

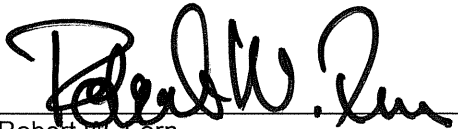
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# CERTIFICATION

I hereby certify that this specification was prepared by me or under my direct supervision and that I am a duly Licensed Professional Architect under the laws of the State of Minnesota.

  
\_\_\_\_\_  
Robert W. Fern

\_\_\_\_\_  
Date 5/20/15

\_\_\_\_\_  
20088  
Reg. No.

**SECTION 01 11 00**

**SUMMARY OF WORK**

1.1 GENERAL

- A. Removal and salvage of existing granite treads and landing sections – turn over to owner.
- B. Excavation, regrading, and backfilling existing hillside for construction of new stair system, including site restoration.
- C. New concrete stair system with railings.

## **SECTION 01 31 00**

### **PROJECT COORDINATION**

#### **PART 1 - GENERAL**

##### **1.1 SECTION INCLUDES**

- A. Project Coordination
- B. Schedule
- C. Construction Meetings
- D. Shift Times
- E. Safety

##### **1.2 SCHEDULE**

- A. Schedule: The general contractor shall submit a schedule of construction activities for approval. Work shall be started as soon as Notice to Proceed is received and continue uninterrupted. Timelines as established by contractor will be adhered to and used as a guide to construction progress.
- B. It shall be a part and requirement of this contract that the following work conditions be applied:  
  
Coordinate construction operations and schedules with City Personnel.
- C. Construction work to be completed within sixty (60) days from Notice to Proceed. After sixty calendar days, there will be liquidated damages of \$200 per day until completion.

##### **1.3 CONSTRUCTION MEETINGS/COORDINATION**

- A. All contractors scheduled to have operations on site during any week, or when requested, shall attend construction meetings as scheduled. All upcoming construction operations will be reviewed at this meeting to allow for scheduling of activities or operations with City of Duluth Staff. Close coordination with authorized City representative must occur throughout construction period.
- B. Coordination: The general contractor shall provide scheduling and superintendence over mechanical, electrical, and subcontracts. Superintendent shall be available by cell phone or telephone during construction period.

##### **1.4 SAFETY PROGRAMS**

- A. Safety Programs: Each contractor shall be responsible for their safety programs and safety programs of their subcontractors. They shall be responsible for holding safety meetings that include a representative of the institution, and adherence to safety programs for their own forces or forces that are performing work that is a part of their contract. They shall be further responsible for the related safety of the public or other persons on site relative to the work under their control.

In no case shall the Owner, the Architect, or their respective employees and agents have either direct or indirect responsibility for matters related to project safety.

## 1.5 SHIFT TIMES

- A. Minimum of eight (8) hour work days during regular Monday – Friday schedule. Hours of construction generally to be between 7:00 a.m. and 5:00 p.m. Work can be arranged for longer hours.

## 1.6 SITE ACCESS/RESTRICTIONS

- A. Building Access: As building will be occupied during construction, access to facilities will not be allowed except for scheduled construction operations.
- B. Operations must be fenced to extent possible. All entrances to Beach House must remain passable unless prior arrangements for restricted use have been made.
- C. Storage Areas: Contractor is to provide locked storage containers/trailers in parking lot location identified by staff and/or schedule staggered delivery of materials to minimize on site congestion. Storage of materials beyond work areas is not available.
- D. Maintain facility delivery access during construction. Coordinate operations with Owner's representative.
- E. Parking – See Section 01 50 00.

## **SECTION 01 33 00**

### **SUBMITTALS**

1. Successful bidder will be required to submit the following before contract forms will be developed.

- a) **Performance and Material Payment Bonds**

Contractor shall deliver with his executed contract, Performance Bond and Labor and Material Payment Bonds in the full amount of the contract, using forms acceptable to the Owner.

- b) **Progress Schedule**

The Contractor shall, within ten (10) days after the Notice of Award, prepare and submit to the Architect for approval, a schedule showing the order in which he proposes to carry on the work, and dates on which he will start, suspend, and complete the various items of work included in this agreement.

The Contractor will be required to adhere to his proposed schedule and he shall prosecute the work in such a manner as to insure its completion within the time set forth in the contract. Any failure to adhere to the proposed schedule will be considered prima facie evidence that Contractor has failed to provide sufficient workmen, equipment or materials to insure completion of the work within the specified time limit.

- c) **List of Subcontractors and Suppliers**

- d) **Schedule of Values**

- e) **Certificates of Insurance**

Certificates of insurance shall be filed with Owner and Architect/Engineer. No work under this contract shall be started until all insurance policies have been filed and approved.

- e) Other submissions required in this specification book.

2. **Shop Drawings**

Contractor shall review, stamp/approve, and then submit to the Architect with reasonable promptness and in such sequence as to cause no delay in the work or in the work of the Owner or any separate contractor, scanned electronic shop drawings in PDF format of all shop drawings, product data, and samples required by the Contract Documents. Each drawing must contain sufficient clear area for the Contractor stamp and the Architect/Engineer stamp.

By approving and submitting shop drawings, product data, and samples, the Contractor represents that he has determined and verified all field materials, field measures, and file construction criteria related thereto, or will do so, and that he has checked and coordinated the information contained within such submittals with the requirements of the work and of the contract documents.

The Contractor shall not be relieved of any responsibility for any deviation from the requirements of the Contract Documents by the Architect's approval of shop drawings, product data or samples, unless the Contractor has specifically informed the Architect in

writing of such deviation at the time of the submission, and the Architect has given written approval to the specific deviation.

The Contractor shall not be relieved from responsibility for errors or omissions in the shop drawings, product data, or samples by the Architect/Engineer's approval thereof.

No portion of the work requiring submission of a shop drawing, product, or sample shall be commenced until the submittal has been approved by the Architect/Engineer. All such portions of the work shall be in accordance with approved submittals.

## **SECTION 01 50 00**

### **TEMPORARY FACILITIES AND CONTROLS**

#### **PART 1 - GENERAL**

##### **1.1 SECTION INCLUDES**

- A. Temporary Utilities
- B. Temporary Controls
- C. Construction Facilities
- D. Protection
- E. Clean Up
- F. Safety
- G. Job Sign
- H. Removal

##### **1.2 TEMPORARY UTILITIES**

- A. Electricity: From existing building. Temporary power extension and lighting by Contractor
- B. Telephone Service: General Contractor's superintendent shall have cellular phone or provide a temporary hard-wire phone with answering machine and fax.
- C. Heat: Temporary heat as required for construction by contractor.
- D. Water: By owner from existing beach house.
- E. Sanitary Facilities: Toilet facility within building will be assigned by Owner.

##### **1.3 TEMPORARY CONTROLS**

###### **A. Barriers:**

- 1. The entire work area such as excavations, roof edges, openings, shafts, etc. shall be protected during the time work is in progress.
- 2. Provide barriers as required to prevent public entry or staff entry to construction areas, to provide for Owner's use of site, and to protect existing facilities and adjacent properties from damage from construction operations.
- 3. Provide barriers around trees and plants designated to remain. Protect against vehicular traffic, stored materials, dumping, chemically injurious materials, and puddling or continuous running water.
- 4. Contractor to maintain all exit ways at all times unless prior approval for alternate exiting path has been given by Fire Marshall.

###### **B. Enclosures and Fencing:**

- 1. Contractors shall provide all required safety enclosures and fencing around equipment and stored materials.
- 2. Provide temporary insulated water-tight closures of openings in exterior surfaces to provide acceptable working conditions and protection of materials, to allow for temporary heating, and to prevent entry of unauthorized persons.



C. Parking: All parking for project to be on public streets or parking lot.

#### 1.4 CONSTRUCTION FACILITIES

A. Jobsite Office: Contractor to provide jobsite office available to all subcontractors and inspectors as well as architect.

#### 1.5 JOB SIGN

A. A job sign is not a requirement of job; however, contractor can furnish a job sign listing the name of the project, architects, engineers, and major contractors, subject to approval of architect. Maximum size to be 4' x 8'. Location to be approved by architect and City prior to erection.

#### 1.6 PROTECTION OF INSTALLED WORK

A. Protection of the Work: All work shall be protected until entire area and work processes are completed and inspected.

B. Work in Place (new or existing) that is subject to injury because of operations being carried on adjacent thereto, shall be covered, boarded up, or substantially enclosed with adequate protection. Permanent openings used for thoroughfares for the introduction of work and materials to or from the structure shall have heads, jambs, and sills well blocked and boarded. All form of protection shall be constructed in a manner such that upon completion, the entire work will be delivered to the Owner in proper, whole, and unblemished condition.

#### 1.8 CLEAN UP

A. All contractors will be responsible for their own clean up, broom clean, and will be responsible for removal of all waste and debris from the site. Coordinate dumpster location with Owner's representative. See Section 01 74 00 for final cleaning requirements.

#### 1.9 REMOVAL

A. Remove temporary materials, equipment, services, and construction prior to Substantial Completion inspection.

B. Clean and repair damage caused by installation or use of temporary facilities. Remove underground installations to a depth of two feet and grade site as indicated. Restore existing facilities used during construction to specified, or to original, condition.

#### 1.10 TESTING

A. Tests indicated in technical specification sections shall be paid for and coordinated by the respective contractors, results are to be forwarded to the Architect.

## **SECTION 02 41 13**

### **SELECTIVE SITE DEMOLITION**

#### **PART 1 - GENERAL**

##### **1.1 WORK INCLUDES**

- A. Demolition of site pavements, curbs, gutters, stairs/railings, sidewalks or other site related structures noted to be removed or required for new construction.
- B. Salvage: Existing granite treads and landing sections. Turn over to owner.
- C. Backfilling voids created by demolition with materials specified in Section 31 20 00.
- D. Furnish all labor, tools, and appliances, and perform all operations necessary to complete all demolition work shown on the drawings and hereinafter specified, or as required to carry all work in the contract to satisfactory completion.

##### **1.2 SITE CONDITIONS**

- A. Protect structures to be removed and their contents from vandalism and theft.
- B. Repair or replace damaged trees and shrubs at no additional cost to Owner.

##### **1.3 GENERAL**

- A. Care of Work
  - 1. The Contractor shall be responsible for all injury to persons or property that occur as a result of his fault or negligence in connection with the prosecution of the work and shall be responsible for the proper care and protection of all work performed until completion and final acceptance.
  - 2. Demolition work shall proceed only after all materials, equipment, etc. designated for reuse or salvage of the Owner have been removed.
  - 3. In an emergency affecting the safety of life or property, on or adjoining the site, the contractor shall act, at his own discretion to prevent such threatened loss or injury.
  - 4. The Contractor shall avoid damaging sidewalks, streets, curbs, pavements, utilities, structures or any other property (except that which is to be replaced or removed) either on or adjacent to the site. He shall repair, at his own expense and in a manner satisfactory to the Architect, any damage thereto caused by his operations.
- B. Except as otherwise specifically stated in the contract documents, the Contractor shall provide and pay for all materials, labor, tools, equipment, water, light, heat, power, transportation, superintendence, temporary construction of every nature, charges, levies, fees or other expenses incurred and all other services and facilities of every nature whatsoever necessary for his performance of the contract within the time specified.

#### **PART 2 – PRODUCTS (Not used)**

## **PART 3 - EXECUTION**

### **3.1 PREPARATION**

- A. Review all work procedures with Architect/Engineer.
- B. Locate and preserve all active utilities which are to remain in service. Contractor is responsible for locating all existing underground utilities within the project area and protect from damage. Any damage to existing utilities shall be repaired by contractor at no cost to owner.

### **3.2 PROTECTION**

- A. The contractor shall take responsible and adequate precautions to protect the Owner's property from damage during demolition work, moving of debris, and damage by the elements, including flooding, wind storms, etc. Any damage to the Owner's property due to the aforesaid work shall be restored or replaced by the contractor at his own expense and in a manner satisfactory to the Owner.
- B. Contractor shall provide and maintain suitable barricades, shelters, lights and danger signals during the progress of the work. They must meet the requirements of state and/or local building codes. The Contractor shall assume full responsibility of barriers to completion of contract and shall remove same. This shall include fence and barriers erected by other contractors.
- C. Avoid or minimize damage to tree roots. Roots provide anchorage, storage of energy, and absorption and conduction of water and mineral elements. Loss of root connection affects health and stability of tree and safety of people and property.

### **3.3 GENERAL**

- A. Remove all work carefully and only to the extent required for the final work. Remove all loose or damaged materials caused by demolition, or noted or specified to be removed. Protect existing construction that is to remain from damage.
- B. Openings and pockets shall be neatly cut for installation of lintels, anchors, concrete slabs, and precast concrete slabs or bearing plates where required.
- C. Depressions, chases, etc. shall be neatly cut with carborundum saws where such cuts will be exposed in the finished work.

### **3.4 STRUCTURE DEMOLITION**

- A. Remove structures and incidentals such as, but not limited to, foundations, sidewalks, pavement slabs, fences and out buildings.
- B. Remove foundation walls and footings completely where indicated.
- C. Backfilling and compaction of excavations for structures – Section 31 20 00.

### **3.5 PAVEMENT REMOVAL/FLATWORK REMOVAL**

- A. Remove all curbs, gutters, sidewalks, driveway approaches or similar flatwork as indicated on plans or required for new construction. Do not damage adjacent surfaces that are not scheduled for removal. Saw cut asphalt surfaces between

existing to remain and removed surfaces, and remove concrete surfaces to the nearest expansion joint or vertical saw cut.

- B. All surface debris to be removed from site and disposed of in a legal manner.
- C. Coordinate removal with utility work and locations as well as traffic control requirements with City Engineering.

### 3.6 SALVAGE

- A. Salvage designated equipment and materials.
- B. All other salvageable materials become the property of the Contractor unless materials are designated to be turned over to Owner.

### 3.7 DISPOSITION OF MATERIALS

- A. Unsalvageable Materials - All unsalvageable materials shall be removed in a manner that will avoid damage to materials or equipment to remain and shall be completely removed and legally disposed away from the site.
- B. Salvageable Materials to be Reused in the Work - Salvageable materials designated for reuse or relocation shall be carefully removed by the applicable trades and shall be protected from damage until they are incorporated into the new work.
- C. Salvageable Materials to be Stored for the Owner - Salvageable materials designated to remain the property of the Owner shall be carefully removed by the applicable trades, protected from damage, and stored as directed on the site.
- D. All other materials or debris resulting from demolition operation shall become the property of the Contractor and shall be removed from the site promptly. No accumulation of debris will be permitted. Wood and flammable debris resulting from demolition operations shall not be burned on the site.

### 3.8 DEMOLITION AND SALVAGE

- A. No right, title, property or interest of any kind whatsoever in or to the land or premises upon which buildings or structures stand is created, assigned, conveyed, granted or transferred to the Contractor or any other person or persons, except only the license and right of entry to remove parts of buildings and structures in strict accordance with the Contract.
- B. Only such property may be salvaged by the Contract as is owned by the Owner and in the event of any doubt respecting the ownership of any particular property, the Contractor shall request from the Owner a written statement regarding its ownership.
- C. All salvage becomes the property of the contractor except as otherwise indicated, but storage of such materials and equipment on the project area will not be permitted except for the duration of the contract and such storage at no time interfere with the activities of the Owner or of other contractors.
- D. Personal property of third persons or of occupants of buildings on the site shall not become the property of the Contractor.

- E. Unless otherwise specified, no part of the structure shall be removed from the premises as a whole, or in a substantially whole condition, but all such parts shall be demolished on the premises.
- F. Live Utilities and Other Property
  - 1. The contractor shall assume all responsibility for damage attributable to him to any property upon, or passing through the project area, but excluded from the work not owned by the Owner such as utility lines, surface improvements, or like items.
  - 2. If disconnections of underground utility services are required to be made in public thoroughfares, the Contractor shall comply with all local requirements and regulations respecting the barricading of trees, the removal and restoration of pavement, and other pertinent matters.

### 3.9 PRECAUTIONS

- A. The operations of the contractor shall be done in such manner as to avoid fires and other hazards to persons and property, interference with the use of adjacent buildings or interruption of free passage to and from such buildings. On completion of the work at each building, the premises shall be left in a condition satisfactory to the Architect.
- B. Where adjoining structures are occupied, the contractor is required to advise the inhabitants as to when the demolition work or site clearance work will be started and of the hazards involved. A barricade shall be provided during working hours to restrict unauthorized persons from entering hazardous working areas. If basement openings or other hazardous conditions must be left unattended, a minimum of a continuous snow fence barricade shall be provided around the entire basement opening or hazard.
- C. The use of explosives in the performance of the work under this Contract is prohibited.

### 3.10 DEBRIS CLEANUP

- A. No combustible debris shall be thrown, stored or burned on the site or adjacent parcels, sidewalks, streets, drives, parking lots or alleys. Debris created from wrecking site clearances must be disposed of as demolition or removal work proceeds.
- B. Dropping of brick, stone or concrete walls on adjacent property, sidewalks, streets, drives, parking lots or alleys not in Contract is forbidden. All wrecking operations, storing or processing of non-combustible debris shall be restricted to the boundaries of the demolition area.
- C. The cleaning up of the streets, drives, walks, parking lots, parcels and the site shall include the removal and disposal of any rubbish, refuse or other trash lying within the areas, whether or not such conditions have resulted from operations under this Contract.

## **SECTION 03 10 00**

### **CONCRETE FORMWORK**

#### **PART 1 - GENERAL**

##### **1.1 DESCRIPTION OF WORK**

- A. Provide all formwork and removal. All exposed concrete to be ACI 347-04 Class A Concrete.

##### **1.2 RELATED WORK IN OTHER SECTIONS**

- A. Concrete Reinforcement - Section 03 20 00
- B. Concrete - Section 03 30 00

#### **PART 2 - PRODUCTS**

##### **2.1 MATERIALS**

- A. All formwork to be built true and strong and removed after concrete is hardened, approximately 15 days minimum, except for foundation work or similar mass concrete. Formwork to be prefabricated formwork, wooden forms. Circular columns formed with Sonotube or approved equal.
- B. Permanent Shoring – Stoops: See structural plans.

#### **PART 3 - EXECUTION**

##### **3.1 FORM CONSTRUCTION**

- A. General - Except as specified herein, all formwork shall be constructed in accordance with ACI 347, Recommended Practice for Concrete Formwork. Construct forms to exact sizes, shapes, lines, and dimensions shown, and as required to obtain accurate alignment, location, grades, level and plumb work in the finished structure.
- B. Construction - Design, erect, support, brace, and maintain formwork so that it will safely support all vertical and lateral loads that might be applied until such loads can be supported by the concrete structure. Carry vertical and lateral loads to the ground by the formwork system and by in-place construction that has attained adequate strength for that purpose.

Design forms and falsework to include assumed values of live load, dead load, weight of moving equipment operated on form work, concrete mix, height of concrete drop, vibrator frequency, ambient temperature, and other factors pertaining to safety of structure during construction.

Support form facing materials by structural members spaced sufficiently close to prevent deflection of the form facing material. Fit forms placed in successive units for continuous surfaces to accurate alignment to assure a smooth complete surface, free from irregularities, and within the allowable tolerances. Provide camber in formwork as required for anticipated deflections in formwork due to weight and pressure of fresh concrete and construction loads for long-span members without intermediate supports.

### 3.2 FORM TREATMENT

- A. Coat the contact surfaces of forms with a form-coating compound before reinforcing is placed. Provide commercial formulation form-coating compounds that will not bond with, stain, nor adversely affect concrete surfaces, and will not impair subsequent treatment of concrete surfaces requiring bond or adhesion, nor impede the wetting of surfaces to be cured with water or curing compounds. Do not allow excess form coating material to accumulate in the forms or to come into contact with concrete surfaces against which fresh concrete will be placed. Apply in compliance with the manufacturer's instructions.

### 3.3 FORMWORK TOLERANCES

- A. Construct formwork to provide complete concrete surfaces after removal of forms complying with the tolerances specified in ACI 347, Section 203.1, Class "A" concrete finish.

## **SECTION 03 20 00**

### **CONCRETE REINFORCEMENT**

#### **PART 1 - GENERAL**

##### **1.1 DESCRIPTION OF WORK**

- A. Reinforcing steel shall include, but is not limited to, the fabrication and placement of reinforcement for cast-in-place concrete as shown on the project drawings.
- B. Provide accessories and related items including: Spacers, chairs, slab bolsters, other supports, ties, and all other items required to support and maintain reinforcing in proper locations.
- C. Related Work in Other Sections:
  - 1. Concrete Formwork - Section 03 10 00
  - 2. Concrete - Section 03 30 00
  - 3. Synthetic Fibermesh Reinforcing – Section 03 30 00

##### **1.2 REFERENCES**

- A. Except as otherwise provided on project drawings or specified, the work of this section shall conform to the applicable provisions of American Concrete Institute ACI 315-65, ACI 301-77, and ACI 318-83, and with ACI "Manual of Concrete Practice - 1970".

##### **1.3 SHOP DRAWINGS**

- A. Submit shop drawings for fabrication, bending, and placement of reinforcing steel. Indicate bar size, mark numbers, bending details, erection drawings and location of chairs, ties, supports, and other accessories.

#### **PART 2 - PRODUCTS**

##### **2.1 MATERIALS**

- A. All steel and accessories shall be clean, free from paint, oil, grease, mortar, dirt, mill scale, excessive rust (a thin film of rust may be permitted at discretion of Architect) or other material which would prevent steel from developing stresses and bond.
- B. Reinforcing Bars - Provide deformed bars, new billet steel, 60,000 psi minimum yield strength, conforming to the requirements of ASTM A615, Grade 60. Epoxy coated at all exterior concrete locations.
- C. Welded Steel Wire Fabric for Concrete Toppings - ASTM A185. Provide 6 x 6 10/10 fabric in all slabs on grade unless another reinforcement is shown on drawings.



- D. Support and Accessories - Conform to ACI 315 where concrete surface is exposed to view or weather, or to be painted or sandblasted, use plastic supports. Include all spacers, chairs, ties, slab bolsters, clips, chair bars, and other devices for properly assembling, placing spacing, supporting, and fastening the reinforcement. Metal supports shall be of such a type as not to penetrate the surface the formwork and show through the surface of the concrete. Individual and continuous slab bolsters and chairs shall be of a type to complement the various conditions encountered and must be capable of supporting a 300 pound load without crushing. Use of slab bolsters is required for concrete to be sandblasted or chiseled to maintain clearance.

## 2.2 FABRICATION

- A. Shop fabricate all reinforcing steel to conform to the required shapes and dimensions, with fabrication tolerances complying with ACI-315. In case of fabricating errors, do not re-bend or straighten reinforcement in a manner that will injure or weaken the material. No kinks or short bends will be allowed.
- B. Deliver all reinforcement to the project site bundled, tagged, and marked. Use metal tags indicating bar sizes, lengths, and other information corresponding to markings shown on placement diagrams.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Place to tolerances of ACI 301. Exposed reinforcing shall be cause for rejection for concrete in which exposed bars occur. Securely hold all reinforcing to dimension and spacing.
- B. Space bars throughout to permit concrete to thoroughly surround and embed steel. Unless otherwise noted, provide minimum concrete coverage (face of concrete to side of bar) in accordance with ACI 318, and as follows:
  - 1. Minimum coverage in all cases - 3/4" or equal to bar diameter for #7 or larger.
  - 2. Slabs and footings on earth - 3".
  - 3. Vertical faces at walls and piers, in contact with earth, or exposed to exterior or moist conditions - 1-1/2" for #5 or smaller bars, 2" for bars over #5.

### 3.2 INSPECTION

- A. Cooperate with Architect to permit required inspection of all reinforcing before concrete is placed. Notify sufficiently in advance of placing concrete to allow inspection of reinforcement in place in forms.

## **SECTION 03 30 00**

### **CAST-IN-PLACE CONCRETE**

#### **PART 1 - GENERAL**

##### **1.1 WORK INCLUDES**

- A. All below grade cast-in-place concrete consisting of Portland cement, fine aggregate, coarse aggregate, water, admixtures; designed, proportioned, mixed, placed, finished, and cured as herein specified.
- B. All concrete shall be standard weight. No lightweight structural concrete, lightweight concrete fill or lightweight insulating concrete will be used.

##### **1.2 RELATED WORK**

- A. Concrete Formwork - Section 03 10 00
- B. Concrete Reinforcement - Section 03 20 00
- C. Exposed Aggregate Concrete – Section 03 35 10
- D. Insulation to be per Section 07 20 00
- E. Exterior Sidewalks, Curbs, and Gutters – See Section 32 10 00.

##### **1.3 REFERENCES**

- A. Comply with the provisions of the following codes, specifications and standards, except as shown or specified.
  - 1. ACI 614 - Recommended Practice for Measuring, Mixing, and Placing Concrete
- B. All concrete work which does not conform to the specified requirements; including strength, tolerances, and finishes, shall be corrected as directed by the Architect at the Contractor's expense, without extension of time therefrom. The Contractor shall also be responsible for the cost of corrections to any other work affected by or resulting from corrections to the concrete work.

#### **PART 2 - PRODUCTS**

##### **2.1 MATERIALS**

- A. Portland Cement - ASTM, C150, light burn. All exterior concrete to be air entrained. Provide Type I cement except as otherwise indicated. Type III may be used in lieu of Type I at contractor's option and when approved by the Architect.
- B. Only one brand of cement may be used for each required type throughout the work unless otherwise accepted by the Architect.
- C. Aggregate - ASTM C33. Do not use aggregate containing soluble salts or other substances such as iron sulfides, pyrite, marcasite or ochre which can cause stains on exposed concrete surface.
  - 1. Fine Aggregate - Clean, sharp, natural sand free from loam, clay, lumps, or other deleterious substances.
  - 2. Coarse Aggregate - Clean, uncoated, processed aggregate containing no clay, mud, loam or foreign matter.

Maximum designated sizes:

1-1/2" for all plain sections over nine (9) inches in thickness.

3/4" for all reinforced sections larger than three and one half (3-1/2) inches in thickness, and all plain sections between three and one half (3-1/2) and nine (9) inches in thickness,

3/8" for all sections three and one half (3-1/2) inches and less in thickness and for grouting hollow metal frames, partition bases, etc.

- D. Water - Clean, fresh, free from oil, acid, organic matter or other deleterious substances. Provide water for curing that does not contain impurities, in sufficient amounts, to concrete to remain exposed.
- E. Admixtures - Provide admixture produced by recognized admixture manufacturers and use in compliance with the manufacturer's printed directions. Do not use admixtures that have not been incorporated and tested in the accepted design mixes, unless otherwise authorized in writing by the Architect.
  - 1. Water Reducing Admixture - ASTM C494, Type A, containing no set-accelerating, set-retarding compound, chlorides, fluorides, or nitrates. Master Builder's Pozzolith and W.R. Grace WDRA or approved equal.
  - 2. Calcium Chloride - Do not use calcium chloride in concrete, except as otherwise authorized in writing by the Architect. When authorized, carefully proportion calcium chloride to not more than 2% of the weight of cement. Dissolve calcium chloride in a separate container and add to the concrete mixing water before water is added to the mix.
  - 3. Air Entraining Agent - ASTM C260 and approved by the Architect. Use in all concrete exposed to weather or freezing as a supplement, as required, to the dispersing agent to produce a total air entrainment of  $6\% \pm 1\%$ .
  - 4. Admixtures retarding setting of cement in concrete shall be used if ordered by the Architect, especially in hot weather for high wall lifts.
  - 5. Admixtures shall be premixed in solution form and dispensed as recommended by the manufacturer. The water in the solution shall be included in the computation of water-cement ratio.
- F. Joint Filler - Pre-formed, non-extruding type, ASTM D1751. Celotex Flexcell, W.R. Meadows Sealtight, or W.R. Grace Co., Korkpak Code 13211.
- G. Membrane Forming Curing Compound - ASTM C309, Type I, clear with fugitive dye for interior and exterior surfaces to receive applied finishes. W.R. Grace Clear Seal or Sonneborn Contech Kure-N-Seal.
- H. Curing Materials
  - 1. Kraft paper shall be waterproof and nonstaining.
  - 2. Burlap shall be of commercial quality and non-staining.
  - 3. Polyethylene film shall be sheet or roll material not less than .004" thick.
  - 4. Sand shall be washed sand.

- I. Slab Joint Key - Preformed asphalt hard board, Brock-White Tongue and Groove Joint, 1/4" thick.
- J. Fiber Mesh Reinforcing – Synthetic fiber reinforcing shall be nycon, fibermesh, or other reinforcing as approved by the architect. Synthetic reinforcing shall be mixed in strict accordance with the manufacturer's recommendations.
- K. Cast-In Abrasive Stair Nosings – Amstep Products 200 Series with integral abrasive filler in an extruded aluminum base with continuous arrow profile anchor or approved equal. Color of abrasive to be black.

## 2.2 PROPORTIONING AND DESIGN OF MIXES

- A. Concrete to be 4000 lb. exterior concrete slabs and slabs exposed to road salt to be air entrained concrete.
- B. Prepare design mixes for each type of concrete shown and specified. Use an independent testing facility accepted by the Architect for preparing and reporting proposed mix design. The testing facility shall not be the same as used for quality control testing.
- C. Proportion design mixes by weight for each class of concrete required, complying with ACI 301 and report the following data:
  - 1. Complete identification of aggregate source of supply.
  - 2. Test of aggregates for compliance with specified requirements.
  - 3. Scale weight of each aggregate.
  - 4. Absorbed water in each aggregate.
  - 5. Brand, type, and composition of cement.
  - 6. Brand, type, and amount of each admixture.
  - 7. Amounts of water used in trial mixes.
  - 8. Proportions of each material by weight per cubic yard.
  - 9. Gross weight and yield per cubic yard of trial mixtures.
  - 10. Measured slump.
- D. Submit written reports to the Architect of each design mix for each type and class of concrete, at least 15 calendar days prior to the start of the specified work. Include in each report the project identification name and number, date of report, name of contractor, name of concrete testing service, concrete class, source of concrete aggregates, manufacturer and brand name of manufactured materials, the precise proportions of the concrete mix, the properties specified herein for the type and class of concrete, and the test results for each property specified for the design mix.
- E. Design the concrete mixes so that the compressive strength will be at least 15% greater than the minimum specified compressive strength; and so that not more than one test, of any 10 consecutive tests for strength, will have a value less than 90% of the required strength.
- F. The criteria specified herein are maximums or minimums, and shall not be construed to predetermine fixed quantities of materials in the mix design, or to preclude change of an accepted mix design at any time. Mix design adjustments may be requested by the Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant, at no additional cost to the Owner and as accepted by the Architect. Laboratory test data for revised mix design and strength results must be submitted to and accepted by the Architect before using in the work.

- G. Concrete Mixes – See notes on structural plans for additional concrete data.
- H. Slump and Workability
  - 1. Slump - For regular weight concrete the slump shall be a maximum of 4" for walls and columns and 3" for all other concrete. The minimum slump shall be 1". The amount of slump shall be determined by the standard test method ASTM C143.
  - 2. Workability - Workability shall be such that when adequately vibrated with high cycle internal vibrators the concrete will consolidate completely without segregation.

### 2.3 CONCRETE MIXING

- A. Concrete shall be mixed at batch plants as specified herein. Batch plants must comply with requirements of ACI 614, with sufficient capacity to produce concrete of the qualities specified in quantities required to meet the construction schedule. All plant facilities are subject to the acceptance of the Architect.
- B. Ready-Mix Concrete - Comply with requirements of ASTM C94, and as herein specified, provided the quantity and rate of delivery will permit unrestricted progress of the work in accordance with the placement schedule. During hot weather or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C94 may be required as specified below. Proposed changes in mixing procedures, other than herein specified, must be accepted by the Architect before implementation.
- C. Batch Mixing at the Site - Batch mixing at the job site is acceptable for small quantities such as frame grouting, beam and lintel filling, etc. Batch mixing shall be accomplished in accordance with Section 702 of ACI 301-66.

## PART 3 - EXECUTION

### 3.1 GENERAL

- A. Notify all parties in advance of concrete pours, allowing reasonable time for others to complete their work. Verify all openings before pouring. Verify locations of inserts with other trades to insure accurately and properly placed inserts.
- B. Pour no concrete until all reinforcing in entire section is in place, properly secured, tied, and with ample supports, and until reinforcing is inspected. See Section 03200 for required coverages. Pouring of concrete signifies satisfaction by Contractor of placement of reinforcing steel and forms and therefore responsibility for results.
- C. Expansion joint material, waterstops, and embedded items shall be positioned accurately and supported against displacements. Voids in sleeves, inserts, grout holes, and anchor slots shall be filled temporarily with readily removable material to prevent entry of concrete into voids.
- D. Before placing concrete, inspect and complete the formwork installation, reinforcing steel, and items to be embedded or cast-in. Notify other crafts involved in ample time to permit the installation of their work and cooperate with other trades in setting such work, as required. Thoroughly wet wood forms immediately before placing concrete as required where form coatings are not used.

- E. Soil below concrete is subject to testing for soil bearing value by the testing laboratory, as directed by the Architect. Place concrete immediately after approval of subgrade.

### 3.2 CONCRETE PLACEMENT

- A. Place concrete in compliance with the practices and recommendations of ACI 614 and as herein specified.
  - 1. Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete which has hardened sufficiently to cause the formation of seams or planes of weaknesses within the section. If a section can not be placed continuously, provide construction joints as herein specified.
  - 2. Perform concrete placing at such a rate that the concrete that is being integrated with fresh concrete is still plastic. Deposit concrete as nearly as practicable to its final location to avoid segregation due to rehandling or flowing. Do not subject concrete to any procedure that will cause segregation.
  - 3. Screed concrete which is to receive other construction to the proper level to avoid excessive skimming or grouting.
  - 4. Set screeds to provide slab depressions of proper depth to provide flush finish surfaces between all adjacent finish floorings. Set metal divider strips.
  - 5. Do not use concrete which becomes non-plastic and unworkable, or does not meet the required quality control limits, or which has been contaminated by foreign materials. Do not use retempered concrete. Remove rejected concrete from the project site and dispose of legally.
- B. Placement Schedule - Prepare a placement schedule and submit to the Architect for acceptance before starting concrete placement operations, indicating an even distribution of loads throughout the entire structure. Rigidly follow placement sequence or schedule (if any) shown on the drawings, unless otherwise directed.
- C. Concrete Conveying - Handle concrete from the point of delivery and transfer to the concrete conveying equipment and to the locations of final deposit as rapidly as practicable, using methods which will prevent segregation and loss of concrete mix materials.

Provide mechanical equipment of such size and design for conveying concrete to ensure a continuous flow of concrete at the delivery end. Provide runways for wheeled concrete conveying equipment from the concrete delivery point to the location of final deposit. Keep interior surfaces of conveying equipment, including chutes, free of hardened concrete, debris, water, snow, ice, and other deleterious materials.
- D. Placing Concrete in Forms - Deposit concrete in forms in horizontal layers not deeper than 18" and in a manner to avoid inclined construction joints.
  - 1. Remove temporary spreaders in forms when concrete placing has reached the elevation of such spreaders.
  - 2. Consolidate all concrete placed in forms with mechanical vibrating equipment supplemented by hand spading, rodding or tamping. Use vibrators designed to operate with vibratory element submerged in concrete, maintaining a speed of

not less than 6000 impulses per minute when submerged in the concrete. Vibration of forms and reinforcing will not be permitted unless otherwise accepted by the Architect.

3. Do not use vibrators to transport concrete inside of forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than the visible effectiveness of the machine. Do not insert vibrators into lower layers of concrete that have begun to set. At each insert, limit the duration of vibration to the time necessary to consolidate the concrete and complete embedment of reinforcement and other embedded items without causing segregation of the mix.
4. Do not place concrete in supporting elements until the concrete previously placed in columns and walls is no longer plastic.

### 3.3 COLD WEATHER PLACING

- A. Protect all concrete work from physical damage or reduced strength which could be caused by frost, freezing action, or low temperatures, in compliance with the requirements of ACI 306 and as herein specified.
- B. When the air temperature has fallen to or is expected to fall below 40°F, provide adequate means to maintain the temperature in the area where concrete is being placed at either 70°F for three days or 50°F for five days after placing. Provide temporary housings or coverings including tarpaulins or plastic film. Keep protection in place and intact at least 24 hours after artificial heat is discontinued. Avoid rapid dry-out of concrete due to overheating and avoid thermal shock due to sudden cooling or heating.
- C. When air temperature has fallen to or is expected to fall below 40°F, uniformly heat all water and aggregates before mixing as required to obtain a concrete mixing temperature of not less than 50° and not more than 80°F at point of placement.
- D. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade containing frozen materials.
- E. Ascertain that forms, reinforcing steel, and adjacent concrete surfaces are entirely free of frost, snow, and ice before placing concrete.
- F. Do not use calcium chloride, salt, and other materials containing anti-freeze agents or chemical accelerators, unless otherwise accepted in writing by the Architect.

### 3.4 CONSTRUCTION JOINTS AND CONTROL JOINTS

- A. Construction Joints: Locate and install construction joints, which are not shown on the drawings, so as not to impair the strength and appearance of the structure, as acceptable to the Architect. Locate construction joints, as follows:
  1. Place construction joints perpendicular to the main reinforcement. Continue all reinforcement across construction joints.
  2. Provide keyways at least 1-1/2" deep in all construction joints in walls, slabs, and between walls and footings.
- B. Control Joints: Construct joints in exterior flatwork in the pattern shown on the drawings.

1. The contraction joints shall be formed by placing in the concrete a sheet of steel 1/8 inch thick which is withdrawn after the concrete is finished or by inserting into the concrete a plane of weakness not less than one half the depth of the concrete, or by sawing to a depth of at least 1/4 the thickness of the concrete.
2. Expansion joints shall be located where shown and at the intersection of the horizontal with vertical surfaces.
3. Expansion joints shall be formed by installing normal to the horizontal surfaces a 1/2 inch section of preformed joint filler extending from 1/2 inch below the finished surface to the subgrade or structural slab. The space above the expended joint shall be kept open by a suitable cap until the concrete is finished.

### 3.5 REPAIRING AND FINISHING OF FORMED SURFACES

- A. It is the intent of this specification to require forms, mixtures of concrete and workmanship so that concrete surfaces, when exposed, will require no patching except for plugging of tie holes. However, where patching is acceptable to the Architect, ACI 301-66 and the procedures described below shall be followed. All exposed concrete to conform to ACI 347-04 Class "A" finish and tolerances. All irregularities are to be ground/patched as listed below.
  1. As soon as the forms have been stripped and the concrete surfaces exposed, fins and other projections shall be removed. Except where hydrolithic waterproofing is to follow, recesses left by the removal of form ties shall be filled and surface defects that do not impair structural strength shall be repaired. Clean all exposed concrete surfaces and adjoining work stained by leakage of concrete to the satisfaction of the Architect.
  2. Immediately after removal of forms, remove cones, or cut off metal ties at least 1-1/2" back from all exterior surfaces exposed to view or which are to be finished. Holes, except in exposed surfaces of concrete walls are then to be promptly filled as follows: Moisten the hole with water, followed by a 1/16" brush coat of neat cement slurry mixed to the consistency of a heavy paste. Immediately plug the hole with a 1:1-1/2 mixture of cement and concrete sand mixed slightly damp to the touch (just short of "balling"). Hammer the grout into the hole until dense and an excess of paste appears on the surface. Trowel smooth with heavy pressure. Employ same source of cement and sand as used in the parent concrete. Where the concrete is exposed to view and scheduled to be unpainted, the color of the patching grout shall be adjusted as necessary (by the addition of proper amount of white cement or limestone screenings) to cause the patches, when dry, to match the parent concrete when dry. Rub lightly with a carborundum stone at an age of one to five (1 - 5) days if necessary to bring the surface plane with the parent concrete.
  3. Holes left by the removal of cones in exposed exterior surfaces of walls and piers shall be treated in the manner specified above, except that the holes shall be filled only to within 1/2 inch of the parent concrete surface.
  4. Defective concrete and honeycombed areas shall be chipped down square and at least 1" deep to sound concrete by means of cold chisels or pneumatic chipping hammers. If honeycomb exists around reinforcement, chip to provide a clear space at least 3/8" wide all around the steel to afford proper ultimate



bond thereto. For areas less than 1-1/2" deep, the patch may be made in the same manner as described above for filling form tie holes, care being exercised to use adequately dry (non-trowelable) mixtures and to avoid sagging. Thicker repairs shall require build up in successive days, each layer being applied (with slurry, etc.) as described above. To aid strength and bonding of the multiple layer repairs, Embeco non-shrink metallic aggregate, as manufactured by the Master Builders Company, Cleveland, Ohio) is recommended as follows:

<u>Materials</u>	<u>Volumes</u>	<u>Weights</u>
Cement	1.0	1.0
Embeco	0.15	0.25
Sand	1.5	1.5

For very heavy (generally, formed) patches, pea gravel may be added to the mixture and the proportions modified as follows:

<u>Materials</u>	<u>Volumes</u>	<u>Weights</u>
Cement	1.0	1.0
Embeco	0.2	0.33
Sand	1.0	1.0
Pea Gravel	1.5	1.55

In cases where the "Embeco" is employed in multiple patches and the final layer (to at least the final 1/2 inch) shall be composed of the 1:1.5 grout without Embeco. After hardening, rub lightly as described above for form tie holes.

### 3.6 CURING AND PROTECTION

- A. General - Freshly deposited concrete shall be protected from premature drying and excessively hot or cold temperatures, and shall be maintained without drying at a relatively constant temperature for a period of time necessary for hydration of cement and proper hardening of concrete.
- B. Initial Curing - Concrete shall be kept continuously moist at least overnight. One of the following materials or methods shall be used:
  1. Ponding or continuous sprinkling.
  2. Absorptive mat or fabric kept continuously wet.
- C. Final Curing - Immediately following initial curing and before concrete has dried, additional curing shall be accomplished by one of the following methods or materials:
  1. Continuing method used in initial curing.
  2. Waterproof paper conforming to "Specifications for Waterproof Paper for Curing Concrete" (ASTM C171), or polyethylene film with taped joints.
- D. Duration of Curing - Final curing shall continue until consecutive, cumulative, number of days during which temperature of air in contact with concrete is above 50°F has totaled 7 days. If high early strength concrete has been used, final curing shall continue for a total of 3 days above 50° F. Rapid drying at the end of the curing period shall be prevented.

- E. Curing Formed Surfaces - Cure formed concrete surfaces by moist curing with the forms in place for the full curing period or until forms are removed. If forms are removed, continue curing by any one of the methods specified above, as applicable.
- F. Temperature of Concrete During Curing - When the atmospheric temperature is 40°F and below, maintain the concrete temperature at not less than 55°F continuously throughout the curing period. When necessary, make arrangements before concrete placing for heating, covering, insulation or housing as required to maintain the specified temperature and moisture conditions continuously for the concrete curing period. Provide hot weather protections complying with the requirements of AIC 605. Maintain concrete temperature as uniformly as possible, and protect from rapid temperature changes in concrete which exceed 5° F in any one hour and 50° F in any 24-hour period.
- G. Protection from Mechanical Injury - During the curing period, protect concrete from damaging mechanical disturbances including load stresses, heavy shock, excessive vibration, and from damage caused by rain or flowing water. Protect all finished concrete surfaces from damage by subsequent construction operations.

3.7 FLATWORK FINISHING – See Exposed Aggregate Concrete – Section 03 35 10

3.8 FIELD QUALITY CONTROL

- A. The owner shall select a separate testing laboratory to perform all tests and to submit test reports to the Architect.

Materials and installed work may require testing and retesting as directed by the Architect at any time during the progress of the work. Allow free access to material stockpiles and facilities at all times. Tests, including the retesting of rejected materials and installed work, shall be done at the Contractor's expense.

- B. Concrete shall be sampled and tested for quality control during the placement of concrete as follows:

Compressive Strength Tests - ASTM C39, one set of 3 specimens for each 50 cubic yards, or fraction thereof, of each concrete class placed in any one day. One specimen shall be tested at 7 days and two specimens tested at 28 days (1 lab cured and 1 job cured).

When there is evidence that the strength for the concrete structure in place does not meet the specification requirements, the concrete testing service shall take cores drilled from hardened concrete for compressive strength determination, comply with ASTM C42 and as follows:

1. Take at least three representative cores from each member or area of suspect strength, from locations directed by the Architect.
2. Strength of concrete for each series of cores will be considered satisfactory if their average compressive strength is at least 90% of the specified 28-day design compressive strength.
3. Report test results in writing to the Architect on the same day that tests are made. Include in test results the project identification name and number, date, name of Contractor, name of concrete testing service, location of test core in the structure, type or class of concrete represented by core sample, nominal maximum size aggregate, design compressive strength, compression

breaking strength and type of break (corrected for length-diameter ratio), direction of applied load to core with respect to the horizontal plane of the concrete as placed, and the moisture condition of the core at the time of testing.

4. The Contractor shall pay for such tests conducted and any other additional testing as may be required. Fill core holes with patching mortar and finish to match adjacent concrete surfaces. Correct all concrete work that is found structurally inadequate by core tests, as directed by Architect.

## **SECTION 03 35 00**

### **EXPOSED AGGREGATE CONCRETE**

#### **PART 1 - GENERAL**

##### **1.1 SUMMARY**

- A. Section Includes: Exposed aggregate concrete produced by exposing the coarse aggregate of a gap graded concrete mix. Exposed aggregate to be on all exposed above grade surfaces of steps and landing walks.
- B. Related Sections: Refer to the following Sections for related work:
  - 1. Section 31 20 00 – Earthwork
  - 2. Section 03 30 00 – Cast-In-Place Concrete
  - 3. Section 05 50 00 – Miscellaneous Metals
  - 4. Section 07 90 00 – Caulking and Sealants
  - 5. Section 32 12 00 – Asphalt Paving (note: Contractor's Option)

##### **1.2 REFERENCES**

- A. American Concrete Institute (ACI)
- B. American Society for Testing and Materials (ASTM)
  - C31 Practice for Making and Curing Concrete Test Specimens in the Field
  - C33 Specification for Concrete Aggregates
  - C39 Test Method for Compressive Strength of Cylindrical Concrete Specimens
  - C42 Test Method for Obtaining, Testing Drilled Cores & Sawed Beams of Concrete
  - C94 Specification for Ready-Mixed Concrete
  - C143 Test Method for Slump of Hydraulic Cement Concrete
  - C150 Specification for Portland Cement
  - C172 Practice for Sampling Freshly Mixed Concrete
  - C231 Test Method for Air Content of Freshly Mixed Concrete, Pressure Method
  - C260 Specification for Air-Entraining Admixtures for Concrete
  - C494 Specification for Chemical Admixtures for Concrete
  - D994 Specification for Preformed Expansion Joint Filler for Concrete
- C. Concrete Reinforcing Steel Institute (CRSI)

##### **1.3 SUBMITTALS**

~~B.A.~~ Product Data: Submit product data for the following materials and items.

- ~~E.1.~~ Admixtures
- ~~F.2.~~ Patching Compounds
- ~~G.3.~~ Sealants

~~K.B.~~ Laboratory Test Reports: Submit concrete materials test reports and mix design reports certifying that each material or item complies with or exceeds the specified requirements.

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## 1.4 QUALITY ASSURANCE

- A. Codes and Standards: Comply with provisions of the following, except as otherwise indicated:
1. ACI 301 "Specifications for Structural Concrete for Buildings"
  2. ACI 304 "Guide for Measuring, Mixing, Transporting, Placing Concrete"
  3. ACI 305 "Hot Weather Concreting"
  4. ACI 306 "Cold Weather Concreting"
  5. ACI 308 "Standard Practice for Curing Concrete"
  6. ACI 309 "Standard Practice for Consolidation of Concrete"
  7. ACI 318 "Building Code Requirements for Reinforced Concrete"
  8. ACI 347 "Recommended Practice for Concrete Formwork"
  9. CRSI "Manual of Standard Practice"
  10. SP-66 ACI Detailing Manual"
- B. Mock-up Panels: Prepare one mock-up panel at the project site to demonstrate proficiency of the workmen, and define the degree of aggregate exposure. Mock-up panels shall be a minimum of 4' x 4'. Contractor shall use the methods and materials proposed for used on the final installation. Uniformity in appearance of each panel shall be the responsibility of the Contractor. The approved mock-up shall serve as a standard of appearance for the final work.
- C. Quality Control Testing During Construction: Coordinate concrete operations with testing service to facilitate quality control testing. Sample and test concrete during placement of concrete as follows:
1. Sampling Fresh Concrete: ASTM C172; except modified for slump to comply with ASTM C94.
  2. Slump: ASTM C143; one test for each concrete load at point of discharge and one for each set of compressive strength test specimens.
  3. Air Content: ASTM C231; pressure method; one for each set of compressive strength specimens.
  4. Compressive Strength Tests: ASTM C39; one (1) set for each 150 cubic yards (115 cubic meters) or fractions thereof, of each concrete class placed in any one day or for each 5000 sq. ft. (465 square meters) of surface area placed; two (2) specimens tested seven (7) days, three (3) specimens tested 28 days and one (1) specimen retained in reserve for later testing if required.

## PART 2 – PRODUCTS

### 2.1 CONCRETE MATERIALS

- A. Portland Cement: ASTM C150 Types I-II and III, "Low-Alkali" cement, unless otherwise specified. Use one brand of cement throughout project.
- B. Aggregates: Aggregate shall be 3/4" round with the following sieve graduation:

<u>Size</u>	<u>% Passing</u>
1"	100
3/4"	90-100
3/8"	40-60
#4	0-10
#8	0-5

- C. Water: Potable, clean, fresh, free from oil, acid, organic matter or other deleterious substances.
- D. Admixtures: All admixtures shall be specified in the mix design.
  - 1. Air-Entraining Admixture: ASTM C260
  - 2. Water-Reducing Admixture: ASTM C494, Type A.
  - 3. Water-Reducing, Retarding Admixture: ASTM C494, Type D.
  - 4. Chloride-containing admixtures are not permitted.

## 2.4 RELATED MATERIALS

- A. Expansion Joint Materials
  - 1. Typical Building: ASTM D994, preformed strips of a bituminous mastic composition.
  - 2. Slabs-in-Ground and Sidewalks: ASTM D1751, preformed expansion joint filler having relatively little extrusion and substantial recovery after release from compression.
- B. Liquid Membrane-Forming Curing Compound: ASTM C309, Type I or I-D, Class A.
- C. Chemical Hardener: Hardener shall be a colorless, aqueous solution of zinc or magnesium fluosilicate. Approved proprietary hardeners shall be delivered ready for use in the manufacturer's original containers.

## 2.5 CONCRETE MIX DESIGN

- A. General: Provide "Ready-Mixed" concrete, unless otherwise approved or specified; in accordance with ASTM C94. Concrete should meet the following criteria.
  - 1. Compressive Strength: Minimum 4,000 psi strength at 28 days.
  - 2. Concrete shall be gap-graded with weathered rounded coarse aggregate with 45 to 48 percent matrix.
  - 3. Water/Cement Ratio: Not greater than 0.55 by weight.
  - 4. Slump: of 3 inches.
  - 5. Air content: Between 5 % and 7%.
- B. Admixtures
  - 1. Use water-reducing admixture in all concrete.
  - 2. Use air-entraining admixture in exterior exposed concrete.

## PART 3 – EXECUTION

### 3.1 FORM SETTING

- A. Design, erect, support, brace and maintain formwork to support vertical and lateral loads that might be applied until such loads can be supported by concrete structure.
- B. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation and position.

- C. Design and fabricate formwork to be readily removable without impact, shock or damage to cast-in-place concrete surfaces and adjacent materials.
- D. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades.
- E. Tolerances: Set forms with the upper edge true to line and grade with an allowable tolerance of 1/8 inch (3 mm) in any 10 foot (3 m) long section.

### 3.2 PLACING REINFORCEMENT

- A. Comply with CRSI's recommended practice for "Placing Reinforcing Bars," for details and methods of reinforcement placement and supports.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, oil, concrete splatter from previous pours, and other materials which reduce or destroy bond with concrete.
- C. Accurately position, support and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as required.
- D. Install welded wire fabric of same gage in as long of lengths as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset end laps of adjacent widths to prevent continuous laps in either direction.

### 3.3 PREPARATIONS FOR PLACING CONCRETE

- A. Remove water from excavations. Before placement of concrete, remove wood chips, shavings, and hardened concrete from forms.
  - 1. Clean all equipment.
  - 2. Wet forms, except in freezing weather, or oil forms.
- B. Earth shall be uniformly moist when concrete is placed. Sprinkling method shall not be such as to form mud or pools of water. Watering subgrade immediately prior to placing concrete is not sufficient to make the soil uniformly moist.
- C. Notify other crafts to permit installation of their work. Coordinate installation of joint materials and moisture barriers with placement of forms and reinforcing steel.

### 3.4 PLACING CONCRETE

- A. Field Inspection: Do not place concrete until forms and reinforcing steel have been erected and properly braced.
  - 1. Place Ready-Mix concrete within specified time after batching.
 

Below 40 degrees F (4 degrees C)	See Cold Weather Placing
40 - 85 degrees F (4 - 29 degrees C)	90 minutes
86 - 90 degrees F (30 - 32 degrees C)	75 minutes
Above 90 degrees F (32 degrees C)	60 minutes

2. Adding Water: Do not add water after initial introduction of mixing water for batch except when slump of concrete is less than that specified upon arrival at job site, and maximum water/cement ratio for mix has not been exceeded.
  - a. Add water to bring slump within specified limits. Turn drum at least 30 additional revolutions at mixing speed. Do not add water to batch at any later time.
  - b. Insure that concrete strength meets specified requirements, and water does not exceed maximum amount specified in CONCRETE MIX DESIGN.
- B. General: Comply with ACI 304, and as specified herein.
  1. Deposit concrete continuously or in layers of such thickness that concrete will not be placed on concrete which has hardened sufficiently to cause formation of seams or planes of weakness.
  2. If section cannot be placed continuously, provide construction joints. Deposit concrete as nearly as practicable to its final location to avoid segregation.
- C. Placing Concrete in Forms: Consolidate placed concrete by high frequency mechanical vibrating equipment, supplemented as necessary by hand-spading, rodding or tamping. Use equipment and procedures for consolidation of concrete in accordance with ACI 309.
  1. Do not use vibrators to transport concrete inside forms.
  2. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible effectiveness of machine.
  3. At each insertion, limit duration of vibration to time necessary to consolidate concrete, and complete embedment of reinforcement and other embedded items without causing segregation of mix.
- D. Placing Concrete Slabs: Deposit and consolidate concrete slabs in continuous operation, within limits of construction joints, until placement of panel or section is completed. Maintain reinforcing in proper position during concrete placement operations.
- E. Placing Concrete Sidewalks: Place concrete in forms in one (1) layer of such thickness that when consolidated and finished, sidewalks will be of thickness indicated.
- F. Cold Weather Placing: Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures; comply with ACI 306.
- G. Hot Weather Placing: When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACI 305 and as herein specified.

### 3.5 CONCRETE FINISHING

- A. General: Do not use tools such as jitterbugs that force the aggregate away from surface.



1. After screeding and consolidating concrete slabs, do not work surface until ready for floating.
  2. As soon as concrete will support the mason on knee-boards, float the surface to bring grout to the surface, completely surrounding the aggregate and filling all surface voids. Float to a uniform appearance.
- B. Exposing Aggregate: Proceed as soon as the surface grout can be removed by simultaneous brushing and flushing with water without overexposing or dislodging the aggregate. Avoid traffic on the concrete during this operation. High pressure water may be used if desired finish is more easily achieved without harm to the concrete. Use same method of exposure, either with or without retarder, throughout the job.
- C. Liquid Chemical Hardener Finish: Apply chemical hardener finish after complete curing and drying of the concrete surface.
1. Dilute liquid hardener with water, and apply in three (3) coats; first coat, 1/3 strength; second coat, 1/2 strength; third coat, 2/3 strength. Evenly apply each coat, and allow 24 hours for drying between coats.
  2. Apply proprietary chemical hardeners, in accordance with manufacturer's printed instructions.
  3. After final coat of chemical hardener solution is applied and dried, remove surplus hardener by scrubbing and mopping with water.

### 3.6 CONCRETE SURFACE REPAIRS

- A. Patching Defective Areas: Immediately cut out honeycomb, rock pockets, voids over 1/4 inch (6.35 mm) in any dimension, and holes left by tie rods and bolts, down to solid concrete but, in no case to a depth of less than one (1) inch (25 mm).
1. Cut edges perpendicular to concrete surface.
  2. Thoroughly clean, dampen with water, and brush coat area to be patched with neat cement grout or proprietary bonding agent before placing cement mortar or proprietary patching compound.
- B. Remove and replace concrete with defective surfaces if defects cannot be repaired.
1. Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets, fins and other projections on surface, and stains and other discolorations that cannot be removed by cleaning.
    - a. Dampen concrete surfaces in contact with patching concrete and brush with neat cement grout, or apply concrete bonding agent.
    - b. Mix patching concrete of same materials to provide concrete of same type of class as original concrete.
    - c. Place, compact and finish to blend with adjacent finished concrete. Cure in the same manner as adjacent concrete.

### 3.7 CONCRETE TRUCK DISCHARGE

- A. Excess Concrete: Discharge excess concrete in mixer trucks that cannot be immediately used to area where it will not create an obstruction or hazard during construction. Remove excess concrete from site in a timely manner to approved site.

- B. Wash Water Discharge: Discharge wash water from mixer trucks to ground surface in manner and at location where discharge cannot escape construction site, or be washed away to arroyos, storm sewers, or sanitary sewers by precipitation or other surface flows.
1. Prior to project completion, remove wash water residue from site to approved location.
  2. Clean wash water discharge site to be free of debris.

## **SECTION 05 50 00**

### **MISCELLANEOUS METALS**

#### **PART 1 - GENERAL**

##### **1.1 DESCRIPTION OF WORK**

- A. The work required under this section consists of all steel and miscellaneous metals, painting, and related items necessary to complete the work indicated on the drawings and described in the specifications.

##### **1.2 REFERENCE STANDARDS**

- A. Cast iron shall conform to ASTM Specification A48-60T and unless designated otherwise shall be Class No. 30 with a minimum tensile strength of 30,000 psi.
- B. Nodular or ductile iron bars shall conform to ASTM A339-55. This material may be used in place of cast iron for items and locations as hereinafter specifically designated.
- C. Refined wrought iron bars shall conform to ASTM A189-60T, Grade B, single refined, round, hexagonal, and rectangular bars.
- D. Steel shall conform to ASTM A36-61T and requirements of Section 05 41 00.

##### **1.3 SUBMITTALS**

- A. Submit shop drawings for approval. Shop drawings shall indicate the fabrication, gauge, assembly and erection details, size of members, fastenings, anchors, and all necessary connections to work of other trades and related items required.

#### **PART 2 - PRODUCTS**

##### **2.1 MATERIALS**

- A. Miscellaneous Anchors and Bolts: Provide all anchors, hangers, bolts, toggle bolts, expansion bolts, rods, clip angle screws, railing sleeves, sleeves, shims, connection stiffeners, reinforcement screws, etc. required for proper and complete fabrication, assembly, and installation of miscellaneous and ornamental metal work. Exposed accessories shall have finish to match exposed hardware.

##### **2.2 PAINTING AND PROTECTIVE COATING**

- A. All ferrous metal, except stainless steel, shall be properly cleaned and given one (1) shop coat of red lead or zinc chromate primer. Anchors that are built into masonry shall be coated with asphalt paint unless specified to be galvanized. Metal work to be encased in concrete shall be galvanized unless specified or noted otherwise. Where hot dip galvanized or zinc coated metal is specified or shown, it shall not be shop primed unless specifically required.
- B. Insulate faces of metal in contact with different metals, with masonry, concrete, plaster, or earth by giving each contact surface one coat of approved alkali resistant bituminous paint.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Metal surfaces shall be clean and free from mill scale, flake rust, and pitting; well formed and finished to shape and size with sharp lines and angles and smooth surfaces. Shearing and punching shall leave clean true lines and surfaces. Weld or rivet permanent connections. Welds and flush rivets shall be finished flush and smooth on surfaces that will be exposed after installation. Do not use screws or bolts where they can be avoided. Where used, heads shall be countersunk, screwed up tight, and threads nicked to prevent loosening.
- B. Casting shall be of uniform quality, free from blowholes, porosity, hard spots, shrinkage distortion or other defects. Casting shall conform to the dimensions indicated with a tolerance of plus or minus 1/8 inch, except in the dimensions of covers and the openings to receive them shall be limited to blasting or other approved method. Covers subject to street or foot traffic shall have machined horizontal bearing surfaces; provide machine bearing for contact surfaces for other joints where indicated or required.
- C. Fastenings shall be concealed where practicable. Thickness of metal and details of assembly and supports shall give ample strength and stiffness. Joints exposed to weather shall be formed to exclude water. Provide holes and connections for the work of other trades.
- D. At the proper time, deliver and set in place items of metal work to be built into adjoining construction.

**SECTION 05 52 00**

**HANDRAILS AND RAILINGS**

**PART 1 - GENERAL**

1.1 SECTION INCLUDES

- A. Galvanized steel pipe handrails, balusters, and fittings.

1.2 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

- A. Section 03 30 00 – Cast-In-Place Concrete: Placement of pipe sleeves in concrete.

1.3 DESIGN REQUIREMENTS

- A. Railing assembly, wall rails, and attachments to resist lateral force of 250 lbs. at any point without damage or permanent set.

1.4 SUBMITTALS

- A. Shop Drawings: Submit shop drawings indicating profiles, sizes, connection attachments, anchorage, size and type of fasteners and accessories.
- B. Samples: Submit two 1'-0" long samples of handrail. Sample to have galvanizing coating applied to serve as an example of railing surface.

1.5 FIELD MEASUREMENTS

- A. Verify that field measurements are indicated on shop drawings.

**PART 2 - PRODUCTS**

2.1 STEEL RAILING SYSTEM

- A. Pipe: ASTM A53, Grade B, Galvanized Schedule 40.
- B. Rails and Posts: 1½" diameter steel pipe, welded joints.
- C. Posts: 1 ½" diameter steel pipe, welded.
- D. Fittings: Galvanized steel pipe sleeves with studs cast into concrete stair. Size to accommodate rail plus perimeter grout. Grout to be non-shrink type.
- E. Galvanizing: 2.0 oz/sq.ft. zinc coating in accordance with ASTM A386. Final surface to be smooth to touch.

2.2 FABRICATION

- A. Fit and shop assemble components in largest practical sizes for delivery to site.
- B. Fabricate components with all joints continuously welded. All welds to be ground smooth prior to galvanizing.

- C. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.
- D. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- E. Accurately form components to suit stairs and landings and to each other and to building structure.

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Verify that field conditions are acceptable and are ready to receive work.
- B. Supply items required to be cast into concrete with setting templates to appropriate sections.

#### **3.2 INSTALLATION**

- A. Install components plumb and level, accurately fitted, free from distortion or defects.

## **SECTION 07 90 00**

### **CAULKING AND SEALANTS**

#### **PART 1 - GENERAL**

##### **1.1 WORK INCLUDES**

- A. Furnish and apply all caulking complete, in strict accordance with these specifications and the applicable drawings. Caulk at all intersections or junctions of metal and other materials as shown on drawings and as required.
- B. Caulk at intersections of metal, concrete, masonry, wood, or similar combinations.

##### **1.2 SUBMITTALS**

- A. Provide samples of colors of sealants to be selected.
- B. Manufacturer's Data - Provide three (3) copies of manufacturer's data sheet recommendations, specifications, and installation instructions.

##### **1.3 STORAGE AND DELIVERY**

- A. Deliver materials in manufacturer's original unopened packaging with identification labels intact and eligible. Store in area protected from weather, moisture, open flame, and sparks.
- B. Environmental Requirements: Comply with sealant manufacturer's recommendations for maximum and minimum application temperatures and humidity.

#### **PART 2 - PRODUCTS**

##### **2.1 MATERIALS**

- A. Caulking and sealant material for exterior use shall be 20-year minimum life expectancy products.
- B. Two part self-leveling urethane sealant shall comply with Federal Specification TT-S-00227E, Type I, Class A. Use for horizontal surface joints, exterior/interior, such as concrete paving joints, concrete floor joints, etc. Sonolastic Paving Joint Sealant; Sonneborn-Contech, Urexpan NR100, Pecora Corp. Color as selected by Architect from manufacturer's standard colors.
- C. Joint Cleaner and Joint Primer - As recommended by sealant manufacturer.
- D. Bond Breaker Tape - As recommended by sealant manufacturer.
- E. Sealant Backer Rod - Ethafoam circular sized to tight fit into opening.
  - 1. Sealant is to be "Sikaflex" polyurethane in color to match adjacent panels.
  - 2. Back up material shall be non-asphaltic expanded closed cell polyethylene, Ethafoam (round) Rod Stock by Dow Chemical Co., or approved equal. Back up material shall not bond to sealant. Diameter of rod stock shall be at least 1/8" larger than the joint opening.

## **PART 3 - EXECUTION**

### **3.1 GENERAL**

- A. Furnish and apply all caulking, complete, in strict accordance with these specifications and the applicable drawings. Caulk at all intersections or junctions, masonry and concrete at junctions of metal, and concrete or masonry at hollow metal and aluminum windows and doors, at tops of all precast and poured concrete walls, tops of block partitions, and as shown on drawings. Caulk at intersections of plaster, metal, concrete, masonry, wood, or similar combinations. Caulk under copings at expansion joints and where required for watertight construction.
- B. Caulk at all joints around doors, windows, louvers, or other openings through exterior walls where shown on drawings. Expansion joints, top joints of all sills, coping stone and projecting cut stone ledges, both sides of jambs and heads on exterior and interior panels, and interior joint at spandrel beams shall be caulked with caulking compound. Where joints are more than 3/4" in depth, joints shall be backed up to 3/4" of surface before caulking.
- C. Caulking compound shall be applied around metal walls and roof panels, HM doors, and similar locations. Where voids occur, joints shall be filled with back-up material specified for use with flexible sealant. For joints up to 1/2" in width, depth of joint shall be equal to width; for joints over 1/2" in width, depth shall be 1/2 of width.

### **3.2 INSPECTION**

- A. Examine joints to be sealed for construction defects that would adversely affect execution of work.
- B. Ensure that masonry and concrete have cured a minimum of 28 days.
- C. Do not proceed with installation until unsatisfactory conditions are corrected.

### **3.3 PREPARATION**

- A. At exterior wall maintenance locations, remove existing sealant, backer rod, and joint materials in area of replacement.
- B. Clean joint surfaces with joint cleaner, free of dust, dirt, oil, grease, lacquers, laitance, release agents, moisture, or other matter which might adversely affect adhesion of sealant.
- C. Apply primer to surfaces recommended by sealant manufacturer to be primed, following manufacturer's instructions.

### **3.4 INSTALLATION**

- A. Install bond breaker tape where required by sealant manufacturer's instructions.
- B. Install sealant backer rod where shown or required by sealant manufacturer's instructions. Install in joints using a blunt instrument to avoid puncturing. Do not twist the backer rod while installing. Install so that joint depth is 50% of joint width, minimum 1/4" deep. Install dry and free of tears or holes.



- C. Install sealants in accordance with manufacturer's instructions. Install sealants in uniform, neat and continuous beads without gaps or air pockets. Tool joints to required configuration within 10 minutes of sealant installation.

### 3.5 WORKMANSHIP

- A. Sides and tops of windows and inside joint areas of exterior frames or any other openings in exterior wall shall be caulked with oakum where voids exist and tubular backup can not be used.
- B. After all back up caulking has been placed, caulk all joints with caulking compound. All surfaces to be caulked shall be clean and thoroughly dry. Caulking shall be forced into rabbets under mechanical pressure, filling all voids complete to render water and airtight and shall be struck smooth and left ready for painting. Where joints occur in stone or other materials not to be painted, compound shall match adjoining surface.
- C. Temperature shall be not less than 40°F, surface dry and clean when flexible sealant is applied. Remove lacquer from caulking rabbets in aluminum. Metal, glass, and other dense surfaces shall be solvent cleaned. Apply solvent with brush and wipe dry with lint-free paper towel. All stone, concrete, wood, and other porous surfaces shall be primed. Primer shall be dry before installation of back up material and applying sealant. Flexible sealant shall be applied from a gun or cartridge in a neat bead, well bonded to both sides and extending full depth of caulking rabbet. Joints shall be masked and struck as required for neatness, and smears solvent-cleaned immediately.

### 3.6 ADJUSTMENT AND CLEANING

- A. Remove excess materials adjacent to joints by mechanical means or with solvents as recommended by sealant manufacturer as work progresses to eliminate evidence of spillage or damage to adjacent surfaces.

## **SECTION 31 20 00**

### **EARTHWORK**

#### **PART 1 – GENERAL**

##### **1.1 EXTENT**

- A. Work consists of all earthwork grading, filling, moving required for rough grading and final grading at building site and miscellaneous earthwork required for regrading adjacent hillsides.
  - 1. Perform all excavation, backfill, and soil preparation for curbs, drives, berm, parking areas, and sidewalks indicated.
  - 2. Excavated material that is suitable may be used for fills and backfills indicated or required. Fills within construction limits shall be placed in accordance with requirements of this section.
  - 3. All excess excavated material shall be removed from the site and disposed of at an approved location.
  - 4. Provide and place all backfill and any special fill material required. Fill obtained from off site shall be of kind and quality as specified for fill herein, and the source approved by Architect.
  - 5. Where adjacent areas within the project site are disturbed as a result of building operations or storage of materials under the contract, they shall be cleaned of all debris and restored to original grades and conditions including sod/lawn restoration.
  - 6. Excavation, earthwork, and backfill for manholes and storm and sewer lines except as noted below.
  - 7. Any rock uncovered on site during construction shall be removed to location directed.
  - 8. Bedrock – Contact Architect if bedrock is encountered in excavation.
- B. Protect all existing improvements to remain including structures, roads, streets, walks, utilities, trees, shrubs, and lawn area. The contractor is liable for any damage he causes outside the construction limits shown on the Site Plan and must restore any damaged items.
- C. Carefully maintain all benchmarks, monuments, and other reference points. If disturbed or destroyed, replace as directed.

#### **PART 2 – PRODUCTS**

##### **2.1 MATERIALS**

- A. Engineered Granular Backfill – Selected fill material shall be essentially well graded sand and gravel or crushed rock conforming to the following:

<u>Sieve Size</u>	<u>Total Percent Passing</u>
3"	100
2"	85 – 100
¾"	71 – 100
#4	35 – 100
#10	30 – 80
#40	0 – 40
#200	0 – 10
Liquid Limit	Max. 25
Plasticity Index	0 – 8

- B. The upper fill, directly under slab and foundation concrete, should contain no material larger than one inch.
- C. Where wet subgrade conditions exist for placement of the first lift, a maximum of 5% passing a No. 200 sieve is recommended.
- D. The above gradations represent the extreme limits that shall determine the suitability of aggregate for use. The aggregate shall have a gradation within the limits designated and shall be uniformly graded from coarse to fine. The fill material shall be non-expansive, free of organic matter, trash, or other foreign matter and deleterious substances.

### **PART 3 – EXECUTION**

#### **3.1 DISPOSITION OF UTILITIES**

- A. Inactive and abandoned utilities encountered in excavating and grading shall be reported to the Architect. They shall be removed, plugged, or capped as directed by the Architect. See civil and mechanical plans. In absence of specific requirements, plug or cap such utility lines at least three feet outside of new building walls or as required by local regulations.
- B. Maintain existing live utilities to remain and protect during all operations.

#### **3.2 FILL UNDER SLABS ON GRADE**

- A. Where fill is required to raise the subgrade for paving base to the elevations indicated on drawings, such fill shall be MN/DOT Class 5 gravel, placed and compacted as specified. Cinders or other similar material that will corrode piping or other metal shall not be used for fill. Place all backfill in maximum lifts of nine inches. Tamp all areas before gravel is deposited. Provide data on tests on Class 5 gravel.
- B. Before depositing fill, remove all loam, vegetation, and other suitable material from areas to receive fill. Do not deposit fill until the subgrade has been checked and approved by Architect. In no case shall fill be placed on a subgrade that is muddy, frozen, or that contains frost. Deposit fill material in horizontal layers not exceeding eight inches in depth before compacting. Spread fill evenly and compact each layer by uniformly rolling, pneumatic tamping, or other approved equipment to minimum 95 maximum modified proctor dry density, ASTM 1557. Field density tests shall be made by Sand Cone Method ASTM D-1556 or as approved by Architect. If necessary, soil shall be moistened or allowed to dry to the correct moisture content before compaction. The finished compacted areas shall be brought to a reasonable true and even plane at the required elevations and shall be approved by the Architect prior to further construction operations thereon.

- C. Compaction of Fill: All fill material shall be uniformly compacted to minimum 95% maximum modified proctor dry density. Moisture content shall be between 75% and 110% of the optimum moisture content. Compaction shall be attained with rollers, vibratory equipment, or other previously approved equipment and methods. The thickness of the lifts shall be reduced anytime the specified density can not be achieved. If the fill material becomes too wet for the required compaction, the fill shall be dried by a method approved by the Architect prior to commencing or continuing compaction operations. If fill material becomes too dry for required compaction, the fill shall be moistened by a method approved by the Architect prior to commencing or continuing compaction operations.
- D. Place engineered backfill or other fill materials in lifts not to exceed eight inches in a loose condition, unless the contractor can demonstrate satisfactory results by placing thicker lifts.
- E. No fill material shall be placed when either the fill material or the previous lift (or subsoil) on which it is to be placed is frozen.
- F. Any soft or yield spots appearing in the fill resulting from frost, rain, or any other force shall be scarified, removed, recompactd or otherwise rectified to the satisfaction of the architect before any new fill material is placed.
- G. The compacted fill shall be brought up to the elevations and limits shown on the drawings. The completed fill shall be subject to the final inspection and approval of the architect.

### 3.3 COMPACTION

- A. Material whose moisture content is more than 5% greater than that of the optimum shall be dried out prior to placing and compacting.
- B. Compaction over ditches less than 3'-0" in width and other areas not accessible to regular compaction equipment shall be accomplished by the use of mechanical hand compactors, such as a "Jackson Compactor" or approved equal. Fill shall be placed in horizontal layers not to exceed 8 inches in depth and moistened by sprinkling as required.

### 3.4 SAMPLING AND TESTING

- A. The contractor shall include in his bid the cost of performing five (5) compaction tests to be made at locations determined by Architect. Where tests indicate that fill does not conform to the compaction density specified or depth, the Architect shall be notified at once.
- B. The name of the testing company shall be submitted to the Architect for approval if other than EPC Engineering and Testing, Twin Ports Testing, or American Engineering and Testing; and copies of each test report shall be furnished to Architect.
- C. All samples and tests to determine the requirements specified herein will be performed under the supervision of an approved testing laboratory.

- D. The source of materials shall be selected in advance of the time when the material will be required in the work and suitably sized samples shall be submitted not less than 30 days before commencing the work. Additional samples of material shall be furnished during construction as required by the Architect.
- E. Compaction Tests – Contractor shall notify the approved testing laboratory 36 hours prior to starting compaction.
  - 1. Prior to and during the placing of the fill materials, the Testing Laboratory will sample the soils which are to be used and make the tests necessary to determine the maximum density and optimum moisture content of the material.
  - 2. The contractor shall arrange to have a representative of the testing laboratory periodically on the job during the entire period of compaction, scheduled by Contractor.
  - 3. Modified proctor density shall be determined by ASTM D1557.
  - 4. Compaction failing to meet the specified densities shall be recompacted and retested. All such retests shall be billed to the Contractor based on the standard rate schedule of the testing laboratory.

### 3.5 COLD WEATHER PROTECTION

- A. Each day's work of site grading, filling, and compaction shall be protected from freezing as the work proceeds by being covered with a minimum 1'-0" deep layer of clean granular material or other approved method. This layer must be removed as the following day's work proceeds and stockpiled for reuse. This material may not be used for fill unless it has been broken up. All frozen fill material from on or off the site must be broken up prior to placement and compaction.
- B. Blankets or other means may be used.

## **SECTION 31 25 13**

### **EROSION AND SEDIMENTATION CONTROLS**

#### **PART 1 - GENERAL**

##### **1.1 APPLICABLE PROVISIONS**

- A. Applicable provisions of Division 1 shall govern work of this section.

##### **1.2 APPLICABLE PUBLICATIONS**

- A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.
  - 1. "Protecting Water Quality in Urban Areas, Best Management Practices for Minnesota," Minnesota Pollution Control Agency, Division of Water Quality, Current Edition.
  - 2. Minnesota Department of Transportation (Mn/DOT), Standard Specifications For Construction, Current Edition.
  - 3. Minnesota Department of Transportation (Mn/DOT), Boiler Plate Special Provisions, Current Edition
  - 4. Minnesota Statutes, Chapters 115 and 116, and Minnesota Rules, Chapter 7001.

##### **1.3 DESCRIPTION OF WORK**

- A. The work under this section shall cover providing the necessary materials, equipment and labor to control erosion by the methods specified herein. If no specific quantities are shown on the contract drawings, the Contractor shall use whatever quantities are necessary to prevent sediment transport off the job site or into any storm water conveyances or streams.
- B. The Contractor shall submit for approval by the Engineer an Erosion Control Plan as required in this section for accomplishing temporary and permanent erosion control, prior to beginning any construction on the project.
- C. The Contractor shall schedule and conduct construction activities in a manner that will minimize soil erosion and the resulting siltation and turbidity of surface waters in accordance with Mn/DOT 1803.5.

##### **1.4 RELATED WORK ELSEWHERE**

- A. Clearing and Grubbing
- B. Site Grading
- C. Seeding and Sodding

## **PART 2 - PRODUCTS**

### **2.1 TOPSOIL BORROW**

- A. Topsoil shall be fertile, friable, natural loam surface soil, reasonably free of subsoil, clay lumps, brush, weeds and free of roots, stumps, stones larger than 2 inches in any dimension, and other matter harmful to plant growth. Topsoil to supplement insufficient topsoil on the site shall originate from local sources, but not from bogs or marshes.

### **2.2 SEDIMENT CONTROL FENCE (SILT FENCE)**

- A. Silt Fence shall be in accordance with Section 3886 of the Mn/DOT Specifications.
- B. The geotextile fabric shall be insect, mildew and rot resistant. The geotextile shall be furnished in a wrapping which will protect the fabric from ultraviolet radiation and from abrasion due to shipping. The geotextile fabric shall be kept dry until installed.
- C. The Contractor shall furnish the Engineer at the time of delivery of the geotextile fabric a manufacturer's Certificate of Compliance that the geotextile fabric as furnished meets the above requirements.

### **2.3 STORM DRAIN INLET PROTECTION**

- A. All storm manholes and catch basins shall be protected from sedimentation.

## **PART 3 - EXECUTION**

### **3.1 EROSION CONTROL REQUIREMENTS**

- A. The Contractor shall provide a certified Erosion Control Supervisor to direct the Contractor and subcontractor(s) operations and insure compliance with Federal, State and Local ordinances and regulations.
- B. A certified installer for erosion/sediment control shall be on the Project site to install the practices or direct the installation. Certified installer requirements shall apply to the following operations:
  - 1. Seeding, Sodding, Mulching, Silt fence or other perimeter sediment control device installations, Erosion control blanket installation, Hydraulic Soil Stabilizer installation, Silt curtain installation, Ditch check installation, Inlet protection, Riprap placement, Compost installation, Erosion Stabilization Mat installation
- C. Temporary and permanent erosion control measures shall be performed by the Contractor. The Contractor shall control water pollution, erosion, and siltation through the use of intercepting embankments, berms, dikes, dams, settling basins, slope paving, ditch checks, riprap, mulches, erosion mats, seeding, sodding, plantings and other erosion control devices or methods.
- D. The Contractor shall submit for approval, the plan of operations for accomplishing temporary and permanent erosion control work relating to grubbing, grading, paving and other work which might create erosion unless the requirement therefore is waived by the Engineer. The Plan shall include a schedule of proposed erosion control activities.

- E. The area of land disturbed by grubbing, excavation, borrow and fill operations at any one time shall be subject to the approval of the Engineer and the duration of such exposure prior to final trimming, finishing and seeding or application of temporary erosion control measures shall be as short as practicable.
- F. All exposed soil areas with a continuous positive slope within 200 feet of surface waters, including pond sides slopes, curb and gutter systems, storm sewer inlets, temporary or permanent drainage ditches, or other storm water conveyance systems, shall have temporary erosion protection or permanent cover for the exposed soil areas within the time frame indicated in the SWPPP.
- G. Pipe outlets shall be provided with temporary or permanent energy dissipation within 24 hours of connecting the pipe to a surface water.
- H. The Engineer shall have full authority to suspend or limit grading and other land disturbing operations pending adequate performance of such permanent erosion control measures as finish grading, topsoiling, mulching, matting and seeding and any temporary erosion control measures ordered by the Engineer.
- I. Grubbing and grading operations shall be performed in proper sequence with other work to minimize erosion. Intercepting ditches or dikes shall be constructed as soon as practical after clearing and grubbing operations are completed and prior to or during the operations of excavating the cuts. Where erosion is likely to be a problem, the permanent erosion control measures shall follow immediately after the grading operations if conditions permit, unless the Engineer shall authorize temporary erosion control measures.
- J. Water pumped from the site shall be treated by A "Dirt Bag" or other appropriate controls designed and used to remove total suspended solids (TSS) to 30 mg/l or less for the highest dewatering pumping rate. If the water is demonstrated to contain less than 30 mg/l TSS during dewatering operations, then no treatment is needed before discharge. Water may not be discharged in a manner that causes erosion of the site or receiving channels.
- K. The Contractor shall take all possible precautions to prevent sediment from being tracked onto public or private roadways. Any sediment reaching a public or private road shall be removed by street cleaning (not flushing) before the end of each workday.
- L. All storm drain or culvert inlets shall be protected with sediment control fence, inlet sedimentation protection devices or equivalent barrier approved by the Engineer. Channelized runoff from adjacent areas passing through the site shall be diverted around disturbed areas, if practical.
- M. All disturbed ground left inactive for seven (7) or more days shall be stabilized by seeding or sodding or by mulching or covering, or other equivalent control measure.

### 3.2 CONSTRUCTION OF SEDIMENT CONTROL FENCE (SILT FENCE)

- A. Installation. Silt fence shall be installed according to the manufacturer's recommendations, as shown on the contract drawings, and in accordance with Section 3886 of the Mn/DOT Specifications.



- B. Removal. Silt fences shall be removed by the Contractor as determined by the Engineer, after the slopes and ditches have been stabilized and turf developed to the extent that future erosion is unlikely. Materials remaining after removal shall become the property of the Contractor and shall be disposed as directed by the Engineer.

### 3.3 SEDIMENT REMOVAL

- A. The Contractor is responsible for preventing or minimizing the potential for erosion or siltation after temporary erosion or sediment control work has been performed. The Contractor shall retrieve all sediment that has left the Project site, to the fullest extent possible. Unless the Project has received approval or certification for depositing fill into surface waters, the Contractor shall remove all deltas and sediment deposited in drainage ways or catch basins and restabilize the areas where sediment removal results in exposed soil. The removal and stabilization shall take place within 7 calendar days of discovery unless precluded by legal, regulatory, or physical access restraints. If precluded, removal and stabilization must take place within 7 calendar days of obtaining access. The Contractor is responsible for contacting all local, regional, state, and Federal authorities before working in surface waters and obtaining applicable permits.

### 3.5 INSPECTION AND MAINTENANCE

- A. The Contractor shall inspect the construction site once every 7 days, within 24 hours of any rainfall event greater than ½" during 24 hours and at least daily during periods of prolonged rainfall.
- B. Maintenance shall be performed as follows:
  - 1. Silt fence shall be repaired, replaced or supplemented when they become nonfunctional or sediment reaches 1/3 their height.
  - 2. Sedimentation Basins shall be drained and sediment removed when depth of sediment reaches ½ of the basins storage volume.
- C. Contractor shall keep a written record of all inspection and maintenance activities. Copies of the inspection maintenance records shall be kept on-site during construction.

**SECTION 31 60 00**

**HELICAL PILES**

Refer to notes on plan for requirements.

## **SECTION 32 12 00**

### **ASPHALT PAVING**

#### **PART 1 - GENERAL**

##### **1.1 WORK INCLUDED**

- A. Work includes patching and infilling bituminous surface between bottom stair and existing path. Install bituminous paving in thickness matching existing. Roll and finish to match existing texture and align with walk.
- B. Contractor's Option: In lieu of bituminous paving patching, contractor may install 4" thick exposed aggregate sidewalk over 6" minimum compacted gravel fill. Top surface is to align with existing paving. Edge of paving to remain is to have a straight saw cut abutting slab.

## **SECTION 32 91 00**

### **TOPSOIL**

#### **PART 1 - GENERAL**

##### **1.1 SCOPE OF WORK**

- A. This section includes all labor, material, and equipment necessary for furnishing and placing topsoil borrow over areas to receive seed and sod and planting.

##### **1.2 RELATED WORK**

- A. Sodding and Seeding - Section 32 92 00
- B. Plant Materials - Section 32 93 00

#### **PART 2 - PRODUCTS**

##### **2.1 MATERIALS**

- A. Topsoil Borrow - Conform with MN/DOT Section 3877.24 and shall be modified so that organic matter is 10%, Topsoil Borrow for Class A Topsoil to be used as a turf growing medium. Coordinate furnishing and placing with other operations.
- B. Salvaged materials must be tested and approved by landscape architect prior to placement.

#### **PART 3 - EXECUTION**

##### **3.1 EXAMINATION OF SURFACES**

- A. Before starting any work under this section this contractor shall examine the areas that are to receive his materials and report any deficiencies to the Architect in writing. Examination shall look for any irregular or settled subgrade surfaces, soft spots, or settlements causing unsatisfactory surface drainage. Such deficient areas shall be corrected by the General Contractor before any work begins. Starting of any work by this contractor shall imply his acceptance of the surfaces as suitable to receive his materials.

##### **3.2 INSTALLATION**

- A. Conform with MN/DOT Section 2105, Finishing Operations for placing and finish grading topsoil.
- B. Coordinate furnishing and placing with other operations.
- C. Loosen subgrade soils to a depth of 12 inches where topsoil is placed and inter-mix topsoil borrow with subgrade soils.
- D. After completion of finish grading, place topsoil over entire area. Smooth grade to within 3/4" of finish grade after settlement to eliminate irregularities and to match adjacent pavements and walks. Minimum depth of topsoil shall be 3" settled measure.

## **SECTION 32 92 00**

### **SODDING**

#### **PART 1 - GENERAL**

##### **1.1 WORK INCLUDED**

- A. The work under this section consist of furnishing all labor, materials, equipment, and related services required for all sodding, seeding, and fertilizer where indicated on the drawings and as specified herein.
- B. This contractor shall be responsible for verifying the quantity available and include additional topsoil as required and as specified in Section 32 91 00. Removal of any excess material shall be the responsibility of this contractor.
- C. This work shall include the spreading of existing stockpiled on-site topsoil as directed by Architect and the restoration of all lawn areas disturbed during construction as shown by contract limits on the site plan.
- D. Maintain carefully bench marks, monuments, and other reference points. If disturbed or destroyed, have replaced or relocated by a registered land surveyor at the Contractor's expense.

##### **1.2 RELATED WORK**

- A. Topsoil - Section 32 91 00.

##### **1.3 PROTECTION**

- A. The Contractor shall protect that which is to remain and shall conduct all sodding or seeding operations in a manner that will not damage or jeopardize the surrounding plant life designated on the drawings to remain.

#### **PART 2 - PRODUCTS**

##### **2.1 MATERIALS**

- A. Sod: Sod shall include a maximum of the top 1" of well established cultured sod consisting in the major part of live Kentucky Bluegrass grown on loam soil. Sod shall be free from noxious weeds and relatively free from all other weeds, and free from roots, stones, and other objectionable materials. Sod shall resist normal handling without undue breaking or tearing. Sod shall be cut in uniform strips 18" minimum width and shall be cut to a uniform thickness so a dense root system will be retained but be exposed on the bottom side of the sod. When the sod is cut, it shall be sufficiently moist to withstand exposure and handling during the transplant operations. If necessary, the sod shall be watered before cutting.

Before the sod is cut, it shall be raked free of debris and the top growth shall be trimmed to a height of approximately 1-1/2 inches.

- B. Fertilizer: Fertilizer shall be a commercial formula, containing minor trace elements and conforming to applicable State fertilizer laws. Specific formula is noted elsewhere in these specifications.

- C. Water: Water shall be suitable for irrigation and free from ingredients harmful to plant life. Water shall be provided by the Contractor.
- D. Topsoil: See Section 32 91 00.

### **PART 3 - EXECUTION**

#### **3.1 GROUND PREPARATION**

- A. Areas to be sodded or seeded shall have a 3" layer of topsoil cover as specified and as approved by the Architect, provided by and brought to finish grade by this Contractor. In the event that the topsoil cover has been disturbed or is not of acceptable depth prior to the application of sod or seed, this Contractor shall be required to supplement the topsoil in the area and to bring it up to the specified depth. All areas for sodding and seeding shall be worked by this Contractor until the soil is completely fined and in a mellow condition to smooth, even, finish grade.
- B. All holes, depressions and rivulets shall be filled in to ensure no disruption of established drainage patterns. All rubble, sticks, branches or stones and extraneous material over 1/2" diameter on the surface which will interfere with the sod or seed shall be picked up and removed.
- C. Immediately prior to sodding or seeding, the Contractor shall loosen topsoil to a depth of 3" on all areas except slopes steeper than 2 horizontally to 1 vertically using discs, harrows, tiller rakes to produce fine grade. On slopes steeper than 2:1, use cultivating equipment in general direction at right angles to the direction of surface drainage wherever practical.

#### **3.2 FERTILIZING**

- A. Fertilizer shall be a commercial formula containing at least the minimum analysis of agriform 16-7-12 controlled release fertilizer at rate of 25 lbs. per 1000 sq. ft. (1000 lbs. per acre).
- B. Fertilizer shall be applied to properly prepared soil bed prior to sodding with a mechanical spreader and thoroughly mixed in by means of a meeker harrow, or weighted chain link fence, or other approved method in top 3 inches. Fertilizer must be dry and free flowing when applied.
- C. Fertilizer shall be applied before seeding, but not more than 14 days before seeding. Areas which are not seeded within 14 days after application of fertilizer shall be refertilized before seeding.
- D. Just prior to dormant seeding, apply 0.5 pound actual Nitrogen, natural organic or slow release fertilizer into top 1/2 inch of seed bed.

#### **3.3 SODDING**

- A. Sodding shall be done in conformance with Mn/DOT Section 2575.35

#### **3.4 SODDING**

- A. Precautions shall be taken to prevent sod from drying out and from heating. Sod that shows visible signs of heating shall not be incorporated in the project.

- B. Strips shall be placed tightly against each other so that no open joints are apparent. Joints between ends for strips shall be staggered at least one foot between adjacent rows. Sod shall be placed without stretching.
- C. On slopes, the sodding shall begin at the bottom and progress upward with strips laid transverse to the flow of water. If necessary to protect sod already laid, the Contractor shall furnish ladders or treaded planks for workmen.
- D. At the top of slopes, sod will be laid so water from adjacent areas will have free flow into sodded areas.
- E. No sodding shall be done earlier than August 15 or later than October 15, for fall sodding; or earlier than April 15 nor later than June 1, for spring sodding. Changes in above dates only if directed on the drawings, these specifications, or by Architect.
- F. Sod shall be watered and compressed into the underlying soil by rolling, or tamped into place. The initial wearing and rolling shall provide firm contact and bond between the sod and the underlying soil. The rolling shall result in a smooth even surface free of humps and depressions, but shall not cause excessive compaction.
- G. Keep sod continuously moist and well watered for 14 days after laying. Thereafter, water sod until soil is soaked at least once every 4 days unless natural rainfall has provided equivalent water.

### 3.5 STAKING

- A. Sod placed on slopes steeper than 3:1 shall be staked. Sod shall be staked by driving wood stakes spaced not more than 30" apart at an angle against the flow of the water until the stakes project 1/2" above the sod. The Architect may approve alternative methods for staking sod. Stakes shall be removed at a time when the sod has become re-established.

### 3.6 WATERING AND MOWING

- A. Watering of all turf areas shall be performed by the Contractor as necessary to assure that sodded areas are uniformly moistened and maintained in a moist condition until the project has been approved and responsibility for maintenance accepted by Owner.
- B. Sodded areas shall be mowed to a height of 1-1/2", if the growth exceeds 3" during the construction period, prior to acceptance by the Owner.

### 3.7 ESTABLISHMENT AND REPLACEMENT

- A. Any sod which fails to become established after one (1) month from installation shall be replaced in the following spring at the Contractor's expense and then guaranteed one year from that date.
- B. The Contractor shall water and maintain sodded areas until accepted by the project representative.