON DRIVE LOADING BRIDGES
STANDARD PERFORMANCE TEST PROCEDURES

Preliminary / Final Inspection (circle one) Date _____

Loading Bridge Gate Number: _____

Airline Served: _____

Airline / Airport Representative present during demonstration: _____

Architect / Engineer's Representative present during demonstration: _____

Owner's Representative present during demonstration: _____

A. ELECTRICAL INSTALLATION

General: Prior to connecting power supply, check all circuits as follows:

		<u>Functioning Properly</u>	<u>Malfunctioning</u>
1.	Insulation resistance	_____	_____
2.	Continuity	_____	_____
3.	Polarity	_____	_____
4.	Earth loop resistance from each main part of the ground connection with building ground	_____	_____
5.	Disconnect operation	_____	_____

B. FUNCTIONAL TESTS

		<u>Functioning Properly</u>	<u>Malfunctioning</u>
1.	Electrical: Demonstrate the following:		
a.	Emergency lights	_____	_____
b.	Emergency stops	_____	_____
c.	Warning lights	_____	_____
d.	Obstruction lights	_____	_____
e.	Floodlights	_____	_____
f.	Bogie visual alarms	_____	_____
g.	Bridge lighting	_____	_____
h.	Stair lighting	_____	_____
i.	Heatable window (if fitted)	_____	_____
j.	Key switch for manual & automatic operation	_____	_____
k.	Height indicator	_____	_____
l.	Signal lamps	_____	_____
m.	Main control panel	_____	_____
n.	Cabin floor heater	_____	_____
o.	Selector switches:		
	1) Lifting / lowering	_____	_____
	2) Cabin rotation	_____	_____
	3) Wheels - steer right / left	_____	_____
	4) Bridge – extend / retract	_____	_____
	5) Emergency back-off	_____	_____
	6) Main / Aux changeover switch (if fitted)	_____	_____
p.	Safety interlocks:		

	1)	Maintenance switches		
	2)	Main panel isolator		
	3)	Safety barrier (if fitted)		
	q.	Fault Monitoring (if fitted)		
2.		Mechanical: Demonstrate the following:		
	a.	Cabin window shutters (if fitted)		
	b.	Door closer on service door		
	c.	Tires		
	d.	Self sustaining elevation screw		
C.		<u>OPERATION TESTS (ALL DONE TWICE)</u>		
1.		Extension / Retraction		
	a.	Extension limit switch No. 1		
	b.	Extension limit switch No. 2		
	c.	Retraction limit switch No. 1		
	d.	Retraction limit switch No. 2		
	e.	Speed reduced (if fitted)		
2.		Lifting / Lowering		
	a.	Height switch No. 1 fully extended		
	b.	Height switch No. 2 fully extended		
	c.	Lower switch No. 1 fully extended		
	d.	Lower switch No. 2 fully extended		
	e.	Height switch No. 1 fully retracted		
	f.	Height switch No. 2 fully retracted		
	g.	Lower switch No. 1 fully retracted		
	h.	Lower switch No. 2 fully retracted		
	i.	Inclination switch bridge up fully retracted		
	j.	Inclination switch bridge down fully retracted		
3.		Rotation (Bridges)		
	a.	Approach switches left hand		
	b.	Approach switches right hand		
	c.	Check slow-down or supplementary switches as above		
	d.	Ultimate limit switches L/R		
4.		Rotation (Cabin)		
	a.	Limit switch left hand		
	b.	Limit switch right hand		
5.		Canopy		
	a.	Extension, check both side switches		
	b.	Retraction, check both side switches		

**NEW PASSENGER TERMINAL
DULUTH INTERNATIONAL AIRPORT
DULUTH, MINNESOTA**

**SECTION 14951 - PASSENGER
BOARDING BRIDGE
REFURBISHMENT**

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections apply to this section.

1.2 SUMMARY

- A. The scope of the work includes:

1. The refurbishment of two (2) Apron-Drive type Passenger Boarding Bridge (PBB) units at existing Gates 1 & 4, acquired by the Airport in 2009 from ThyssenKrupp Airport Systems, Inc:
 - a. Gate 1:
 - 1) TKAS Model No. TB 41/24.5-2
 - 2) Serial No. 05191TB4121533
 - b. Gate 4:
 - 1) TKAS Model No. TB 35/21.0-2;
 - 2) Serial No. 05191TB3521534
 - c. Contractor shall, at a minimum, provide finish refurbishment including, but not limited to:
 - 1) Touch-up of exposed interior and exterior PBB surface finishes in accordance with the requirements of this Section.
 - 2) Replace tires in kind.
 - 3) Replace carpet finish.
 - 4) Replace rubber flooring finish.
 - 5) Replace damaged or missing panels and trim at wall finishes and ceiling.
2. The refurbishment of one (1) Apron-Drive type PBB unit at existing Gate 3:
 - a. Gate 3:
 - 1) TKAS Model No. TB 33/20.0-2
 - 2) Serial No. 05095TB3321089
 - b. Contractor shall, at a minimum, provide finish refurbishment including, but not limited to:

- 1) Touch-up of exposed interior PBB surface finishes in accordance with the requirements of this Section
 - 2) Paint all exposed exterior PBB surface finishes in accordance with the requirements of this Section.
 - 3) Replace tires in kind.
 - 4) Replace aircraft closure.
 - 5) Replace all worn gaskets and weather seals.
 - 6) Remove existing baggage lift device and restore cab rolling slat curtain walls to original manufacturer specifications.
 - 7) Replace carpet finish.
 - 8) Replace rubber flooring finish.
 - 9) Replace damaged or missing panels and trim at wall finishes and ceiling.
 - 10) Replace door locks as needed to match other PBBs.
3. Each unit shall be refurbished to meet performance requirements for a comparable new PBB in accordance with the provisions of this Section.
- B. Related Sections: The following sections contain requirements that relate to this section:
1. Division 14 Specification Section 14950 – “Aircraft Passenger Boarding Bridges” for new PBB components and installation.
 2. Division 14 Specification Section 14955 – “Baggage Lifts” for baggage lifts.
- C. The proposer shall verify all field conditions prior to bidding and is responsible for any engineering, purchasing, co-ordination, obtaining permits and other related items in order to refurbish three (3) existing PBB’s.

1.3 BID SUBMITTALS

- A. Refurbishment List: The Bidder shall provide, with the bid proposal, a Refurbishment List for each Passenger Boarding Bridge with tabbed sections for each of the following criteria for Owner review:
1. Bridge Structure Condition
 - a. Age of Original Bridge Structure.
 - b. Bridge Serial Number (OAG#).
 - c. Original Manufacturer.
 - d. Date Bridge Purchased by Bidder.
 - e. List of Components of Bridge Structure Refurbishment (in whole or in part). Provide detailed description of parts/components replaced, reconditioned, repaired, etc. Include condition of Aircraft Closure.
 2. Controls
 - a. Original Manufacturer of Controls.
 - b. Extent of Controls Refurbishment (in whole or in part).
 - c. Manufacturer of Refurbished Controls components (provide detailed description of parts replaced, reconditions, repaired, etc).

3. Vertical & Horizontal Drive Systems
 - a. Original Manufacturer of Drive Systems.
 - b. Extent of Drive Systems Refurbishment (in whole or in part).
 - c. Manufacturer of Refurbished Drive Systems components (provide detailed description of parts replaced, reconditions, repaired, etc).
4. Electrical Systems Components
 - a. Original Manufacturer of Electrical Systems.
 - b. Extent of Electrical Systems Refurbishment (in whole or in part).
 - c. Manufacturer of Refurbished Electrical Systems components (provide detailed description of parts replaced, reconditions, repaired, etc).
5. Miscellaneous Components
 - a. Original manufacturer(s) of Miscellaneous Components.
 - b. Extent of Miscellaneous Component Refurbishment (in whole or in part).
 - c. Manufacturer of Refurbished Miscellaneous Components (provide detailed description of parts replaced, reconditions, repaired, etc)

1.4 ACTION SUBMITTALS

- A. The Contractor shall submit complete and detailed shop drawings and specifications for items to be refurbished in the existing PBB units to the Architect for review. An index prepared in sequential order listing all drawings, sketches, details, and materials to be submitted shall be provided. All drawings, sketches, details and materials shall be submitted in English language, in United States units, including dimensions, volumes, weights and forces. The use of the metric or SI units is not acceptable.
- B. Shop drawings shall show the following, as they apply:
 1. Loading bridge dimensions and general arrangement drawings.
 2. Interior elements:
 - a. Interior walls and ceilings finishes.
 - b. Transition details.
 - c. Wall finish attachment.
 - d. Light fixture details and layout.
 - e. Joint details.
 - f. Tunnel floor finish.
 - g. Cab floor finish.
 - h. Rotunda floor finish.
 - i. Carpet edging details, including lines of demarcation between carpeted and hard surfaced floor at wall areas and treatment at doors, thresholds and doors to terminal building.
 3. Exterior elements:
 - a. General bridge layout.
 - b. Exterior sketch of each bridge element.
 - c. Paint finishes.
 - d. Handrails and ladder to roof.
 - e. Flashing (building to passenger loading bridge).
 - f. Flashing (bridge segments).
 - g. Cab door seal.

- h. Ramp service stairway.
- 4. Cab features:
 - a. Operator's cone of visibility from control console.
 - b. Control panel location and functional layout.
 - c. View panels.
 - d. Safety devices.
 - e. Interface with aircraft.
 - f. Modifications necessary for appropriate mating with required aircraft types (including auto-leveling devices).
 - g. Safety strips.
 - h. Signage (exterior).
 - i. Signage and plaques (interior).
 - j. Electric heater
- 5. Appearance and Safety Markings:
 - a. Color and finish, exterior.
- 6. Finish Samples:
 - a. Provide samples of all interior and exterior passenger boarding bridge finishes.
- C. Engineering Calculations: The Contractor shall submit to the Architect-Engineer structural calculations and power requirement computations including the following:
 - 1. Electrical power and control schematic diagrams.
 - 2. Hydraulic schematics.
 - 3. Structural drawings including all pertinent calculations which shall be signed and sealed by a professional Engineer licensed in the State of Minnesota.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data:
 - 1. The Contractor shall provide 30 days prior to acceptance inspections of each loading bridge, 2 copies of technical manuals per each loading bridge. The shop drawings and manuals shall reflect the exact construction (not typical construction) of each unit including manufacturer's part number and pictorial drawings for each item.
 - 2. The technical manuals shall contain the following information:
 - a. Original manufacturer's name, model number, service manual parts list and brief description of all equipment, including basic operating features.
 - b. Maintenance instructions including troubleshooting / diagnostics guidelines.
 - c. Overhaul instructions.
 - d. Equipment layout and complete wiring and control diagrams of applicable new (replacement) systems as installed.
 - e. List of applicable new (replacement) parts and part numbers including manufacturer's name and part number, as well as the supplier's name and part number.

- f. Illustrated parts list.
 - g. Recommended spare parts list and source.
- 3. Operation and maintenance manuals shall be in notebook format.
 - 4. Electrical drawings shall reflect the wiring for each unit as it has been refurbished and not general drawings. Place 1 set of drawings in control console of the bridge and 1 in the manual.

1.6 PERFORMANCE REQUIREMENTS

- A. The Passenger Boarding Bridge (PBB) shall be refurbished in accordance with good engineering practices and the standards developed and adopted by the passenger boarding bridge industry.
- B. The refurbished PBBs must be capable of reaching all specified aircraft types and aircraft parking positions as designed on the Aircraft Layout Plans. The bridge cab shall have sufficient flexibility to enable it to mate with the aircraft passenger-boarding door when the aircraft is parked at the gate. The bridge shall have sufficient vertical travel to accommodate all aircraft indicated.
- C. The refurbished PBBs shall be modified as necessary to accommodate the mounting of point-of-use gate equipment to be provided and installed by Others. The PBB Contractor shall coordinate with the suppliers of the following to ascertain loading requirements and attachment provisions:
 - 1. Pre-Conditioned Air Systems and associated Hose Management Systems.
 - 2. 400 Hz and 28 VDC Solid State Ground Power Units.
- D. Structural Loads:
 - 1. The PBB shall be designed to support the following loads. The design shall be based on the load combination that imposes the most adverse loading. In addition to the dead loads and strain caused by movement, the entire passenger boarding bridge shall support:
 - a. Floor Live Loads: 30 pounds per square foot (191 kg per square meter).
 - b. Wind Loads:
 - 1) Retracted and stowed: 25 pounds per square foot (120 kg per square meter).
 - 2) Operational: 12.5 pounds per square foot (61 kg per square meter).
 - c. Seismic Loads: The PBB shall be designed to withstand the earthquake induced forces.
 - d. Roof Live Loads: 25 pounds per square foot.
 - e. Design Snow Loads: Per 2006 Edition International Building Code.
- D. The PBB, when refurbished and with adequate maintenance, shall provide a minimum useful service life of 15 years.
- E. The PBB is to drain all water entering the PBB to the exterior. All "water entering joints, condensation, and migrating moisture shall be drained to the exterior of

the PBB. Replace all drainage tubes, parts, etc. as required for fully functioning systems.

- F. All new electrical systems installed as part of this contract must be protected/guarded from damage that may be caused by falling objects or collision with aircraft service equipment and other moving ground vehicles.
- G. Cabs, tunnel sections, service stairs and landings, rotundas, and all electrical items shall be interconnected by a continuous grounding conductor. The main grounding conductor shall be provided with the power supply feeder.
- H. Environmental Considerations:
 - 1. Passenger boarding bridge shall operate satisfactorily under ambient temperature conditions of –40 degrees F (-40 degrees C) to 125 degrees F (52 degrees C), with wind up to 60 mph (96.56 kph).
 - 2. All components and materials shall be individually and collectively designed or selected for long service life under such conditions.
- I. Power Characteristics:
 - 1. The passenger boarding bridge shall operate on 480 V.A.C., 3 phase, 60 Hz. Electrical power, and separate ground (4 wire). The 480 V.A.C. shall be transformed to 120/240 V.A.C. for lighting and controls.
- J. Safety Provisions:
 - 1. The refurbished bridges shall conform to all applicable current Federal, State, Local, Occupational Health and Safety Codes, and NFPA, along with standards developed and adopted by the Passenger Boarding Bridge industry to the extent practical for refurbished PBBs. All new components used in the refurbished PBB must conform to the latest version of the NFPA and UL requirements, as required.
 - 2. Operating controls and maintenance features shall be rebuilt, reconditioned, or replaced so that errors in the operation and maintenance of the bridge cannot cause structural damage to any of its elements.
 - 3. Positive mechanical stops shall be provided to prevent hazardous over-travel where any component might become disengaged from its guiding or restraining component.
 - 4. The operator's position in the cab shall be arranged to permit the operator to operate the PBB with the cab weather door closed. The Operator console shall be positioned on the left side for jet aircraft (when facing the aircraft from inside the cab).
 - 5. Sheared or sharp metal edges must be deburred or broken and all exposed metal corners are to be rounded. All critical fasteners are to incorporate suitable locking devices.
 - 6. Audible and visual alarms shall be included to alert personnel when the PBB is in motion or operational.
- K. Paintings and Coatings

1. All external components shall be constructed and finished in a manner to inhibit corrosion.
2. The exterior paint finish shall meet the following as a minimum:
 - a. Surface preparation:
 - 1) Power wash entire boarding bridge with detergent additive (e.g. Simple Green) to remove dirt and cracked or chipped paint from the surface.
 - 2) The surface shall be mechanical cleaned (power tool) to remove loose scale, contaminants, and rust from the surface where required. Rust shall be cleaned to bare metal. All sanded areas shall be "feathered out" to give a smooth appearance before priming and painting.
 - b. Primer (as required for any bare metal and sanded areas):
 - 1) One coat of Sherwin-Williams Kem-Kromik Metal Primer (or equivalent) shall be applied. Color: White (B50 WI).
 - c. Finish Coat:
 - 1) Sherwin-Williams Industrial Enamel (B54 Series). The Color shall be as selected by the Owner.
3. All electric motors, controls, and electrical wiring I equipment to be installed outdoors shall be installed in NEMA 4 rated enclosures in order to protect this equipment and connections from the elements.
4. All machined surfaces shall be coated with a suitable rust preventative.

L. Equipment

1. All equipment and material shall be new where specified or otherwise cleaned and reconditioned to "like new" appearance, undamaged, and of the best grade and workmanship feasible; decisions concerning quality, fitness of materials, or workmanship shall be by the Owner.
2. Where items exceed one in number, provide products with similar construction, model numbers, and appearance, from the same manufacturer.
3. Insofar as possible, products shall be the standard and proven design of the manufacturer. Manufacturer shall be engaged in the manufacture of the product for a minimum of 5 years. When standard products are modified to suit these Contract Conditions, manufacturer shall certify operating conditions, ratings and capacity of the product based on qualification tests and Contractor shall submit compliance certificates.
4. Acceptable Products: Certain makes and/or manufacturers of material and equipment are specified herein and/or indicated on the Drawings as acceptable products. Prior to submittal, use manufacturer's published data to verify that the product meets the requirements of the Contract Documents. Notify the Owner of conflicts.
5. Substitutions: Submit the specified materials and equipment. Where "or equal" products are specified, equivalent materials and equipment of other manufacturers may be submitted for consideration for approval by

the Owner but shall be clearly distinguished in the submittal as substitutions.

1.7 QUALITY ASSURANCE

A. PBB Refurbishment Contractor Qualifications

1. The PBB Refurbishment Contractor have a minimum of ten years successful experience in the design, fabrication and installation of similar passenger boarding bridges and must be able to supply a list of at least 20 similar projects involving the refurbishment and re-installation of PBBs during the same time period..
2. The Superintendent or person in charge of all craft personnel shall have at least 5 years experience in refurbishing and re-installing similar PBBs and installed at least 15 PBBs and associated systems/ equipment. Also, said individual shall be knowledgeable in the fabrication, assembly, installation, and operation of the required electrical and mechanical systems and equipment, the engineering essentials, safety requirements and be capable of reading, interpreting and coordinating the drawings, specifications, and submittal data of the electrical and mechanical work.
3. Coordinator shall plan and expedite delivery of the PBB products to the Project site, and to schedule labor to meet the progress schedule of the work.
4. It will not be acceptable for a Contractor who meets the experience qualifications to subcontract the PBB reconditioning work to a Sub-Contractor who does not meet the same experience qualifications.

B. The Passenger Boarding Bridges shall be reconditioned to conform to all applicable Federal, State, and Local codes and regulations that apply to the installation site. The necessary design, fabrication, and installation of all new parts and subassemblies shall be in accordance with good commercial practices to assure safe, efficient, and practical systems in keeping with standards, which have been adopted by the Passenger Boarding Bridge industry. Applicable documents include, but are not limited to, the following::

1. AISC – American Institute of Steel Construction.
2. ASME – American Society of Mechanical Engineers.
3. ASTM A36 – Specification for Carbon Structural Steel.
4. ASTM A53 – Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
5. ASTM A307 – Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
6. ASTM A311 Grade 1018 and Grade 1144 Hinge Pins.
7. ASTM A325 – Specification for Structural Bolts, Steel, Heat-Treated, 120/105 ksi Minimum Tensile Strength or SAE-J429 Grade 5 or 8.
8. ASTM A490 – Specification for Heat-Treated Steel, Structural Bolts, 150 ksi Minimum Tensile Strength.
9. ASTM A500 – Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

10. ASTM A514 and A517– Specification for High-Yield Strength, Quenches and Tempered Alloy Steel Plate, Suitable for Welding.
11. ASTM A1011 – Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon Structural, High-Strength Low-Alloy with Improved Formability.
12. AWS – American Welding Society.
13. NEC – National Electric Code.
14. NEMA – National Electrical Manufacturers Association.
15. NPA – National Plywood Association.
16. SAE – Society of Automotive Engineers.
17. SSPC – Structural Steel Painting Council.
18. Society of Automotive Engineers (SAE) Standards.
19. National Fire protection Association (NFPA — 70, 415 and 417).
20. Occupational Safety and Health Administration (OSHA).
21. Sheet Metal and Air Conditioning Contractors National Association (SMACNA).
22. Underwriters Laboratories (UL).
23. Institute of Electrical and Electronic Engineers (IEEE).
24. Air Transportation Association (ATA) — Specification 101 — Manufacturer's Technical Data.
25. International Building Code, 2006 Edition.
26. Code of Federal Regulations (CFR).
 - a. 36 CFR 1191 — Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities.
 - b. 14 CFR 382 — Nondiscrimination on the Basis of Disability in Air Travel.
 - c. 28 CFR 36 — Nondiscrimination on the Basis of Disability by Public Accommodation and in Commercial Facilities.

1.8 WARRANTY

- A. Warranty shall include all parts, labor, travel time, and expenses necessary for repairs or replacement of defective or malfunctioning bridge units or defective system components. All new parts and materials shall be guaranteed against defects in material and workmanship for a period of 1 year from the date of acceptance of the work by the Owner.
- B. All work by the Contractor within this warranty period shall be provided without cost to the Owner and shall include all labor and necessary materials required to replace defective material and workmanship. If a component is replaced, the warranty period begins again as if the part were new.
- C. Contract shall warrant that the equipment and all new components and accessories furnished in connection therewith, shall comply fully with contract documents; be free of any defect in design, material, or workmanship; be new and of good quality; and free and clear from any liens, encumbrances and title defects.

1.7 MAINTENANCE

- A. Preventive maintenance: Prior to formal acceptance and during the on-airport storage and installation, the Contractor shall be responsible for the preventive maintenance and general protection from deterioration of the passenger loading

bridge. After formal acceptance, the Owner shall be responsible for all preventive maintenance, in accordance with manufacturer's manual.

- B. Corrective maintenance: The Contractor shall be responsible for all corrective maintenance, under the terms of the guarantee - (parts and labor) for one (1) year from date of acceptance of the passenger loading bridge. Corrective maintenance shall include all maintenance except minor and routine adjustments and lubrication. In the event that the Contractor fails to respond within twenty-four (24) hours to correct a maintenance occurrence (and expediently perform whatever repairs necessary to restore the loading bridge into service), the Owner reserves the right to perform (with its own maintenance forces or otherwise) such corrective maintenance work and the Contractor shall reimburse the Owner whatever expenses incurred by the Owner in performing such corrective maintenance work.
- C. The Contractor shall provide the maintenance personnel of the Owner with service bulletins outlining product improvement data resulting from continuing field operation experiences.

1.8 PERMITS

- A. Project Permits: The PBB Contractor shall be responsible to apply for and obtain all required permits, including the FAA Crane Permit, if a deviation from the current permit is desired. The FAA Crane permit may entail a 30 to 60 day lead time, so immediate application is required by the PBB Vendor. All airport required special permit requirements/conditions are the responsibility of the PBB manufacturer.

1.9 AIRPORT SECURITY

- A. The PBB Contractor shall be responsible for determining and complying with Airport Security, Badging and Vehicle access requirements. PBB Contractor shall not rely on Owner's representatives for airport access/escorts. No extension of the performance period will be allowed due to the Contractor's ability to comply with Airport Security requirements.

1.10 PROJECT / SITE CONDITIONS

- A. Contractor shall visit the site and familiarize himself regarding the existing conditions at the project site.
- B. Contractor shall be responsible for verification and acceptance of all existing conditions affecting the refurbishment of all PBB's and components prior to starting the Work.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following, or approved equal:

1. Passenger Boarding Bridge:
 - a) JBT Aerotech – Jetway Systems
 - b) ThyssenKrupp Airport Systems

2.2 PASSENGER BOARDING BRIDGE (PBB)

- A. Refurbished Passenger Boarding Bridges shall be a maximum of ten (10) years old from the issuance of this document.
- B. Rotunda Assembly: The rotunda assembly shall be made up of a corridor, rotunda and support pedestal. The assembly shall be designed so that it does not transmit any live or dead loads or vibrations to the terminal building.
 1. The rotunda assembly shall be installed as the terminal end pivot for passenger boarding bridge's vertical and horizon motion. As the main pivot for passenger boarding bridge, the rotunda assembly shall allow the passenger boarding bridge to rotate a total of 175 degrees, 87 ½ degrees clockwise and 87 ½ degrees counter clockwise for the corridor center line.
 2. Slope, over-travel and operational swing limits shall be located on the rotunda assembly. Slope limits shall be adjustable up to 8.33 percent for both up and down slopes. This limit shall be adjustable to meet local operating conditions and requirements.
 3. Over-travel swing limit shall be provided. The over-travel swing limit switch shall be located on the support column. The trip plate for this switch shall be located on the rotunda and shall be adjustable to meet local conditions. When this switch is actuated it shall cut off all control power so that the PBB can only be moved by using the by-pass switch in the control console. The rotunda frame shall be equipped with rubber bumper type mechanical stops to prevent collapse of the telescoping tunnel sections.
 4. A potentiometer, or limit switches, shall be provided at rotunda, which senses the position of the passenger boarding bridge and sounds a warning buzzer at control console prior to activation of the over-travel swing limit. Actuation of the warning buzzer shall be adjustable within the over-travel limit envelope and shall signal rotational operational limits.
 5. Rotunda floor shall remain stationary and level at all times and provide a smooth transition between the fixed bridge/corridor and telescoping tunnels. Flap type seals shall be provided for weather protection between the rotunda and the hinged telescoping tunnel section.
 6. The rotunda support pedestal shall provide the structural support for the passenger boarding bridge and fixed bridge/corridor. The support column shall rest on a foundation and anchor bolt pattern that is supplied by others. The pedestal shall be custom built to meet specific site conditions.
 7. The electrical disconnect panel, mounted on the pedestal, shall provide the electrical disconnects and transformers required to adapt specified terminal power to the passenger boarding bridge's electrical requirements.
- C. Tunnel Assembly: The tunnel assembly connects the rotunda assembly and aircraft cab assembly.

1. Telescoping tunnels shall be rectangular in cross section. The tunnel with the largest cross section shall be closest to the aircraft.
2. The exterior roof, and floor panels of the telescoping tunnel sections shall be manufactured from corrugated, or galvanized flat steel panels attached to a framework of angle and tubing. These panels are formed, welded, sealed and painted to form the tunnel enclosure. Roof shall be flat to prevent the collection of water.
3. Solid-Sided PBB: The exterior sides of the telescoping tunnel sections shall be manufactured from corrugated, or galvanized flat steel panels attached to a framework of angle and tubing. These panels are formed, welded, sealed and painted to form the tunnel enclosure.
4. Hinged transition ramps shall accommodate the difference in elevation where telescoping tunnel sections overlap.
5. Minimum interior clear dimensions are as follows:
 - Minimum Floor Width: 4'-10".
 - Minimum Interior Height: 6'-11".
 - Minimum Inter-Tunnel Ramp Width: 4'-8".
 - Minimum Corridor Width: 4'-4-1/2".
6. The telescoping tunnels shall be equipped with an under-bridge or side-mounted exterior electrical cable conveyance system. This system is accessible to maintenance personnel for inspection or cable addition at all passenger boarding bridge positions and operations conditions. Access to the conveyance system shall not impede passenger traffic or passenger boarding bridge operation. The system shall be capable of supporting a combination of cables and hoses with a maximum weight of 12 pounds per square foot and a maximum cross-sectional area of 12 square inches consisting of two 6 square inch areas. The largest tunnel shall be equipped with an aluminum or galvanized wire way to continue electrical cable routing beyond the electrical cable conveyance system.
7. Fire resistant plywood or steel shall be used in the repair of all damaged or rotted sub floor material in tunnel sections.
8. Tunnel Ice Scrapers: Provide tunnel ice scrapers — EXTERNAL to the tunnels.
9. All existing tunnel rollers shall be inspected and adjusted. Rollers should be replaced as required

D. Aircraft Cab:

1. The refurbished aircraft cab shall be capable of rotating in accordance with the original manufacturer's specification.
2. Limit switches and physical stops shall control the rotation limits.
3. The cab shall be equipped with a forward facing control console. The console shall be located behind laminated glass windows. Operation of the PBB shall be possible without opening the weather doors. Additional visibility may be obtained through the vision panels in the cab side-coiling curtains and windows located in front, left and right to the operator.
4. Cab Mirrors shall be mounted to allow the operators to view the apron area from their console. If cracked or damaged, mirrors shall be replaced new. Provide 3 mirrors as follows:
 - a. A wheel-bogie mirror shall be installed and positioned in such a manner that the operator can constantly view the wheel bogies from the control console while the cab is in a left rotation position.

- b. A mirror shall be located to allow the operator to view the service stairs and the ramp around the service stair area.
 - c. A mirror shall be positioned to allow the operator to view the other side of the bridge (opposite side than the service station).
 - 5. A full width spacer shall be located at the aircraft end of the cab floor. The spacer material shall meet the fire protection specifications of NFPA-415 shall be flexible and non-abrasive to prevent scratching or other damage to aircraft fuselage. Spacers shall be properly equipped to drain so as to not retain precipitation or moisture.
 - a. The spacer must be installed so as to not cause damage to any fuselage protrusion such as antenna or pitot tubes, etc.
 - 6. The aircraft end of the cab shall be equipped with a cab floor that adjusts to the optimum relative to the aircraft doorsill. The floor shall be actuated and independently adjustable to adapt to all aircraft doorsills. It shall be designed to level automatically and shall be equipped with a manual override control switch. The floor shall be capable of providing a level surface adjacent to the aircraft doorsill for passenger boarding bridge slopes from -10% to +10%.
 - 7. Exterior floodlights shall be provided for nighttime operation to illuminate the apron area ahead of the passenger boarding bridge. A floodlight shall also be provided to illuminate the drive column wheel bogey area. This light shall be located under the tunnel section.
 - 8. A weatherproof fluorescent fixture shall be provided outside the weather doors to illuminate the cab-aircraft interface.
 - 9. A ventilator shall be mounted on the cab bubble roof, which exhausts hot air from the passenger boarding bridge. The damper shall be gravity operated. The exhaust fan control shall be console operated. Ventilator shall be 1500 CFM model.
 - 10. A thermostat controlled electric cab heater shall be provided.
 - 11. Provide electric cab floor de-icer.
 - 12. The cab area shall be equipped with a new fire extinguisher. The fire extinguisher shall be 10 lb. dry chemical
- E. Aircraft Closure: The aircraft end of the cab shall be equipped with a folding bellows aircraft closure. The closure, when fitted against the fuselage, shall surround both the open aircraft door and the doorway to protect passengers from the elements. Covering shall not absorb water, shall be highly tear resistant and shall remain flexible form -31 degrees F (-35 degrees C) to 127 degrees F (52.8 degrees C). The aircraft enclosure color shall be black or dark gray.
- 1. Each side of the aircraft closure shall independently seal against aircraft contours.
 - 2. If necessary, pressure sensitive switches shall be incorporated into the closure mechanisms to prevent excessive pressure on the aircraft.
 - 3. The contacting seal shall be a soft material to prevent scratching or damage to the aircraft skin. The seals that contact the aircraft shall be designed for easy replacement.
- F. Service Access: A service door, landing and stair leading to the apron areas shall constitute the service access. Service access shall be located on the right hand side of the cab end of the passenger boarding bridge; it provides access between the passenger boarding bridge and apron for authorized personnel.

1. Service door shall be steel, hollow core with wire glass window, and meets or exceeds the 3/4-hour fire rating per ASTM E 152. The minimum door width is 3 feet 0 inches, (914 mm) wide and 6 feet 8 inches (2032mm) high. Door shall be equipped with heavy-duty commercial-type hardware (Best Brand core) and automatic door closure. The door shall open outward onto the service stair landing. A cipher lock is to be provided on the exterior and knob on the interior. A 30-inch (762mm) stainless steel kick plate shall cover the lower inside portion of both interior and exterior sides of the door.
 2. Service stair landing shall be parallel to the adjacent tunnel floor. The landing shall be made of hot dipped galvanized steel, open mesh grating. The landing shall be protected on the open sides by galvanized steel handrails, which meet OSHA standards. A switch operated, full cut-off luminaire shall be provided above the landing.
 3. Service stair shall be equipped with self-adjusting risers and treads made from expanded metal with a serrated edge for a gripping surface. All steps shall have an equal rise. The tread width shall be 28 inches (711 mm) and the maximum tread height shall be 9-1/2 inches (241 mm). The service stair shall be protected on each side by handrails designed to meet OSHA standards. The entire service stair assembly shall be galvanized steel. The service stair assembly accessible to ramp service personnel at all operational heights and positions of the passenger boarding bridge.
 4. Maintenance Access: An OSHA standard ladder (with OSHA standard cage) must be supplied order to access vertical drive components.
- G. Control Station: The control station shall be located at the aircraft end of the passenger boarding bridge. It shall provide the operator with a control console, service utilities, and control interlocks required to accomplish passenger boarding bridge operation. Station shall be positioned on the left side of the cab and oriented to position the operator facing forward in full view of the aircraft during maneuvering and docking operations.
1. Control Console: The control console shall be located –in the operator compartment and shall be protected from the outside environment.
 - a. Controls: All passenger boarding bridge motion controls shall be momentary contact type (deadman) controls. All of the motion controls shall be designed to be relative to the function of the passenger boarding bridge being controlled, i.e., raise and lower functions, the “raise” push button will be located above the “lower” push button. The control console shall include the following controls-.
 - 1) A three-position master key switch used to select "OFF", "OPERATE", or "AUTO" (automatic leveling). The key may be removed only in the "OFF" or "AUTO" positions,
 - 2) A 4- way lever arm or "joystick" to control forward and reverse and steering motions. As the joystick is moved progressively forward or back, passenger boarding bridge speed increases proportionally with the position of the joystick. Steering, left or right, may be accomplished at the same time as forward and reverse motions. An interlock

- shall prevent the passenger boarding bridge from being driven forward when the aircraft closure is deployed.
- 3) Push button switches for raising and lowering the cab end of the passenger boarding bridge.
- 4) Push button switches for cab rotation, left or right.
- 5) Push button(s) to deploy the bellows-type aircraft closure.
- 6) Switch for floodlights that illuminate the apron area under the aircraft and drive column undercarriage.
- 7) Digital position indicator
- 8) Switch to change the cab floor level adjustment from an automatic operation to a manual operation,
- 9) Relative motion push-button switch to control the cab floor level adjustment while in the manual mode.
- 10) Emergency stop button, which shuts down all passenger boarding bridge movement when pressed.
- 11) Lamp test button to allow function testing of all indicator lights.
- 12) Switch for cab light to illuminate the area forward of the cab door.
- 13) Horn button to alert that the bridge is about to move.
- b. Indicators: The control console shall have indicators that display the current passenger boarding bridge status. The passenger boarding bridge status indicators shall be as follows:
 - 1) Digital position indicator to display the relative vertical position of the lift column. This indicator is used to vertically pre-position the passenger boarding bridge prior to the arrival of the aircraft.
 - 2) Wheel position indicator, which displays wheel orientation with respect to the operator's position. A wheel position indicator maintains correct wheel orientation while cab is being rotated.
 - 3) An amber light to indicate auto-leveling system is energized and functioning.
 - 4) A red light and audible warning to indicate the auto leveler sustained travel timer has tripped.
 - 5) A red light to indicate the passenger boarding bridge has reached the operational horizontal rotation limits. This light is preceded by an audible warning.
 - 6) A red light to indicate drive wheels have reached an over steer condition.
 - 7) A red light to indicate aircraft closure is deployed.
 - 8) A red light to indicate vertical drive column fault (for electromechanical lift).
 - 9) A green light to indicate power is on.
- c. A flashing amber beacon shall be mounted under the cab. The beacon shall indicate that power is on and the passenger boarding bridge may move at any moment.
- d. An audible warning bell shall be mounted on the underside of the cab and shall ring when the passenger boarding bridge is moving. The bell sound loudness shall be at least 92 db at 10 feet.

2. Utilities:

- a. A six pair (twelve conductor) wire outlet for the installation of telephone or intercom equipment shall be located on left side wall adjacent to the control console.
 - b. Duplex outlets (unswitched 120 volt, single phase, 15 ampere) shall be located on the side wall of the control console, on the lower portion of the drive column (GFI), and in the rotunda corridor.
- 3. Control Features and Interlocks
 - a. Mechanical interlocks shall be provided to prevent damage to control circuits or passenger boarding bridge components by selecting opposite motions simultaneously. For example, depressing the up button prevents depressing the down button.
 - b. When the master key switch is in the "OFF" or "AUTO" position, the controls for horizontal and vertical movement, steering, aircraft closure and cab rotation shall be inoperative.
- H. Automatic Leveling: The passenger boarding bridge shall be equipped with an automatic leveling system, allowing the passenger, boarding bridge to adjust to changes in the aircraft elevation that occur during aircraft loading and unloading, The system shall function with equal reliability for all aircraft contours. The auto leveler shall be located on the right side of the cab and in full view of the operator at the control console
 - 1. The auto leveler shall be engaged when the master key switch is positioned to "AUTO".
 - 2. The auto leveler circuit shall include a sustained travel timer, Timer shall limit auto level operation shall be adjustable from 1.6 seconds to a maximum of 6 seconds. If the operation exceeds the set time limit a fault condition is assumed, all motor power shall be disconnected; audible and visual alarms shall be energized.
 - 3. The main auto level-sensing switch is activated by a 5-degree or more auto level wheel rotation.
- I. Drive Column- The drive column shall provide the vertical and horizontal motion for the passenger boarding bridge. The drive column and control systems shall be designed for smooth, quiet operation. The vertical and horizontal movements shall be operable at the same time. The drive column shall be divided into two major components: Vertical Drive and Horizontal Drive.
 - 1. Vertical Drive - Hydraulic Lift System: The passenger boarding bridge shall move vertically by means of two extra capacity hydraulic ram assemblies,
 - a. Each ram is independent of the other and shall be capable of supporting the passenger boarding bridge under full design load.
 - b. The lift cylinders are equipped with internally mounted pilot operated check valves that prevent the bridge from descending in the event of fluid loss or other system failure,
 - c. Mechanical stops in the cylinders shall be provided to prevent over-travel of the lift column. The system shall not be damaged if the bridge is raised or lowered into the cylinder stops

- d. The vertical travel speed shall be in accordance with original manufacturer specifications, measured at the spacer.
- 2. Horizontal Drive: A variable speed, electromechanical drive system shall provide horizontal travel.
 - a. Drive wheels shall be driven independently by electric motors with integral brakes. A solid-state controller shall be provided for drive wheel speed control. Horizontal speed shall be in accordance with original manufacturer specifications.
 - b. The braking system shall allow the passenger boarding bridge to come to smooth controlled stops. The brakes shall lock the passenger boarding bridge in place when it is not being driven horizontally.
 - c. Horizontal drive motors shall be equipped with manual brake releases, allowing the passenger boarding bridge to be towed in the event of a power failure.
 - d. The bogeys shall be equipped with supports capable of supporting the PBB in the event of tire failure.
 - e. Tow lugs shall be a component of the lower wheel frame.

J. Electrical Systems and Components

- 1. From the cab of the PBB, there shall be a 3 phase 480 volt, 60 amp, 60 Hz, "Y" configuration with neutral and ground service terminating in a weather-proof "J" box on the terminal wall or adjacent to the rotunda column of the bridge. A manual, fused, main disconnect for the motor, lighting, and control circuits shall be mounted on the building face or rotunda support column. If a rotunda mounted electrical cabinet is provided, it shall be positioned to create no interference for the Ground Service Equipment (GSE) (i.e., may require rotating disconnect 90 degrees).
- 2. All standard lighting, duplex receptacles, operator controls, and fractional HP motors shall operate on 120 volt, single phase, 60 Hz power. The transformer and separate circuit breaker for lighting and control power shall be mounted in the power control panel.
- 3. All electrical boxes on the PBB shall be non-corrosive NEMA 4 rated enclosures (painted steel boxes are not acceptable) with the exception of the auto-level enclosure, canopy actuator enclosures, and Rotunda disconnect.
- 4. All new electrical equipment and methods of installation shall conform to the requirements and recommendations of the American Insurance Association (AIA), the National Electrical Manufacturers Association (NEMA), and the National Electrical Code (NEC).
- 5. Any new wiring and installation shall be in accordance with National Electric Code, applicable local electrical codes, and the Airport's requirements. All power and communications wiring and cables shall be replaced new within the refurbished PBB including the E81C Cable which

provides connection(s) between the main PBB power panel and the control console.

- a. Both ends of all conductors shall be color coded or identified. Particular attention shall be given to separating circuits of different voltages, emergency lighting, and telephone lines.
- b. Un-switched, parallel slots, 125 volt, 1 phase, 60Hz, 20 Amp three-conductor duplex receptacles shall be provided as follows:
 - 1) One near the operator's console,
 - 2) One in the Rotunda,
 - 3) One near the midpoint of each tunnel of the bridge.
 - 4) One weatherproof outlet at the wheel undercarriage near one of the lift columns,
 - 5) One near the terminal end of the connecting walkway, or at a maximum of 50 feet between outlets along the length of the walkways.
 - 6) One weatherproof outlet on tunnel roof near lift column assembly.
- c. The bridge shall contain a flush mounted "J" box containing 12 pair communication cables near the operator's position and wall-mounted telephone connected to the Airports phone system.

- 6. The bridge shall be refurbished with safety as the first priority. The following control features, interlocks, and warning devices shall be added if not already included in the bridge:
 - a. With the Operator Key Switch in the "Off" position, all controls shall be inoperative.
 - b. Spring-loaded wheel brake(s) shall be automatically set whenever controls for horizontal travel are not actuated by the operator. The drive system shall have provisions to manually release the brakes to permit towing of the unit in the event of a power failure. The manual release mechanism shall automatically reset when electrical power is applied to the motor/brake circuit.
 - c. The vertical lift column safety stops are to be automatically engaged whenever controls for vertical travel are not actuated by the operator.
 - d. With the Operator Key Switch in the "Auto-Level" position, all manual motion controls shall be inoperative. In this mode, vertical travel shall be regulated by the automatic leveling system.
 - e. With the Operator Key Switch in the "Operate" position, the Auto-Leveler shall be inoperative.
 - f. The control circuits shall be wired so that it is impossible to select opposite motions simultaneously, e.g., extend and retract or raise and lower travel.
 - g. Two limit switches, one for slow and one for stop, shall slow to half speed and then halt forward or reverse travel of the bridge when the tunnel extension or retraction limits have been reached. New limit switches shall be provided.
 - h. Limit switches shall prevent movement of the bridge beyond specified Rotunda and Cab operating parameters.
 - i. An alarm bell located under the aircraft cab shall sound continuously whenever the bridge is in drive mode of operation.

- j. An amber colored rotating beacon located under the aircraft cab shall illuminate when the key switch is in the "Operate" position.
 - k. Limit switches mounted on each of the electrical mechanical vertical drive columns to stop the motion of the screws prior to reaching the mechanical limits of the screw and in the event that the normal electronic travel controls fail to stop the screws. New limit switches shall be provided.
 - l. An audible alarm shall sound in the event the horizontal controls are activated.
7. Deployed Canopy Interlock: All bridge motions, except auto leveling shall be possible only when aircraft canopy is in the fully retracted position.
- a. Provide dead-man type canopy interlock bypass switch to permit retraction of bridge tunnels only in the case of mechanical emergency or mechanical failure with canopy not in the fully retracted position.
 - b. Contrary control signal interlock: All bridge motion shall be prevented from occurring whenever contrary control signals (i.e. extend and retract) are activated
8. When master key switch is in "OFF" or "AUTO" position, controls for horizontal and vertical movement, steering, aircraft closure, and cab rotation shall be rendered inoperative.
- K. Interior Finishes:
- 1. Ceiling should be plank type panels made from continuous coil coat painted galvanized sheets or 0.020" thick aluminum with a baked-on enamel finish. Planks shall run perpendicular to the tunnel centerline and continuously from wall to wall,
 - 2. Interior light fixtures shall be recessed linear fluorescent type and blend with the ceiling design, The average light intensity at the floor shall be 18-foot candles (194 lux) (minimum). Fixture trim shall be painted black or shall match ceiling finish,
 - 3. Light fixture in the rotunda shall be a flush mounted fluorescent type.
 - 4. Single three-way switches shall be located in the rotunda and on wall near the service door at the aircraft cab. These switches shall control interior tunnel, bubble and rotunda lights and the weatherproof fluorescent cab floodlight.
 - 5. To the ends of the ceiling panels and the top edge of the wall panels, aluminum corner molding shall be used.
 - 6. Insulation in the ceiling shall be 1 1/2-inch (12.7mm) thick, fire resistant
 - 7. Sub floor in the cab and bubble area shall be smooth galvanized steel or 3/4 inch (19mm) marine grade plywood with high resistance to moisture and moisture damage. Sub floor in the remainder of the passenger boarding bridge 3/4-inch (19mm) thick moisture resistant, fire retardant plywood or oriented strand board-exposure 1, made with exterior phenolic resin adhesive, or smooth galvanized steel.
 - 8. The cab finish floor shall consist of ribbed rubber 3/16 inch (4.76mm) thick..
 - 9. Passenger boarding bridge interior floor covering, other than covered in the cab and bubble area shall be carpet tile, color and pattern to be

selected by the Architect provided and installed by the passenger boarding bridge manufacturer.

10. The tunnel wall treatment shall consist of panels composed of 20 ga. galvanized steel sheet with baked-on enamel finish laminated to ½" rigid insulation or high-pressure phenolic laminate facing on medium-density fiberboard. Panels shall be supported by clear anodized aluminum trim with black plastic accent strips at each vertical joint. Wall treatments in the pivoting sections (rotunda and cab support) shall be galvanized steel slats.

K. Other Surfaces Exposed to Passengers: The coating system shall be specifically designed to provide long-term protection from the harmful effects of corrosion on passenger boarding bridges:

1. A prime coat of Epoxy followed by a topcoat of Polyurethane for a combined average dry film thickness of 7 mils (175 microns).
2. A topcoat Polyurethane that is available in a wide variety of standard colors. Custom colors are also available per contractual agreement.
3. Normal life expectancy is 10-15 years with proper maintenance, which consists of monthly inspection and repair of scratches, broken film, or delamination. Semi- annual power washing is also recommended.
4. These coatings are environmentally friendly due to very low VOC (Volatile Organic Compounds) in the primer and the topcoat.

L. INTERIOR COATING SYSTEM – Surface Preparation

1. Clean area to be painted in accordance with SSPC-SP1, solvent cleaning. This specification calls for the removal of all visible oil, grease, dirt, loose mill scale, rust, and loose paint.
2. Surface must be dry immediately prior to application of paint. There must also be at least a 5 point differential between the atmospheric temperature and dew point before painting can commence.

M. Coating Description

1. American Coatings Rustlok 8000 Series
2. American Coatings SU Series Polyurethane
 - a. 60% solids color base (Part A)
 - b. 60% solids urethane catalyst (Part B)
 - c. Mix just prior to application per manufacturer's instructions

N. Application Requirements.

1. Apply to a total dry film thickness of 6-7 mils (150-175 microns).
2. Allow to dry per manufacturer's instructions prior to application of topcoat.

O. Inspection Criteria

1. Take five random film build readings per 100 square feet (9.3 sq. meters) of coverage area to verify correct millage.
2. Minimum acceptable dry film thickness is 3 mils (75 microns).

2.3 EXTERIOR COATING SYSTEM

A. Surface Preparation – Hot Roll / Cold Roll Steel Only

1. Clean area to be coated in accordance with SSPC-SP6, commercial blast cleaning. This specification calls for the removal of all rust, mill scale, paint, and other foreign matter except for any slight staining of same in less than one third of each square inch of blasted area.
2. The anchor pattern shall be no less than 1.5 mils (37.5 microns) or more than 2.5 mils (62.5 microns).
3. Surface must be dry and free of any foreign matter to include blast debris prior to coating.

B. Surface Preparation – Galvanized Steel Panels Only

1. Clean area to be coated in accordance with SSPC-SP1, solvent cleaning.
2. Do not blast or utilize any chemical cleaning product that could inhibit proper adhesion to the galvanized surface.
3. Surface must be dry prior to coating application. There must be at least a 5 point differential between the atmospheric temperature and dew point.

C. Coating Description – Primer - Hot Roll / Cold Roll Steel Only

1. 80% volume of solids Epoxy Primer
2. American Coatings Rustlock 8000 Series Epoxy (Two Components)
 - a. 80% solids epoxy primer base (Part A)
 - b. 80% solids epoxy catalyst (Part B)
 - c. Mix just prior to application per manufacturer's instructions.

D. Application Requirements

1. Apply to a total dry film thickness of 3-5 mils (75-125 microns).
2. Allow to dry per manufacturer's instructions prior to topcoat application.

E. Inspection Criteria

1. Take five random millage readings per 100 square feet (9.3 meters) of coverage area.
2. Minimum average dry film thickness is 4 mils (100 microns).

F. Coating Description – Topcoat – All Surfaces

1. Aliphatic Polyurethane color coat with satin gloss finish (60-65 @ 60 degree gloss meter).
2. American Coatings SU Series High Solids Polyurethane
 - a. High solids urethane color coat (Part A)
 - b. High solids urethane catalyst (Part B)
 - c. Mix just prior to application per manufacturer's instructions.

G. Application Requirements

1. Apply to a total dry film thickness of 2-4 mils (50-100 microns).
2. Allow to dry per manufacturer's instructions.

H. Inspection Criteria

1. Take five random millage readings per 100 square feet (9.3 meters) of coverage area
2. Minimum total average dry film thickness is 7 mils (175 microns) for carbon steel surfaces and 7 mils (175 microns) for galvanized steel surfaces.

2.4 PRE-PAINTED ITEMS

- A. Purchased components that are factory painted shall be repainted. Typical items include the hydraulic power unit, cab rotate drive motor, hydraulic drive motor, control power transformer, control console, limit switches, electrical junction boxes, conduit, etc.
- B. The finish color for the above items will be the individual manufacturer's standard.
- C. The finish color of the hydraulic unit is gray.
- D. The finish color of the control console is beige.

2.5 FIRE PROTECTIVE COATING – Fixed and Rotating Cab Floors only

- A. Surface Preparation
 1. Cab floors must be primed per exterior coating application procedures.
 2. Surface must be dry prior to coating application. There must be at least a 5 point differential between the atmospheric temperature and dew point.
- B. Coating Description
 1. Fire Protective Epoxy Coating
 2. Thermo Lag 220
- C. Application Requirements
 1. Apply to a total dry film thickness of 7-8 mils (175-250 microns).
 2. Allow to dry per manufacturer's instructions prior to topcoat application.
- D. Inspection Criteria
 1. Take five random millage readings per 100 square feet (9.3 meters) of coverage area.
 2. Minimum average dry film thickness is 13 mils (325 microns).

2.6 COATING REPAIR PROCEDURE

- A. Surface Preparation

1. Prepare area to be painted using wire brush or power tool to remove any loose paint or other foreign matter.
2. Clean area to be painted by wiping with a general cleaning solution to minimize presence of rust, oil, grease, or other contaminants.
3. Surface must be dry prior to paint application.

B. Application Requirements

1. If damage is to bare metal, apply Rustlock primer in accordance with above sections. An alternative primer selection is American Coatings' AK 11187 Phenolic primer if recoat time is a consideration.
2. Apply urethane topcoat in accordance with above sections.
3. Verify total film builds meet specification requirements.

2.7 TOW BAR ATTACHMENT

- A. The PBB shall have provision for attaching a standard tow bar to move the bridge in the event of motor / power failure.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Report conditions detrimental to proper and timely completion of the refurbishment of the passenger boarding bridge.

3.4 FIELD QUALITY CONTROL

- A. Acceptance testing: Perform tests with the Owner present prior to placing the passenger boarding bridge in service.
- B. Adjust the passenger boarding bridge for proper and smooth operation.
- C. Install all work, meeting the requirements of the Contract Conditions and in accordance with product manufacturer's instructions and recommendations, NFPA requirements, and requirements as specified herein
- D. Workmanship: Install all equipment, materials, specialties, etc., in accordance with the best practice and standards for this type of work.
- E. Surface Finishes: All surfaces and edges of miscellaneous steel, etc. shall be smooth and free of marks, burrs, roughness, and other defects. Finish welds to match parent material. Where possible, grind welds smooth; remove flux, oxide, splatter or any other residue from the weld and adjacent areas of exterior and interior surfaces.

3.5 PROTECTION AND CLEANING

- A. Protect the passenger boarding bridge from time of installation until acceptance by the Owner.
- B. All finish surfaces shall be delivered to the Owner free of any soil or damage.

- C. Repair or replace any damage to the passenger boarding bridge prior to Owner acceptance.

3.6 MANUALS

- A. Operation and Maintenance Manuals shall be provided and be prepared in accordance with Air Transport Association (ATA) Specification 101. Included in the manuals shall be preventative maintenance requirements and problem solving procedures.

3.7 DEMONSTRATION AND TRAINING

- A. The Contractor shall provide as a minimum 8 hours of operator and 8 hours of maintenance training, in separate sessions by a qualified Manufacturer's representative. Training shall be conducted at the installation site and in classrooms as designated and provided for by the Owner and airlines. Maintenance training shall include proper demonstration of cut-away models of critical parts, full instruction on proper maintenance and trouble shooting, instructions on proper use of manuals, etc. Operation training shall include proper training of the operators on correct bridge operations to avoid damaging the equipment by improper use of the controls. The Contractor shall provide a complete operation training program and maintenance training program both recorded on separate video tapes to enable the Owner to train additional employees in the future.
- B. Training shall be conducted by the Contractor utilizing prepared texts, slides, actual passenger boarding bridges and other instructional material as appropriate.
- C. The Contractor shall, upon completion of the training program, provide the airline and Owner with 2 operating instruction manuals and 2 maintenance manuals for each passenger boarding bridge.
- D. Training dates shall be mutually agreed upon by the Contractor, airlines and the Owner and shall be at dates prior to bridges going into regular operational service.
- E. The airlines and Owner will assign persons or companies to be trained.

3.8 SPARE PARTS

- A. The Contractor shall furnish, not less than forty-five (45) days prior to completion of a passenger loading bridge, a list of suggested spare parts, including prices and sources, to the Architect / Engineer for review by the Owner. Spare parts as recommended in this context are those items which are necessary to maintain in stores in order to maintain service availability of bridges.

3.9 APPENDIX "A"

- A. See attached Appendix "A" for standard performance and procedure checklist. Contractor shall perform standard performance testing procedure and document on the checklist and procedure checklist during the "punchlist" phase in the

presence of an Owner's Representative, see Section 3.7.A for further requirements. Contractor shall submit performance and procedure checklists for all PBB models installed and/or refurbished.

END OF SECTION 14951

APPENDIX "A"
STANDARD PERFORMANCE
AND
ACCEPTANCE TEST PROCEDURES
FOR APRON DRIVE LOADING BRIDGES
STANDARD PERFORMANCE TEST PROCEDURES

Preliminary / Final Inspection (circle one) Date _____

Loading Bridge Gate Number: _____

Airline Served: _____

Airline / Airport Representative present during demonstration: _____

Architect / Engineer's Representative present during demonstration: _____

Owner's Representative present during demonstration: _____

A. ELECTRICAL INSTALLATION

General: Prior to connecting power supply, check all circuits as follows:

		<u>Functioning Properly</u>	<u>Malfunctioning</u>
1.	Insulation resistance	_____	_____
2.	Continuity	_____	_____
3.	Polarity	_____	_____
4.	Earth loop resistance from each main part of the ground connection with building ground	_____	_____
5.	Disconnect operation	_____	_____

B. FUNCTIONAL TESTS

		<u>Functioning Properly</u>	<u>Malfunctioning</u>
1.	Electrical: Demonstrate the following:		
a.	Emergency lights	_____	_____
b.	Emergency stops	_____	_____
c.	Warning lights	_____	_____
d.	Obstruction lights	_____	_____
e.	Floodlights	_____	_____
f.	Bogie visual alarms	_____	_____
g.	Bridge lighting	_____	_____
h.	Stair lighting	_____	_____
i.	Heatable window (if fitted)	_____	_____
j.	Key switch for manual & automatic operation	_____	_____
k.	Height indicator	_____	_____
l.	Signal lamps	_____	_____
m.	Main control panel	_____	_____
n.	Cabin floor heater	_____	_____
o.	Selector switches:		
	1) Lifting / lowering	_____	_____
	2) Cabin rotation	_____	_____
	3) Wheels - steer right / left	_____	_____
	4) Bridge – extend / retract	_____	_____
	5) Emergency back-off	_____	_____
	6) Main / Aux changeover switch (if fitted)	_____	_____
p.	Safety interlocks:		

	1)	Maintenance switches	_____	_____
	2)	Main panel isolator	_____	_____
	3)	Safety barrier (if fitted)	_____	_____
	q.	Fault Monitoring (if fitted)	_____	_____
2.		Mechanical: Demonstrate the following:		
	a.	Cabin window shutters (if fitted)	_____	_____
	b.	Door closer on service door	_____	_____
	c.	Tires	_____	_____
	d.	Self sustaining elevation screw	_____	_____
C.		<u>OPERATION TESTS (ALL DONE TWICE)</u>		
1.		Extension / Retraction		
	a.	Extension limit switch No. 1	_____	_____
	b.	Extension limit switch No. 2	_____	_____
	c.	Retraction limit switch No. 1	_____	_____
	d.	Retraction limit switch No. 2	_____	_____
	e.	Speed reduced (if fitted)	_____	_____
2.		Lifting / Lowering		
	a.	Height switch No. 1 fully extended	_____	_____
	b.	Height switch No. 2 fully extended	_____	_____
	c.	Lower switch No. 1 fully extended	_____	_____
	d.	Lower switch No. 2 fully extended	_____	_____
	e.	Height switch No. 1 fully retracted	_____	_____
	f.	Height switch No. 2 fully retracted	_____	_____
	g.	Lower switch No. 1 fully retracted	_____	_____
	h.	Lower switch No. 2 fully retracted	_____	_____
	i.	Inclination switch bridge up fully retracted	_____	_____
	j.	Inclination switch bridge down fully retracted	_____	_____
3.		Rotation (Bridges)		
	a.	Approach switches left hand	_____	_____
	b.	Approach switches right hand	_____	_____
	c.	Check slow-down or supplementary switches as above	_____	_____
	d.	Ultimate limit switches L/R	_____	_____
4.		Rotation (Cabin)		
	a.	Limit switch left hand	_____	_____
	b.	Limit switch right hand	_____	_____
5.		Canopy		
	a.	Extension, check both side switches	_____	_____
	b.	Retraction, check both side switches	_____	_____

**NEW PASSENGER TERMINAL
DULUTH INTERNATIONAL AIRPORT
DULUTH, MINNESOTA**

**SECTION 14955 – BAGGAGE
LIFTS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Baggage Lifts.
- B. Related Sections include the following:
 - 1. Division 14 Section 14950 "Aircraft Passenger Boarding Bridges"
 - 2. Division 14 Section 14951 "Passenger Boarding Bridge Refurbishment"
 - 3. Division 16 - Electrical: Electric service for motors, motor controls, internal communication, low voltage wiring and data transfer.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for baggage lifts.
 - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. Shop Drawings: For baggage lifts..
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 3. Include diagrams for power, signal, and control wiring.
- C. Samples for Initial Selection: For each finish product specified, one set of shade cloth options representing manufacturer's full range of available colors and patterns.

1. Include Samples of accessories involving color selection.
- D. Samples: For each exposed product and for each color and texture specified, in manufacturer's standard sizes.
- E. Samples for Initial Selection: For units with factory-applied finishes.
 1. Include Samples of exposed finishes and accessories involving finish selection.
- F. Samples for Verification: For each type of exposed finish, in manufacturer's standard sizes.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: For each type of baggage lift.
- C. Field quality-control reports.
- D. Sample Warranty: For manufacturer's special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For baggage lifts to include in operation and maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Obtain baggage lifts from a single manufacturer with a minimum of ten years experience in manufacturing products comparable to those specified in this section and minimum of five projects of similar scope and size.
- B. Installer Qualifications: Fabricator of products, or Installer trained and certified by the manufacturer with a minimum of five years experience in installing products comparable to those specified in this section.

1.7 WARRANTY

- A. Manufacturer's Special Warranty: Manufacturer agrees to repair or replace components of baggage lifts that fail in materials or workmanship within specified warranty period.
 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. Regulatory Requirements: Comply with ANSI/ASME A20.1-2009.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 BAGGAGE LIFTS

- A. Manufacturer's standard preengineered baggage lift system utilizing a vertical reciprocating conveyor and designed to conform to the requirements of ASME B20.1-2000.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide "Baggage Buddy" as manufactured by JBT Aerotech or comparable product by one of the following:
 - a. ThyssenKrupp Airport Systems, Inc.
 - b. U.S. Applied Mechanics, Inc.
 - 2. Baggage Cart Size: Minimum 30 inches wide by 68 inches long by 78 inches high.
 - 3. Rated Load: Minimum 600 lbs.
 - 4. Self-Supporting Structure: Structural-steel, self-supporting hoistway framing that supports vertical loads of unit only at base, with lateral support only at landing levels.
 - 5. Hoist: Manufacturer's standard.
 - 6. Traveling Cradle: Supports bag cart and reciprocates vertically with the action of the electric hoist to transfer bag cart between the opening in the Jetway and the ground level or apron.
 - a. Provide safety catch attached to the support structure that prevents the cradle from falling When the cradle is in the upper most position should the hoist catastrophically fail.
 - 7. Bag Cart: Manufacturer's standard construction and as follows:
 - a. Size: Minimum 30 inches wide by 68 inches long by 78 inches high.
 - b. Number of Shelves: Four.
 - 1) Each shelf shall be designed to carry 150lbs.
 - c. Cover three sides of cart with a custom metal grating no less than 16g to stop bags falling out and allow the operator to see through.
 - 1) Grating max hole size 2" Square.

- d. Wheels: 8" dia. with medium density rubber tires with a flat tread surface
 - 1) Front wheels do not swivel and have a "Dead man" braking system controlled by lever on push handle of the cart that must be pulled toward the operator to disengage the automatic brake.
 - 2) Rear wheels have ball bearing hubs, swivel rotation and foot-operated brakes.
- 8. Passenger Boarding Level Door: Clear anodized aluminum roller shutter located in the upper frame 5' 6"W x 5' 10"H with a manually engaged, electrically released lock.
 - a. Fit with 2 "D" handles and aluminum stops..
 - b. Provide sensor that detects if the door is closed.
- 9. Apron Level Door: steel hinged door at ground level 3' 8"W x 6'6"H which swings outward and can be locked in the open position using a "Hold Open" device.
 - a. Provide a mechanical latch that automatically prevents the door from opening when the cart and cradle have moved upward.
 - b. Provide with a NEMA 4 switch that detects if the door is closed and prevents the LLD moving if the door is not closed.
 - c. Provide a clear polycarbonate window in its upper half to allow the operator to visually see the position of the cradle and bag cart.
 - d. Provide large "D" handle mounted to the doorframe.
- 10. Steel Finish: Factory-applied powder-coat finish.
 - a. Powder-Coat Finish: Manufacturer's standard finish consisting of epoxy powder coat prime coat and polyester powder coat topcoat. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry-film thickness.
 - b. Color: As selected by Architect from manufacturer's full range.
- 11. All hardware will be zinc plated or galvanized.
- 12. All steel parts will be painted powder coat per above or zinc plated or galvanized.

2.3 OTHER COMPONENTS

- A. Provide hinged roof to allow access for major maintenance.
- B. Provide an amber light above the apron door which will illuminate after the cradle arrives from the upper position to notify baggage handlers that a bag cart is ready to unload

- C. Control System: Manufacturer's standard, fully automatic, call-and-send Programmable Logic Control (PLC) or microprocessor control system that responds to momentary touch pad signals at each landing as follows:
1. The control enclosure is located within the frame in a sheet metal enclosure beneath the roller door.
 2. A lower Touch Pad is fitted to the side of structure adjacent to the lower door to allow the operator to control the LLD from the ground position.
 3. An upper Touch pad will be located adjacent to the upper roller door.
 4. The Upper & Lower Touch Pads are MEMBRANE SWITCHES and are complete waterproof units connected with a micro plug for easy replacement.
 5. The Upper & Lower Touch Pads will have the following operator interface push buttons:
 - a. UP (Moves traveling cage up)
 - b. DOWN (Moves traveling cage down)
 - c. LAMP TEST (Push to illuminate & test all indicator lights)
 - d. ROLLER DOOR RELEASE (Releases upper roller door – this function will only work from the upper control station)
 - e. STOP/REST (Push to stop & Reset some PLC functions)
 6. Both Touch Pads will have the following indicator lights:
 - a. Stop (Red light indicating that the Stop has been activated)
 - b. Cart Up (Yellow light indicating the cart is in the up position)
 - c. Cart Down (Yellow light indicating the cart is in the down position)
 - d. Cart in Cage (Green light indicating the cart is in the correct position on the cage – if this light is **not illuminated** the cage will not move)
 - e. Roll Door Closed (Green light indicating that the roller doors are closed - if this light is **not illuminated** the cage will not move)
 - f. Lower Door Closed (Green light indicating that the lower door is closed - if this light is **not illuminated** the cage will not move)
 7. The PLC will turn off power to the control panel LED's after 5 minutes. Pushing the UP, DOWN or STOP/RESET buttons will bring the Touch Pad indicator lights on and prepare the system for an input.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for hoistway installation tolerances and other conditions affecting performance of baggage lift work.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of baggage lift work.

- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with ASME A20.1 and manufacturer's written instructions.
- B. Alignment: Coordinate hoistway doors with baggage lift travel and car positioning for accurate alignment and required clearances between baggage lift components including car, hoistway doors, sills, and door frame at each landing.
- C. Set sills flush with finished surface of landings
- D. Adjust car stops for accurate stopping at each landing, within required tolerances.
- E. Lubricate operating parts of baggage lift, including door tracks, and hardware.

3.3 FIELD QUALITY CONTROL

- A. Acceptance Testing: On completion of installation and before permitting use of baggage lifts, perform acceptance inspections and tests as required by ASME A20.1 and authorities having jurisdiction.
- B. Operating Test: Load baggage lifts to rated load and operate continuously for 30 minutes between landings served. Readjust stops, signal equipment, and other devices for accurate stopping and operation of system.
- C. Advise Owner, Architect, and authorities having jurisdiction in advance of dates and times tests are to be performed on baggage lifts.
- D. Baggage lifts will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports.

3.4 MAINTENANCE SERVICE

- A. Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of baggage lift Installer. Include preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper baggage lift operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

3.5 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain baggage lifts.

END OF SECTION 14955

