



ADDENDUM 3

project Lake Superior Zoo Black Bear Exhibit
project # 019001.00
date August 7, 2019
from Tiersa Wodash, DSGW Architects
to All planholders for above project

The following addendum shall become part of the construction documents for the construction of the above referenced project.
This addendum supersedes and supplements all previous reference to similar items.

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

Signature

Registration #

21068

Date

August 7, 2019

specifications

SECTION
03 30 00

DESCRIPTION

CAST-IN-PLACE CONCRETE

1. 1.02.B: ADD the following after:
C. Section 13 15 00 – Water Feature: Shotcrete and related.

13 15 00

WATER FEATURE

1. OMIT this section as originally issued & revised by previous addenda, and
REPLACE with REVISED Section 13 15 00 as included with this addendum.

Enclosures - Spec. Section 13 15 00 – Water Feature - Revised (8 pages)

This addendum shall become part of this bid. The bidder shall insert the addendum number in the space where indicated on the proposal form. Failure to comply may result in the bid being rejected.

END OF ADDENDUM THREE (3)

SECTION 13 15 00

WATER FEATURE - REVISED

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Shotcrete concrete rockwork, water feature, and accessories.
- B. Mechanical life support system equipment, by others.
- C. Design intent is to match that of existing appearance.

1.02 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete: Shotcrete and related.
- B. Other related work: Mechanical: Piping, specialties, drains, valves, fittings other plumbing systems, etc.
 - 1. Landscaping
 - 2. Electrical power to Equipment Room
 - 3. Water Supply to Equipment Room
 - 4. Storm Drains and Sanitary Sewer lines to equipment spaces
 - 5. Other Civil, Mechanical and Electrical work on the project.

1.03 REFERENCE STANDARDS

- A. Minnesota State Building Code, 2015 Edition
- B. Manual of Steel Construction, AISC, 8th Edition
- C. National Electrical Code, current edition
- D. Manual of Standard Practice, Concrete Reinforcing Institute
- E. American Concrete Institute ACI 301, 302 and 318
- F. Applicable Federal, State and local Safety Codes, Ordinances and Orders
- G. ASTM A 312 - Specification for Seamless and Welded Austenitic Stainless Steel Pipe
- H. ASTM B 88 - Specification for Seamless Copper Water Tube

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene one week before starting work of this section.
- B. Project Conditions: Cold-Weather Shotcrete: Protect shotcrete work from physical damage or reduced strength caused by frost, freezing, or low temperatures according to ACI 306. 1 and as follows:
 - 1. Discontinue shotcreting when ambient temperature is 40°F (4.4°C) and falling. Uniformly heat water and aggregates before mixing to obtain a shotcrete shooting temperature of not less than 50°F (10°C) and not more than 90°F (32°C).
 - 2. Do not use frozen materials or materials containing ice or snow.
 - 3. Do not place shotcrete on frozen surfaces, or surfaces containing frozen materials.
 - 4. Do not use calcium chloride, salt or other materials containing antifreeze agents.
- C. Hot-Weather shotcreting: Mix, place, and protect shotcrete according to ACI 305R when hot-weather conditions and high temperatures would seriously impair quality and strength of shotcrete, and as follows:
 - 1. Cool ingredients before mixing to maintain shotcrete temperature at time of placement below 100°F (38°C) for dry mix or 90°F (32°C) for wet mix.
 - 2. Reduce temperature of reinforcing steel and receiving surfaces below 100°F (38°C) before shotcreting.
- D. Coordinate work with related sub-contractors.
- E. The Plans, Specifications and other contract documents shall govern the Work. The Plans and Specifications and other contract documents are intended to be complementary to describe and provide for a complete project.

- F. In submitting a proposal for this project, the bidder is required to visit the project and examine the site of the work to fully understand the scope of work, the materials, labor and workmanship required and the conditions under which they will be provided.
All special conditions set forth in the bidding documents shall be a part of these Specifications.
- H. Before entering into a contract for execution of the work, the Contractor shall verify all quantities, dimensions and shall, upon discovering any error or omission or discrepancies between the Plans, Specifications and actual conditions, immediately call it to the attention of the Owner and Architect. No work shall be done where there is a discrepancy until approval has been given by the Owner and the Architect.
- I. The Owner shall, at the request of the Contractor, provide plans or field staking locating existing lines and underground utilities. Before excavating, the Contractor shall verify the location of cables, conduits, pipes, sewers and other underground utilities and shall take proper precautions to avoid damage to such utilities. In the event of a conflict or discrepancies, the Contractor shall promptly notify the Owner and request for necessary relocation. Failure to follow this procedure places upon the Contractor the responsibility of making any and all repairs for damages of any kind at his expense.
- J. The Contractor shall provide necessary safeguards and exercise caution against damage to existing site improvements. The Contractor shall be responsible for any damage resulting from his operations and shall repair or replace such damage at his own expense.
- K. The Contractor shall furnish and install a complete Water Feature systems as described in the scope of work. All work shall be in strict accordance with Plans, Specifications and existing codes and regulations.
- L. Soils reports, Architectural, Structural, Civil, Mechanical and Electrical Plans, and other documents have been prepared for this project. By reference, these project documents are made a part of these specifications. Copies of the plans and reports are available for inspection, coordinate with General Contractor.
- M. Contractor's Qualifications: The Contractor and his field supervisor assigned to this project shall have the minimum qualifications of having successfully completed five Water Feature projects of equal or greater scope than this project. The Contractor shall submit a reference list of Landscape Architects/Engineers, Owners, etc., with a brief description of the work involved.
- N. Terminology: "Water Feature" or "Water Feature Systems": the Water Feature for which the Work has to be done, modification of the water feature will ensue.
- O. Design is based on rough suggestions/recommendations. Final design shall be drawn by the water feature shotcrete and mechanical designer and submitted to Architect as a shop drawing to be approved. This section of work is administratively design-build.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on accessories, and water feature information.
- C. Shop Drawings: Indicate layout.
 - 1. Indicate planning: Include layout, details, and seal and signature of design professional responsible for design.
 - 2. Design shall match existing conditions of shotcrete/natural rock. Coordinate with field conditions and Architect.
- D. Manufacturer's Installation Instructions: Indicate special installation procedures.
- E. Designer's Qualification Statement.
- F. Manufacturer's Qualification Statement.
- G. Installer's Qualification Statement.
- H. Operation Data: Provide operating instructions, and related information.
- I. Maintenance Data: Provide maintenance instructions, maintenance schedules, and related information.

1.06 QUALITY ASSURANCE

- A. Designer Qualifications: Design components under direct supervision of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located. Contractor for this specialty work will need to be approved by Architect prior to bidding. The final

design will be submitted for approval to the architect and owner prior to commencing construction including design and construction drawings and specification.

- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this Section with minimum ten years documented experience.
- C. Installer Qualifications: Company specializing in performing work of the type specified and with at least ten years of documented experience.

1.07 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Shotcrete:
 - 1. Cost of Wisconsin: www.costofwisconsin.com
 - 2. Cemrock Landscapes, Inc: www.cemrock.com
 - 3. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Life Support System:
 - 1. Longhorn Organics: www.longhornorganics.com
 - 2. Aquatic Exhibits International: www.aquaticexhibitsintl.com
 - 3. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 REGULATORY REQUIREMENTS / PERFORMANCE REQUIREMENTS

- A. Comply with applicable codes for pools and associated equipment.
- B. Waterfall from existing rockwork, base pond, stream and termination pond shall be constructed to match existing conditions.
 - 1. Depth of base pond to be minimum of 12" from the scupper.
- C. Circulation system by the Water Feature Contractor.
 - 1. Circulating system only (no filtration). Water supply is existing.
 - 2. Contractor shall supply machinery including but not limited to: pumps, circulation system, etc. Goal is to resemble a natural flow waterfall and stream system suitable for black bears.
 - 3. Contractor shall include means for ability to drain system to sanitary line (provided by others).
 - 4. Design system to be seasonal, shut off and drained during the cold season.
- D. Materials for construction. Intent is to create a waterfall and stream that simulates natural bear habitat in the northwoods of Minnesota, Wisconsin, Michigan. Water feature is seasonal, all exposed surfaces to be finished like rockwork.
 - 1. Waterproof membrane
 - 2. Reinforcing
 - 3. Shotcrete
 - 4. Natural Rock boulders and rock imbedded into the ground or shotcrete for effect.

2.03 MATERIALS

- A. Spray-Applied Shotcrete Concrete and Reinforcement.
- B. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.
- C. Supports: Bolsters, chairs, spacers, ties, and other devices for spacing, supporting, and fastening reinforcing steel in place according to CRSI's "Manual of Standard Practice" and as follows:
 - 1. For uncoated reinforcement use all-plastic or CRSI Class I. Plastic-protected bar supports.
- D. Reinforcing Anchors. ASTM A 36/A 36M, unleaded rods or ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6), hex-head bolts; carbon steel, and carbon-steel nuts.
 - 1. Finish: Plain, uncoated.
- E. Portland Cement: ASTM C 150, Type I or 111. Use only one brand and type of cement for Project.
- F. Normal-Weight Aggregates: ASTM C 33, from a single source, and as follows:

1. Aggregate Gradation: ACI 506R, Gradation No. 2 with 100 percent passing 1/2-inch (13 - mm) sieve.
2. Coarse-Aggregate Class: 35.
- G. Water: Potable, complying with ASTM C 94/C 94M, free from deleterious materials that may affect color stability, setting, of strength of shotcrete.
- H. Ground Wire: High-strength steel wire, 0.8 to 1 mm in diameter.
- I. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf. Weighing Approximately 9oz./sq. yd. (505 g/sq. m.) dry
- J. Moisture-Retaining Cover: ASTM C 1 71, polyethylene film or white burlap-polyethylene sheet.
- K. Water: Potable.
- L. Clear, waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type I, Class B.
- M. Latex Bonding Agent: ASTM C I 059/C I 059L1. Type II.
 1. Products: Subject to compliance with requirements. Available products that may be incorporated into the Work include, but are not limited to, the following;
 - a. Latex Bonding Agent, Type 11 (Non-R dispersible):
 - 1) Dayton Superior Corporation; Conspec Strone Bond.
 - 2) Euclid Chemical Company (be). an RPM company; Flex-Con.
 - 3) W.R. Meadows, Inc.; Sealtight A cry-Lok.
 - 4) Kaufman Products, Inc.; Surebond
- N. Concrete Patching Mortar: Chemical treatment for waterproofing concrete.
 1. Xypex Concrete Waterproofing by Crystallization. Xypex Chemical Corporation.
 - a. Xypex Concentrate or approved equal.
- O. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.
 1. Provide for coping (if coping is shown to be concrete).
- P. Flexible PVC Waterstops: CE CRD-C 572, with factory-installed metal eyelets, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate comers, intersections, and directional changes.
 1. Available Manufacturers:
 - a. Bometals, Inc.
 - b. Greenstreak
 - c. Meadows, W. R., Inc.
 - d. Murphy. Paul Plastics Co.
 - e. Progress Unlimited, Inc.
 - f. Tamms Industries, Inc.
 - g. Vinylex Corp.
 2. Profile: Ribbed without center bulb.
 3. Dimensions: As provided per general practice from manufacturer for work sequence, non-tapered.
- Q. Non-Expanding Plastic Adhesive Waterstops: 'Manufactured rectangular or trapezoidal strip, single-component, self-sealing adhesive compound, for adhesive bonding to concrete, 5/8 by 1-1/2 inch.
 1. Products: Subject to compliance with requirements, provide the following:
 - a. Synko-Flex SE302, Henry Company.
 - 1.) Synco-Flex SF311 Solvent Based Primer.
- R. General: ASTM C 114 I, Class A or B, but limited to the following admixture materials. Provide admixtures for shotcrete that contains not more than 0.1 percent chloride ions. Certify compatibility of admixes with each other and other cementitious materials.
 1. Air-Entraining Admixture: ASTM C 260.
 2. Water-Reducing Admixture: ASTM C 494/C 494M, T) type A.
 - 3 Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 4. Water-Reducing and Accelerating Admixture: ASTM C 494/C 494M, Type E.
 5. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
 6. Accelerating Admixture: ASTM C 494/C 494M, Type C.
- S. Waterproof membrane to suit application.
- T. Rock, Boulders, and related to match that of existing. Intent is to mimic a natural bear habitat in the northwoods of Minnesota, Wisconsin, Michigan.
- U. Contractor shall provide all plans, drawings and product information on physical water feature for approval.

- V. Work is deemed administratively design-build. Rockwork work can be contracted independent from mechanical water
- W. Scope of Work: The intent is to make use of the existing rockwork that becomes the source of the water feature and the top of the waterfall. The existing rockwork has a depressed pool that will need to be downsized to meet the new configuration. The new stream and ending pool will be newly constructed. It will be designed and constructed to look like a natural woodland stream and pool, complete with natural rocks, bottom aggregate and vegetation. The construction of the stream and pool will be reinforced shotcrete and embedded natural rock aggregate over a waterproofing membrane.
- X. Contractor Qualifications: Minimum 10 years experience working in the industry.

2.04 SHOTCRETE MIXTURE

- A. Prepare design mixtures type and strength of shotcrete.
- B. Limit water-soluble chloride ions to maximum percentage by weight of cement or cementitious materials permitted by ACI 301.
- C. Admixtures: When included in shotcrete design mixes, use admixtures and retarding admixtures according to manufacturer's written instructions.
- D. Design-Mix Adjustments: Subject to compliance with requirements, shotcrete design-mix adjustments may be proposed when characteristics of materials, project conditions, weather, test results, or other circumstances warrant.
- E. Proportion dry mixtures by field test data methods and wet mixtures according to ACI 211.1 and ACI 301, using materials to be used on Project, to provide shotcrete with the following properties.
 - I. Compressive Strength (28 Days): 4000 psi (27.6 MPa).
- F. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight wet-mix shotcrete having an air content before pumping of 8 percent with a tolerance of plus or minus 1-1/2 percent.
- G. Dry-mix shotcrete shall not be air-entrained.

2.05 EQUIPMENT

- A. The pump system utilized to convey premixed concrete shall deliver a uniform and uninterrupted flow of material, without segregation or loss of ingredients.
- B. The main run from the pump to the work shall be at least 3 inch diameter steel pipe or flexible hose reduced to 2 inch diameter at the point of expulsion. Aluminum pipe will not be permitted.
- C. The air compressor shall have the capacity to deliver at least 100 cubic feet per minute for each operating nozzle.

2.06 WATER FEATURE MECHANICAL EQUIPMENT

- A. Remove the existing mechanical water circulation pumps and associated equipment will be demolished.
 - 1. The water feature life support system to be new to accommodate newly renovated Bear Exhibit Space.
- B. Contractor shall provide all plans, drawings and product information on life support system for approval.
- C. Work is deemed administratively design-build. Mechanical work to be contracted independent from physical water feature work. Mechanical contractor to coordinate design and construction with rockwork contractor.
- D. Scope of Work:
 - 1. The layout, extent and configuration are indicated on the drawings.
 - 2. The pool is intended to operate as circulation system only. The pool will have the ability to be drained into the existing sanitary line for maintenance purposes. The new pump(s) and associated disconnect electrical panel will be located in the existing rockwork.
 - 3. The new system will be complete with all new piping, drains, valves, etc. necessary for an active waterfall and stream.
 - 4. The intent is to make use of the existing mechanical room within the existing rockwork, unconditioned space, that is at the beginning of the waterfall initiating the water feature. The waterfall flows into an existing rockwork depressed pool that will need to be downsized to

- meet the new configuration. The new stream and ending pool will be newly constructed. It will be designed and constructed to look like a natural woodland stream and pool.
- E. Contractor Qualifications: Minimum 10 years experience working in the industry.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify excavation surfaces are clean, smooth, and without voids or irregularities.
- B. Verify grounding of electrical and metallic components before shotcreting.

3.02 INSTALLATION - SHOTCRETE CONCRETE POOL

- A. Install mesh reinforcement and gun apply concrete to prepared excavation.
- B. Develop concrete average thickness and trowel smooth.
- C. Air-Placed Concrete, Guniting and Shotcrete shall conform to Uniform Building Code (Current Edition) requirements, Sections 2621 and 4710, and American Concrete Institute Standard ACI 506.
- D. Only personnel skilled in the techniques of air placement of concrete shall be utilized for air-placed concrete construction.
- E. Shotcrete shall be a proportioned combination of Portland cement, aggregate and water mixed by mechanical methods, pumped in a plastic state through a pipe or hose to the nozzle, where, by the addition of air, the mixture is forcibly propelled to the work.
1. Quality Assurance:
 - a. Applicator Qualifications: Contractor must have at least 3 years of experience in Shotcrete construction and at least 5 projects of this type and size which have been completed in a satisfactory manner. A written submittal to the Owner is required.
 - b. The Contractor shall make the work accessible to facilitate the preparation of test specimens.
 - c. Testing: Make three test cylinders for each day of guniting application. Test cylinders shall be made and stored in accordance with ASTM C-31.
 - d. The compression test cylinders shall be prepared by the Contractor in the presence of the Engineer in 6 inch diameter by 12 inch long containers of 3/4 inch square hardware cloth, utilizing the same mix, air pressure, water pressure and nozzle tip as for the material placed in the structure. Cylinders shall be cured in accordance with ASTM C 31 and ASTM C39.
 - e. One of the three test specimen cylinders shall be tested at 7 days; the remaining two specimen cylinders shall be tested at 28 days per ASTM C- 39 by a certified Materials Testing organization.
 2. Preparation:
 - a. Earth subgrade for air-placed concrete shall be neatly trimmed to line and grade and shall be free of all loose material. The subgrade shall be compacted to a minimum 90% Relative Density per ASTM D 1557.
 - b. Ground Wires: Install adequate ground wires prior to shotcreting to be used as screeds to establish the thickness and surface planes of the shotcrete work. Place ground wires so that they are tight and true to line and in a manner that they may be easily tightened.
 - c. Reinforcement:

Mortar blocks, metal chairs, clips or spacers with wire ties or other acceptable means shall be used to secure the reinforcement firmly in the position shown on the plans. All reinforcement shall be clean, free from loose mill scale, loose rust oil or other coatings interfering with bond.
 - d. Call the Water Feature Engineer for an inspection of the wires and steel before beginning shotcrete operation.
 3. Proportioning and Mixing:
 - a. Mix Design: Contractor shall submit proposed Shotcrete concrete mix design to Engineer at least 10 days prior to placement.
 - b. Strength: The compressive strength of shotcrete shall be 3250 psi minimum at 28 days.
- F. Application:

1. All surfaces shall be dampened before application and material shall not be applied to a surface on which free water is visible.
 2. Shotcrete shall not be placed when temperature is likely to rise above 100 degrees (F) or fall below 30 degrees (F).
 3. Use cement gun or apparatus equipped with an air pressure gauge. All hoses and connections are to be tight. Hose shall not exceed 300 feet in length.
 4. Shotcrete shall be applied in shapes and thickness shown in drawings.
 5. Hold the nozzle at right angles to the surface being shotcreted. When placing shotcrete around reinforcing steel, direct the material behind the bars on both sides. Care shall be taken to ensure all loose sand and rebound is removed from the surface prior to shotcreting. This is to be accomplished by the continuous use of a blow-off hose.
 6. No rebound material shall be used in the structural shell of the Water Feature. Rebound may be used for backfilling.
 7. Expansion joints shall be formed at the locations designated on the plans
 8. Upon reaching the thickness and shape outlined by the forms and ground wires, the surface shall be rodded off to true line and grade. Low spots or depressions shall be brought up to proper grade by placing additional air- placed material. Ground wires shall then be removed. Rodding and working with a wood float shall be held to a minimum.
 9. Guniting tolerances for plumb and planes shall not exceed 1/4 inch in 10 feet, nor exceed 1 inch total and wall thicknesses as specified in the plans shall not vary by more than 1/2".
- G. Curing and Cleaning
1. Shotcrete shall be kept damp for at least 10 days after being placed. Curing method to be approved by the Water Feature Engineer.
 2. The Contractor shall be responsible for the removal from the site of all shotcrete debris, rebound and construction waste materials upon completion of the guniting work.
 3. Finished guniting surfaces shall be cleaned to the approval of the Water Feature Engineer.
- H. JOINT SEALANT (ELASTOMERIC)
1. Elastomeric Joint Sealant shall be chemical cure, non-sag, permanently flexible polyurethane sealant conforming to U.S. Federal Specification TT-S-00227E, Types I and II, Class A, ASTM C-920-79, Type M, Class 25, Grade P and NS.
 2. Sealant shall be installed by a Contractor who is approved in writing by the sealant manufacturer to apply specified material. Submittals are required.
 3. All joint walls must be sound, clean, dry and free from oil, grease and frost. Curing compound residues and any other foreign matter must be thoroughly removed.
 4. All joints shall be first primed per manufacturer's specifications prior to application of elastomeric sealant.
 5. The two component sealant shall be added together per manufacturer specified proportions and mixed in a pail using a low speed drill (400-600 RPM) for 4-5 minutes minimum to achieve a uniform color and consistency. Avoid entrapment of air during mixing.
 6. Apply sealant at temperatures within the 40-100 F range. Load the mixed non- sag grade sealant into a bulk gun. Place the application gun nozzle into the bottom of the joints. Keeping the nozzle deep in the sealant, continue with a steady flow of sealant preceding the nozzle to avoid air entrapment. Avoid overlapping of sealant. Tool joints as required.
- I. Coordinate installation of mechanical and electrical components; connect to utilities.
- J. Fill pool, activate filtration and circulation equipment, and chemically stabilize.

3.03 INSTALLATION – MECHANICAL EQUIPMENT

- A. Install according to applicable codes and mechanical specification

3.04 INSTALLATION - ACCESSORIES

- A. Install water feature accessories and fittings in accordance with component manufacturer's instructions.

END OF SECTION

