Addendum 2
Solicitation 20-08AA
Lake Superior Zoo Brown Bear Exhibit Renovation Phase 2

This addendum serves to notify all bidders of the following changes to the solicitation documents:

1. The bid form for Work Scope 23-A has been revised a second time to separate alternates identified in the bid package. Revised bid form is attached.

2. Please see specification changes in HGA’s addendum 2, also attached.

Please acknowledge receipt of this Addendum by checking the acknowledgment box within the [www.bidexpress.com](http://www.bidexpress.com) solicitation if submitting an electronic bid; or by initialing and dating Addendum 1 below the bid form if submitting a paper bid.

Posted: **February 24, 2020**
BID FORM (SECOND REVISION)
BID #20-08AA
LAKE SUPERIOR ZOO BROWN BEAR EXHIBIT PHASE 2
WORK SCOPE 23-A COMBINED MECHANICAL

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<td>WORK SCOPE 23-A – ALTERNATE 5A – ONE BOILERS &amp; ONE PUMP WITH BEAR LSS</td>
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<td>WORK SCOPE 23-A – ALTERNATE 5B – ONE BOILER &amp; ONE PUMP W OTTER LSS</td>
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TOTAL LUMP SUM BASE PRICE IN WRITING (NOT INCLUDING ALTERNATES)

ACKNOWLEDGMENT OF ADDENDA

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Signature _______________________________________________________  Date  ___________________

Name/Title ______________________________________________________________________________

Company Name ___________________________________________________________________________

Address _________________________________________________________________________________

City, State, Zip _________________________________________________________________________

Tel. ____________________________________  E-Mail _________________________________________

If your organization is certified as a Disadvantaged Business Enterprise, please check here: ☐
ADDENDUM NUMBER 2
Addendum Date: February 20, 2020

Addendum to Contract Documents dated September 26, 2019 entitled:

CITY OF DULUTH
LAKE SUPERIOR ZOO - BROWN BEAR COUNTRY
CONSTRUCTION PACKAGE 2 (CP-2)
DULUTH, MINNESOTA

Hammel, Green and Abrahamson, Inc.
420 North 5th Street, Suite 100, Minneapolis, Minnesota 55401-2338
HGA Commission Number: 3862-002-00

This Addendum forms a part of and modifies previously issued Contract Documents as indicated below or by attachments. Acknowledge receipt of this Addendum in space provided on Bid Form. Failure to do so may subject Bidder to disqualification. Items listed or attached are to be posted to Contract Documents and included in Bids submitted and Work performed. Drawing and Specification references made below are a general guide only. Bidder and Contractor must determine for themselves Work affected by Addendum items.

SPECIFICATIONS

S1 Section Issued:
A. The following Sections are issued and attached as a part of this Addendum:
   1. Section 000110 - Table of Contents - Revised
   2. Section 012300 - Alternates - Revised
   3. Section 170115 - Chopper Pumps - Revised
   4. Section 235216 - Condensing Boilers - Revised

DRAWINGS

G1 Drawings Issued:
A. The following drawings are hereby issued as a part of this Addendum and attached:
   - C001
   - C200
   - C300

G2 Drawing M201:
A. Note associated with existing heat exchanger in LSS EQUIP 100 room.

   B. Add: Existing HWS/R to heat exchanger for LSS. See details on M700 and additional comments on sheet LS0.02. **Installation of heat exchanger shall be included by LSS contractor.**

G3 Drawing M202:
A. Notes associated with boilers: Change **Alternate 1** and **Alternate 2** to be **Alternate 5**.

   B. Existing 5” HWS/R has been previously removed. New 3” piping shall be installed where existing 5” pipe was shown.

ACKNOWLEDGE RECEIPT OF THIS ADDENDUM #2 ON BID FORM
Revised, Addendum No. 2, 02/20/2020

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000115 Schedule of Drawings
001110 Invitation to Bid (City of Duluth)
002100 Instruction to Bidders
004100 Bid Form Online (City of Duluth-Bid Express)
005110 List of Contract Forms (Bid Express)
005200 Agreement Form – AIA Document A132/CMa
007200 General Conditions of the Contract for Construction – AIA A232/CMa
007210 Supplemental General Conditions

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011210 General Requirements for All Work Scopes
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011220 3-A Work Scope for 03-A – Concrete Package
011220 3-B Work Scope for 03-B – Artificial Rockwork (Shotcrete) Package
011220 4-A Work Scope for 04-A – Masonry Package
011220 5-A Work Scope for 05-A – Structural Steel – Material Only Package
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011220 8-A Work Scope for 08-A – Doors, Frames, and Hardware – Material Only Package
011220 8-K Work Scope for 08-K – Glazing Package
011220 10-D Work Scope for 10-D – Special Partitions Package
011220 10-I Work Scope for 10-I – Safety and Fire Protection Package
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011220 13-A Work Scope for 13-A – Animal Enclosures Package
011220 17-A Work Scope for 17-A – Life Support Systems Package
011220 23-A Work Scope for 23-A – Combined Mechanical Package
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011220 31-A Work Scope for 31-A – Earthwork, Exterior Improvements, & Utilities Package
012900 Payment Procedures
012300 Alternates ADD-2
013100 Project Management & Coordination Procedures
013210 Project Schedule Requirements
013253 Project Safety Requirements
013300 Submittal Procedures
013310 Submittal Transmittal
014400 Quality Assurance Procedures
014533.10 Structural Testing and Special Inspections
015010 Temporary Facilities and Controls
016000 Product Requirements
016200 Product Options
016211 Substitution Request Form
017710 Procedures for Project Closeout

DIVISION 02 EXISTING CONDITIONS

024113 Selective Site Demolition

DIVISION 03 CONCRETE

031500 Concrete Accessories
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<td>Masonry Restoration and Cleaning</td>
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<td>Animal Enclosures and Gates (by PJA)</td>
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<td>Life Support System General Provisions</td>
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<td>Static Screen Filters</td>
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<td>Chopper Pumps <em>ADD-2</em></td>
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170126  Close Coupled Metal Pumps
170142  Butterfly Valves
170144  Ball Valves
170148  Diaphragm Valves
170151  Gate Type Valves
170155  Check Valves
170170  Float Actuated Valves
170220  PVC/CPVC Pipe and Fittings
170250  Polyethylene (PE) Pipe and Fittings
170260  Ozone Gas Piping
170270  Flexible Molded Rubber Couplings
170280  Mechanical Pipe Seals
170286  Quick Disconnect Fittings
170288  Eductor Injectors
170310  Pipe Supports
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170360  Basket Strainer
170410  Pressure Gauges
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170442  Magnetic Flow Meters
170456  ORP Monitoring
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220519  Meters and Gages for Plumbing Piping
220523.12  Ball Valves for Plumbing Piping
220523.13  Butterfly Valves for Plumbing Piping
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220529  Hangers and Supports for Plumbing Piping and Equipment
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220719  Plumbing Piping Insulation
221116  Domestic Water Piping
221119  Domestic Water Piping Specialties
221316  Sanitary Waste and Vent Piping
221319  Sanitary Waste Piping Specialties
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230500  Common Work Results For HVAC
230513  Common Motor Requirements For HVAC Equipment
230514  Variable Speed Drives for HVAC Equipment
230517  Sleeves and Sleeve Seals for HVAC Piping
230518  Escutcheons for HVAC Piping
230519  Meters and Gages for HVAC Piping
230523  General-Duty Valves for HVAC Piping
230529  Hangers and Supports for HVAC Piping and Equipment
230533  Heat Tracing for HVAC Piping
230553  Identification for HVAC Piping and Equipment
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<td>HVAC Piping Insulation</td>
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<td>HVAC Gravity Ventilators</td>
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<td>Condensing Boilers</td>
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<td>Indoor, Indirect, Gas-Fired Heating and Ventilating Units</td>
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**DIVISION 24 THROUGH 25**
Not Used

**DIVISION 26 ELECTRICAL**
- 260500 Common Work Results for Electrical
- 260519 Low-Voltage Electrical Power Conductors and Cables
- 260526 Grounding and Bonding for Electrical Systems
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- 260533 Raceways and Boxes for Electrical Systems
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- 260923 Lighting Control Devices
- 262416 Panelboards
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**DIVISION 33 UTILITIES**
- 333500 Sewerage

**APPENDIX**
- Appendix 01 Life Support System Narrative (TJP Engineering)
- Appendix 02 Bear Country Photo References Manual

END OF SECTION
PART 1 GENERAL

1.1 SUMMARY
A. Section Includes: Alternates.

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

1.3 PROCEDURES
A. Refer to Schedule of Alternates at the end of this Section.
1. Alternate descriptions are general only and are not intended to be complete tabulation of Work which may be affected by alternate.
2. Refer to related Drawings and Specifications for detailed requirements for each alternate.
B. Carefully examine Contract Documents and determine extent of Work of each Alternate, including:
1. Alternate-related work as indicated in Contract Documents.
2. Coordination of work of all trades affected by Alternate.
3. Adjustments to or revisions to other work as necessary to completely integrate work of Alternate.
4. Miscellaneous devices, accessories and other items incidental to or required for a complete installation of alternate, whether or not indicated as part of alternate.
C. Submit price for each Alternate listed on Bid Form.
1. State dollar amount to be added to or deducted from Base Bid, or indicate “No Change” in Base Bid sum.
2. Alternate prices shall not increase by change in material prices, wage rates, or other escalatory factors.
3. Alternate prices are all-inclusive, and include labor, materials, supervision, tools, equipment, taxes, overhead and profit.
D. Owner reserves the following Rights:
1. To reject Alternates.
2. To accept Alternates regardless of order or combination.
3. To determine low bidder based on the sum of Base Bid and accepted Alternates.
4. To delay decisions on Alternates and to accept or reject Alternates within 60 days after bid date, unless longer Alternate time frames are indicated.
E. Notification: Immediately following award of Contract, notify each party involved, in writing, of status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration.
1. Include complete description of negotiated modifications to alternates, if applicable.
F. Execution: Execute accepted alternates under the same conditions as other Work of the Contract.
1. In executing Base Bid Work, make provisions for future completion of alternates where indicated in the Contract Documents.
1.4 SCHEDULE OF ALTERNATES

A. Alternate No.1: Bear LSS
   1. Base bid to include below grade piping.
   2. Alternate to include LSS equipment, electrical connections, mechanical connections, equipment pads, concrete tank, structural supports, above-ground piping connections, aluminum access ladder and galvanized guardrails at top of balance tank.

B. Alternate No.2: Otter LSS
   1. Alternate to include LSS equipment, electrical connections, mechanical connections, equipment pads, structural supports, above-ground piping connections.

C. Alternate No. 3: Bear Ozone System
   1. Alternate to include LSS equipment, electrical connections, mechanical connections, equipment pads, structural supports, above-ground piping connections.

D. Alternate No. 4: Otter Ozone System
   1. Alternate to include LSS equipment, electrical connections, mechanical connections, equipment pads, structural supports, above-ground piping connections.

E. Alternate No. 5: LSS Boilers and Pumps
   1. Alternate to include two (2) boilers and Pumps. **Alternate 5a:** Include one boiler and one pump associated with the Bear LSS system **ADD-2**
   2. **Alternate 5b:** Include one boiler and one pump associated with the Otter LSS system **ADD-2**

F. Alternate No. 6: Creek Shotcrete
   1. Alternate to include creek extension from pond to waterfall.

G. Alternate No. 7: Waterfall Shotcrete
   1. Alternate to include rockwork associated with waterfall.

H. Alternate No. 8: New Storm Sewer Connection
   1. Provide all new storm sewer pipe storm sewer structures, hydrodynamic separator and storm sewer outlet at creek.

PART 2 PRODUCTS
Not Used

PART 3 EXECUTION
Not Used

END OF SECTION
SECTION 170115
CHOPPER PUMPS

Revised, Addendum No. 2, 02/20/2020

PART 1 - GENERAL

1.1 SUMMARY
   A. Pump capacity, horsepower, TDH (Total Dynamic Head), speed, minimum efficiency, suction and discharge diameters, type, and other requirements shall be as shown on the drawings. The General Conditions shall apply to this Section as fully as if repeated herein.

   B. Applies to Brown Bear Static Screen pumps. Used for pumping unfiltered water from Brown Bear Exhibit containing uneaten food, feces, and other large debris.

1.2 COORDINATION
   A. LSS Equipment shall be broken out in bid by contractor as appropriate "Add Alternate" package as identified on the Equipment Schedules.

   B. Coordinate with Electrical: The Contractor is responsible to fully coordinate pump motor sizing with the electrical power supply. Coordinate power wiring from motor starter, to junction box on pump motor, with Electrical Division of the Project Manual and Electrical Code requirements. See Electrical documents for motor starter specification and power supply wiring.

1.3 SUBMITTALS
   A. Submit shop drawings and product data in accordance with Division 1. Submittals shall include a complete pump description plus material list including casings, impellers, seals, shaft, hardware, baseplate, exterior coatings, and the following items:
      1. Dimensional drawings of each item, including equipment weights and location and size of anchor bolts.
      2. Literature and drawings describing the pump and motor, including parts list and materials of construction, in sufficient detail to indicate full conformance with the detail specifications.
      4. Manufacturer's certified rating curves, to satisfy the specified design conditions, showing pump characteristics of discharge, pressure head, brake horsepower, efficiency and net positive suction head required (NPSHr).

   B. Installation Instructions and Operating and Maintenance Manuals shall include recommended protection and maintenance required for storage prior to putting pumps in service, and may be submitted anytime before shipment of the pumps.

   C. Submit warranty covering or exceeding requirements given below.

1.4 WARRANTY
   A. Pump equipment Manufacturer shall warrant and guarantee all equipment furnished to be free from defect in materials for a minimum of 1-year from the date of startup of the complete system, or 18-months from the date of shipment, whichever date occurs first. Manufacturer's warranty shall not relieve the Contractor from furnishing a complete system warranty as specified in the General Conditions.
1.5 MAINTENANCE AND OPERATIONAL DATA

A. Include pertinent information in the project bound Operations & Maintenance Data Manual per requirements in Sectional 170010.

PART 2 - PRODUCTS

2.1 FRAME-MOUNTED CLOSE COUPLED HORIZONTAL CHOPPER PUMPS  ADD-2

A. Type: Horizontal frame-mounted close coupled centrifugal alloy chopper pump with a spacer type coupling.

B. Pump Design: Shall be designed for cutting and pumping and built of abrasion and corrosion resistant materials. Alloy casing with integral cast foot mount and back pull-out design. Shall include a hardened intake plate with profiled cutter bars acting against sharpened rotating impeller blades. Shall include a disintegrator cutting prop in front of the intake plate at the entry into the pump. The impeller shall be an open two-vane type manufactured for cutting and pumping.  ADD-2

C. Connections: Shall have 125/150 Class flange connections.

D. Pump Materials: Specific components shall be of the following:
   1. Pump casing: Ductile Iron or Cast Iron.
   2. Intake Cutting Plate: ASTM A148 Hardened Steel
   3. Pump impeller: ASTM A148 Hardened Steel
   5. Bearing Housing: Ductile Iron or Cast Iron
   6. Hardware: Steel or Stainless Steel.

E. Seals: The pump supplier shall take full responsibility for proper installation and selection for application of all seals. Selected mechanical seals shall not require a separate fresh water flush.

F. Motor: Motor shall be totally enclosed and fan cooled (TEFC).
   1. Motor Sizing: Fixed-speed motors shall be non-overload throughout the operational range of the pump curve. Pump supplier shall verify scheduled horsepower meets above requirements and in no case shall the horsepower be less than indicated on the Drawings without specific approval from the Engineer.
   2. Power: Electrical requirements including phase, frequency, and voltage shall be as indicated on the Drawings. Motors shall have minimum 1.15 service factor.
   3. Motor Efficiencies: Motors shall be either “High Efficiency” or “Premium Efficient.”

G. Base Mount: Single mount for pump casing and motor, of steel, cast iron or ductile iron, with a superior corrosion resistant coating.

H. Exterior Coating: All external metal parts, except stainless steel, shall be protected with the motor manufacturer’s recommended coating system for superior corrosion resistance.

I. Pump Manufacturers:
   1. Hayward Gordon, Georgetown, ON, Canada
   2. USA Supplier: Contact Pat Lipinski, at Mellema Engineering; http://www.mellema.com/contact.php
   3. Approved substitute.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Pumps shall be installed in accordance with the Manufacturer’s instructions.
B. Safety: Be aware that the un-installed pump has very sharp edges and use caution.

C. Mounting: Install a concrete house-keeping pad using structural concrete per the Structural specifications. Mount the pump/motor combination securely using Type 304 stainless steel threaded anchors and nuts with SS washers.

D. Pump Discharge Connections: The drawings show suction and discharge sizes for the pumps. Increasers or reducers, as may be required at the pump inlet and/or outlet port, and shall be provided by the installing Contractor. All increasers on the discharge side of pumps shall be FRP gradual reducers by Conley Composites www.conleyfrp.com, or equal, and substitution with bushing fittings is not acceptable.

E. Where "reducing" type flex couplings are indicated at the pump suction, "straight" type couplings shall not be substituted. See specification Section 170270.

F. Piping Alignment: Inlet and outlet piping must be in alignment with pump nozzles prior to fastening and not re-aligned by bolting to pump.

G. Baseplate Grout: Align and anchor the pump prior to installation of baseplate grout that may be recommended by the manufacture of the delivered pump.

H. Do not install valves directly on pump discharge flanges.

I. Start-up pumps in accordance with manufacturer’s recommendations. Pumps must be flooded or primed with water prior to starting. Open the inlet valve. Close, or partially close, the discharge valve; then open discharge valve slowly soon after starting the pump.

J. Technical Seminar: At completion of the installation, the contractor shall make arrangements for technical seminar by the pump factory representative to the owner’s staff. The seminar shall include instruction on pumping operations, seal replacement, shaft alignment, lubrication, preventative maintenance, and other routine maintenance requirements.

END OF SECTION
SECTION 235216
CONDENSING BOILERS

Revised, Addendum No. 2, 02/20/2020

PART 1 GENERAL

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

1.2 SUMMARY
   A. Section includes packaged, factory-fabricated and -assembled, gas-fired, pulse-combustion fire-tube water-tube condensing boilers, trim, and accessories for generating hot water.

1.3 ACTION SUBMITTALS
   A. Product Data: For each type of product
      1. Include construction details, material descriptions, dimensions of individual components and profiles and finishes for boilers.
      2. Include performance data, rated capacities, operating characteristics, and furnished specialties and accessories.
      3. Efficiency Curves: Submit efficiency curves for 100%, 60%, and 5% input firing rates at incoming water temperatures ranging from 60°F to 160°F
      4. Pressure Drop Curve: Submit pressure drop curve for flows ranging from 0 GPM to maximum value of boiler.
   B. Shop Drawings: For boilers, boiler trim, and accessories:
      1. Include plans, elevations, sections, details, and attachments to other work.
      2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components and location and size of each field connections.
      3. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS
   A. Source quality-control reports.
   B. Field quality-control reports.
   C. Warranty: Special warranty specified in this Section.

1.5 CLOSEOUT SUBMITTALS
   A. Operation and Maintenance Data: For boilers to include in emergency, operation, and maintenance manuals.

1.6 COORDINATION
   A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.
   B. Coordinate size and location of electrical connections.
   C. Coordinate building automation system (BAS) interface.

1.7 WARRANTY
   A. Manufacturer’s Warranty: Manufacturer’s agrees to repair or replace components of boilers that fail in materials or workmanship within specified warranty period.
      1. Warranty Period for Pulse-Combustion Boilers:
a. Heat Exchanger Damaged by Thermal Shock: 10 years from date of Substantial Completion.
b. Heat-Exchanger Corrosion: Non-prorated for five years from date of Substantial Completion.

2. Warranty Period for Fire-Tube Condensing Boilers:
a. Leakage and Materials: 10 years from date of Substantial Completion.
b. Heat Exchanger Damaged by Thermal Stress and Corrosion: Non-prorated for five years from date of Substantial Completion.

3. Warranty Period for Water-Tube Condensing Boilers: 20 years from date of Substantial Completion.

4. Warranty Period for Water-Jacketed Condensing Boilers:
a. Leakage and Materials: Eight years from date of Substantial Completion.
b. Heat Exchanger Damaged by Thermal Stress and Corrosion: Non-prorated for five years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS
A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. ASME Compliance: Fabricate and label boilers to comply with ASME Boiler and Pressure Vessel Code.

C. ASHRAE/IESNA 90.1 Compliance: Boilers shall have minimum efficiency according to "Gas and Oil Fired Boilers - Minimum Efficiency Requirements."


E. UL Compliance: Test boilers for compliance with UL 795, "Commercial-Industrial Gas Heating Equipment." Boilers shall be listed and labeled by a testing agency acceptable to authorities having jurisdiction.

2.2 FIRE-TUBE CONDENSING BOILERS
A. Manufacturers: Subject to compliance with requirements provide products by one of the following:
   1. AERCO International. (www.aerco.com)
   2. Bosch Thermotechnology Corp. (www.boschthermotechnology.com)
   3. Heat Transfer Products, Inc. (www.htproducts.com)
   4. Lockinvar FTXL ADD-2

B. Description: Factory-fabricated, -assembled, and -tested, fire-tube condensing boiler with heat exchanger sealed pressure tight, built on a steel base; including insulated jacket; flue-gas vent; combustion-air intake connections; water supply, return, and condensate drain connections; and controls. Water heating service only.

C. Heat Exchanger: The heat exchanger shall be constructed of 316L stainless steel fire tubes and tube sheets, with a one-pass combustion gas flow design. The fire tubes shall be 5/8” OD, with no less than 0.065” wall thickness. The upper and lower stainless steel tube sheet shall be no less than 0.375” thick. The pressure vessel/heat exchanger shall be welded construction. The heat exchanger shall be ASME stamped for a working pressure not less than 160 psig. Access to the tube sheets and heat exchanger shall be available by burner and exhaust manifold removal. Minimum access opening shall be no less than 10-inch diameter

D. Pressure Vessel: Carbon steel with welded heads and tube connections.

E. Burner: The boiler burner shall be capable of a 20-to-1 turndown ratio of the firing rate without loss of combustion efficiency or staging of gas valves.
   1. Natural gas, forced draft.
F. Blower: Variable speed centrifugal fan to operate during each burner firing sequence and to pre-purge and post-purge the combustion chamber.

1. Motors: Comply with requirements specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
   a. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

G. Gas Train: Combination gas valve with manual shutoff and pressure regulator.

H. Ignition: Spark ignition with 100 percent main-valve shutoff with electronic flame supervision.

I. Casing:
   1. Jacket: Sheet metal with snap-in or interlocking closures.
   2. Control Compartment Enclosures: NEMA 250, Type 1A.
   3. Finish: Baked-enamel or Powder-coated protective finish.
   4. Insulation: Minimum 2-inch-thick, mineral-fiber or polyurethane-foam insulation surrounding the heat exchanger.

J. Characteristics and Capacities:
   1. Refer to condensing boiler schedule on drawings for characteristics and capacities.

2.3 WATER-TUBE CONDENSING BOILERS

A. Manufacturers: Subject to compliance with requirements provide products by one of the following:
   2. Lochinvar Corporation. (www.lochinvar.com)
   3. Harsco Paterson-Kelly (www.harsco.com)

B. Description: Factory-fabricated, -assembled, and -tested, water-tube condensing boiler with heat exchanger sealed pressure tight, built on a steel base; including insulated jacket; flue-gas vent; combustion-air intake connections; water supply, return, and condensate drain connections; and controls. Water heating service only.


D. Combustion Chamber: Stainless steel, sealed.

E. Burner: 5:1 turndown Natural gas, forced draft drawing from gas premixing valve.

F. System shall be designed to operate between 80 and 130 degree return water to maximize condensing boiler efficiency

G. Burner shall automatically compensate for pressure/temperature changes of the intake combustion air.

H. Variable Speed Blower: Centrifugal fan to pre-purge and post-purge the combustion chamber. Fan shall operate at a predetermined speed based on the burner firing rate to maintain stoichiometric O₂ levels at 5% and CO₂ at 9% at both high and low fire. Output signal shall be available to control a variable speed primary pump to effectively increase the system delta T to maintain a return water temperature conducive to condensing flue gases.
   1. Motors: Comply with requirements specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
      a. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

I. Gas Train: Combination gas valve with manual shutoff and pressure regulator, FM approved.

J. Ignition: Silicone carbide hot-surface ignition that includes flame safety supervision and 100 percent main-valve shutoff.

K. Integral Circulator: Cast-iron body and stainless-steel impeller sized for minimum flow required in heat exchanger.
L. Casing:
1. Jacket: Sheet metal, with snap-in or interlocking closures.
2. Control Compartment Enclosures: NEMA 250, Type 1A.
4. Insulation: Minimum 2-inch-thick, mineral-fiber insulation surrounding the heat exchanger.

M. Characteristics and Capacities:
1. Refer to condensing boiler schedule on drawings for characteristics and capacities.
2. Boilers shall be AHRI BTS-2000 certified for efficiencies of 95% at 100°F return water temperature and a 40°F delta T.

2.4 TRIM
A. Aquastat Controllers: Operating, firing rate, and high limit.
B. Safety Relief Valve: ASME rated.
C. Pressure and Temperature Gage: Minimum 3-1/2-inch- diameter, combination water-pressure and -temperature gage. Gages shall have operating-pressure and -temperature ranges so normal operating range is about 50 percent of full range.
D. Exhaust Air and Outside Air Temperature Sensor: Mounted in field by Contractor
F. Provide an integral low pressure drop air intake check valve for positive backdraft prevention.

2.5 CONTROLS
A. Boiler operating controls shall include the following devices and features:
   1. Control transformer.
   2. Set-Point Adjust: Set points shall be adjustable.
   3. Sequence of Operation: Electric, factory-fabricated and field-installed panel to control burner firing rate to reset supply-water temperature inversely with outside-air temperature. At -20 deg F outside-air temperature, set supply-water temperature at 130 deg F; at 60 deg F outside-air temperature, set supply-water temperature at 100 deg F.
      a. Include automatic, alternating-firing sequence for multiple boilers to ensure maximum system efficiency throughout the load range and provide equal runtime for boilers.
      b. Provide a PC based interface for programming and monitoring all boiler functions.
      c. A comprehensive history of the operating parameters including supply and return water temperatures shall be available at the unit controller.
B. Burner Operating Controls: To maintain safe operating conditions, burner safety controls limit burner operation.
   1. High Cutoff: Manual reset stops burner if operating conditions rise above maximum boiler design temperature.
   2. Low-Water Cutoff Switch: Electronic probe shall prevent burner operation on low water. Cutoff switch shall be manual-reset type.
   4. Audible Alarm: Factory mounted on control panel with silence switch; shall sound alarm for above conditions.
C. Building Automation System Interface: Factory install hardware and software to enable building automation system to monitor, control, and display boiler status and alarms.
   1. A communication interface with building automation system shall enable building automation system operator to remotely control and monitor the boiler from an operator workstation. Control features available, and monitoring points displayed, locally at boiler control panel shall be available through building automation system.
2.6 ELECTRICAL POWER
A. Single-Point Field Power Connection: Factory-installed and -wired switches, motor controllers, transformers, and other electrical devices necessary shall provide a single-point field power connection to boiler.
   1. House in NEMA 250, Type 1 enclosure.
   2. Wiring shall be numbered and color-coded to match wiring diagram.
   3. Install factory wiring outside of an enclosure in a metal raceway.
   4. Field power interface shall be to nonfused disconnect switch.
   5. Provide branch power circuit to each motor and to controls with a disconnect switch.
   6. Provide each motor with overcurrent protection.

2.7 VENTING
A. The exhaust vent must be UL Listed for use with Category III and IV appliances and compatible with operating temperatures up to 480°F, positive pressure, condensing flue gas service. UL-listed vents of Al 29-4C stainless steel must be used with boilers.
B. Combustion-Air Intake: Boilers shall be capable of drawing combustion air from the outdoors via a metal or PVC duct connected between the boiler and the outdoors.

2.8 ACCESSORIES
A. Condensate neutralizing kit: Provide each boiler with dedicated neutralizing kit sized for respective boiler BTUH input capacity.
   B. PVC tubing filled with ½ in. – ¾ in. calcium carbonate for neutralizing boiler flue gas condensate before draining into sanitary sewer system.
      1. PVC tubes to include end caps with barbed inlet and outlet hose connections and plastic Unistrut floor mounting brackets with steel clamps.
      2. Manufacturer: JJM Boiler works, Inc. JM Series or equal.

2.9 SOURCE QUALITY CONTROL
A. Burner and Hydrostatic Test: Factory adjust burner to eliminate excess oxygen, carbon dioxide, oxides of nitrogen emissions, and carbon monoxide in flue gas and to achieve combustion efficiency; perform hydrostatic test.
B. Test and inspect factory-assembled boilers, before shipping, according to ASME Boiler and Pressure Vessel Code.

PART 3 EXECUTION

3.1 EXAMINATION
A. Before boiler installation, examine roughing-in for concrete equipment bases, anchor-bolt sizes and locations, and piping and electrical connections to verify actual locations, sizes, and other conditions affecting boiler performance, maintenance, and operations.
   1. Final boiler locations indicated on Drawings are approximate. Determine exact locations before roughing-in for piping and electrical connections.
B. Examine mechanical spaces for suitable conditions where boilers will be installed.
C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 BOILER INSTALLATION
A. Equipment Mounting:
   1. Install boilers level on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in Division 3 Section "Cast-in-Place Concrete." and "Miscellaneous Cast-in Place Concrete"
B. Install boilers, trim, controls, and vents according to the boiler manufacturer's installation instructions.

C. Install gas-fired boilers according to NFPA 54.

D. Assemble and install boiler trim.

E. Install electrical devices furnished with boiler but not specified to be factory mounted.

F. Install control wiring to field-mounted electrical devices.

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to boiler to allow service and maintenance.

C. Install piping from equipment drain connection to nearest floor drain. Piping shall be at least full size of connection. Provide an isolation valve if required.

D. Connect piping to boilers, except safety relief valve connections, with flexible connectors of materials suitable for service. Flexible connectors and their installation are specified in Section 232116 Hydronic Piping Specialties.

E. Connect gas piping to boiler gas-train inlet with union. Piping shall be at least full size of gas train connection. Provide a reducer if required.

F. Connect hot-water piping to supply- and return-boiler tappings with shutoff valve and union or flange at each connection.

G. Connect condensate drain hose to boiler and neutralizing kit terminating drain hose at nearest floor drain.

H. Install thermometers on the supply and return water pipes near the boiler connections.

I. Install piping from safety relief valves to nearest floor drain.

J. Boiler Venting:
   1. Install flue venting kit and combustion-air intake.
   2. Connect full size to boiler connections. Comply with requirements in Section 235123 "Gas Vents."

K. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

L. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

C. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
   1. Perform installation and startup checks according to manufacturer's written instructions.
   2. Leak Test: Hydrostatic test. Repair leaks and retest until no leaks exist.
   3. Operational Test: Start units to confirm proper motor rotation and unit operation. Adjust air-fuel ratio and combustion.
   4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
      a. Check and adjust initial operating set points and high- and low-limit safety set points of fuel supply, water level and water temperature.
      b. Set field-adjustable switches and circuit-breaker trip ranges as indicated.

D. Remove and replace malfunctioning units and retest as specified above.
E. Prepare test and inspection reports.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain boilers. Refer to Section 017900 "Demonstration and Training."

END OF SECTION
GENERAL CIVIL NOTES:

PREPARATION & RESTORATION
1. All temporary excavation facilities for the drainage area must be based on the roadway, location, topography, utility safety, and existing utility boundaries provided by public and private utilities.
2. Contractor must provide a list of all required permits from city, state, and other regulatory agencies.
3. Utilize the state one call system 811 at least 48 hours prior to performing any operations that could damage utility pipelines. Provide documented evidence of one call calls on site.
4. Notify the landowner of all locations where utility lines are located. "A" points are located by locating the utility by the landowner or the utility owner. "B" points are located by the landowner or the utility owner.
5. Prior to construction, all temporary excavation facilities, including location and location of utilities that may be impacted or damaged by construction, repair, and/or relocations of facilities.
6. All permits to the drainage area shall be approved prior to construction.
7. Preparing the drain to the pipe, brick, or other materials required for construction. All storm water systems are required to comply with the appropriate permits.
8. Provide temporary utility service with temporary utility service where necessary.
9. Temporary water service should be kept connected and in place prior to the establishment of permanent water service.
10. All temporary utility service shall be installed and maintained in a manner that will not interfere with the runway during construction.
11. Provided with temporary utility service with temporary utility service where necessary.
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KEY NOTES

1. PROTECT EXISTING FEATURES
2. SEE SHEET EX-001 & EX-002 FOR REMOVAL LIMITS
3. REMOVE ALL PIPE AND APPURTENANCES WITHIN THE BEAR COUNTRY EXHIBIT THAT ARE NO LONGER REQUIRED FOR OPERATION OF THE RESTORED EXHIBIT.
4. REMOVE DRAIN GRATE
5. SEE SHEET EX-001 FOR DEMOLITION WITHIN OTTER EXHIBIT.
6. SEE CP#1: DEMO AND BUILDING PREP ARCHITECTURAL DRAWINGS A100-A102 FOR DEMOLITION WITHIN HOLDING BUILDING.
7. ABANDON EXISTING PIPE DOWNSTREAM OF NEW PIPE - SEE SHEET C500.
8. SEE STRUCTURAL FOUNDATION PLAN S200
9. PROTECT PLANTS ON SHOTCRETE SURFACE

NOTES:

1. SEE SHEET C001 FOR CIVIL NOTES AND LEGEND.
2. SEE SHEET EX-001 & EX-002 FOR ADDITIONAL SITE DEMOLITION REQUIREMENTS.
3. SEE CP#1: DEMO AND BUILDING PREPARATION FOR ADDITIONAL INFORMATION ON EXISTING CONDITIONS.

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EXISTING HOLDING BUILDING

BEAR COUNTRY

OTTER EXHIBIT

BEAR POOL

SCALE            IN            FEET

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KEY NOTES

1. SEE SHEET C001 FOR CIVIL NOTES AND LEGEND.

2. SEE SHEET EX-101 SITE PLAN, EX-102 ENLARGED SITE PLANS, EX-110 SHOTCRETE PLAN AND EX-301 AND EX-303 SITE SECTIONS FOR ADDITIONAL INFORMATION.

HGA NO:

DATE:

ARCHITECT

STRUCTURAL ENGINEER

MECHANICAL/ELECTRICAL/ PLUMBING ENGINEER

CIVIL ENGINEER

LANDSCAPE ARCHITECT

ZOO ARCHITECT

LIFE SAFETY SYSTEM ENGINEER

CITY OF DULUTH

LAKE SUPERIOR ZOO

BROWN BEAR COUNTRY

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ISSUANCE HISTORY - THIS SHEET

FEBRUARY 4, 2020

3862-002-00

KENNETH W. HORNS

I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA

NAME:

DATE:

REGISTRATION NUMBER:

FEBRUARY 4, 2020

CP#2 CONSTRUCTION DOCUMENTS

C300

SITE LAYOUT AND SURFACING PLAN