

SECTION 033712 - EXHIBIT ROCKWORK – Revised Addendum #1

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Work in this section shall be performed by an approved Exhibit Rockwork Contractor, as defined in this Section, and include all labor, materials, and equipment to excavate, rough grade, finish grade and fabricate the work under this contract which includes the following features as illustrated on the drawings and the Exhibit Rockwork Theming and Pages.

1. Exterior Shotcrete Fabrications of highly natural appearance, including, but not limited to the following:
 - a. Artificial geology, landform, and a structure including pool, stone walls, exterior building stucco, tree stumps, and flagstone flat work.
2. Coloring, dying, tinting of new shotcrete rockwork required achieving the required finish.
3. Coordination with other contractors for installation of hot-rocks, cooling stumps and animal drinkers.
4. Natural stone boulders used in the exhibit and public areas
5. Waterproofing of pool and waterfalls.
6. All theme painting as shown on natural boulders, rockwork and pavement.

- B. Delegated Design:

1. Provide Engineering calculations and professionally sealed drawings by a licensed engineer within project site jurisdiction for all work involving structural reinforcing.

- C. Related Requirements:

1. Division 03 Section "Shotcrete" for additional shotcrete criteria covering rockwork specified in this section.
2. Division 05 Section "Structural Steel Framing" for welding criteria.
3. Division 23 and 26 Section "Mechanical and Electrical:" Required field coordination of all piping, plumbing, and electrical (including ground wire system) with work of this Section.
4. Division 31 Section "Site Clearing:" Excavating, filling and backfilling, compaction, and grading.
5. Exhibit Rockwork Theming Pages. For examples of highly naturalistic appearances.

1.3 DEFINITIONS

- A. Approved Exhibit Rockwork Contractor: Contractor whose proven experience, qualifications, and methods have been reviewed and accepted for the Work of this Section by BKP, SDC LLC. and/or the Owner after submitting the required information indicated under the Quality Assurance paragraph of this Section.
- B. Artificial Geology and stone walls (rockwork) Definition: Shall consist of the construction and placement of the artificial features indicated on the Drawings and Specifications herein.
- C. Carved or Embossed Shotcrete: Shall consist of premixed fine aggregate and cement and water pneumatically placed or applied by suitable mechanism. Texture shall be by hand carving and embossing.

1.4 QUALITY ASSURANCE – EXHIBIT CONTRACTOR

- A. Experience and Qualification of Bidders: The Exhibit Rockwork Contractor, in order to qualify as a specialty skilled craftsman for the exhibit rockwork fabrication under this Work, shall demonstrate experience in:
 - 1. Specializing in the artistic construction of animal exhibit concrete work.
 - 2. Managing projects of this size and complexity.
 - 3. Coordination of this Work with other trades that affect this Work.
 - 4. Employing qualified and experienced crafts persons / and artists and meeting the following criteria in section 1.4B.
- B. The Exhibit Rockwork Contractor shall submit the following with the bid:
 - 1. A signed statement of experience certifying that the Contractor is an established business with a minimum of 5 years of experience and indicate in detail his experience in successfully constructing items described in paragraph 1.2.
 - 2. Photographic proof and reference material for evaluation of experience and ability to perform under this Work, including photographs (at least five (5) 8 1/2" x 11" color photographs of previous comparable work) to show the Contractor's capabilities to construct the above mentioned items for natural habitat exhibits and stone walls similar to those shown on the drawings, Contractor also to include a list of completed projects and references which demonstrate these capabilities. These projects and photographs of projects must have been the work of those craftsman and artist proposed for this work.
 - 3. Full documentation of the Construction crew, including resumes of lead personnel (on-site supervisor, and final texturing and finish experts, et al) lists of specific personnel to be used, and details of each listed person's experience and abilities to perform all phases of construction under this Work to the Architect's satisfaction. The assigned project on site supervisor and aesthetic coordinator's resume should show a minimum of four (4) years' experience in the management of project crews of no less than five persons, as well as experience in coordination with other trades in the completion of simulated rockwork fabrication projects under the Work.
- C. The following is a nonrestrictive list of pre-qualified Exhibit Rockwork Contractors, subject to compliance with the requirements of these specifications. Contractor may submit alternate

Exhibit Rockwork Contractor but must obtain pre-qualification prior to bid with design team and owner:

1. Cemrock Landscapes, Inc. / attn: Chris Conley
4798 S. Julian Avenue,
Tucson AZ 85714
(520) 571-1999
2. Cost of Wisconsin, Inc. / attn: Jack Beatty
Corporate Headquarters
4201 County Road P
Jackson, Wisconsin 53037
(262) 677-6060
3. Nassal Company, / attn: Melissa Ruminot
415 W. Kaley Street
Orlando, FL 32806-3942
(407) 648-0400
4. Paradise Labs
Baltimore, MD
5. DreamScape Designs/attn.: Stephanie Tommasello
Baltimore, MD
949-735-7122

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
- B. Contractors wishing to be approved for Shotcrete and/or artificial rockwork fabrication under this work may independently make application directly to the Architect as detailed above.
- C. The Architect/Exhibit Designer may require additional information and may request a visit to completed work in order to make a determination of the Contractor's qualification to produce exhibit artifacts with the required criteria under this Work. The Exhibit Designer may also require a submittal of a high-quality digital documentation of the completed work.
- D. The Owner and Architect reserve the right to reject non-qualified Contractors, based on qualification submittals and, at their option, review of past work and references.

1.6 INTENT

- A. It is intended that the work involved create a highly natural appearance of the above-mentioned items as shown on the Drawings and Exhibit Images.
- B. The Contractor will perform this work under the direction of the Architect and will be expected to cooperate fully in this process.

- C. The Architect explicitly reserves the right to continuously monitor the work for aesthetic quality and functional criteria of the work as it is performed.
- D. The Exhibit Contractor is responsible to see that no loose materials used in the execution of this work remain after completion of the project.

1.7 COORDINATION

- A. The Exhibit Rockwork Contractor shall fully coordinate with the other Contractors and their Contractors and the Architect. If the Exhibit Rockwork Contractor suspects that a conflict may exist between work in this Section and any other work, he/she shall bring the issue to the attention of the Architect before proceeding.
- B. Coordinate with all other trades, placement of continuous waterstops where planter construction adjoins work of other trades such as but not limited to retaining walls, building walls, and footings.

1.8 SAMPLES

- A. At least thirty days prior to beginning any exhibitry work, the Exhibit Rockwork Contractor shall deliver to the project site one 4' x 4' or other approved size sample panel for each of the rockwork and themed material types listed in the Exhibit Rockwork and Theming and Pages to the Architect for approval. The types are reiterated in the following rockwork and theming type list:
 - 1. Flagstone paving
 - 2. Stone wall
 - 3. Pool and Beach
 - 4. Mudbank
 - 5. Stucco on holding building
- B. Samples shall represent finished surfaces with texturing, coloring, etching, etc.
- C. Samples rejected by the Architect shall be resubmitted for approval by the Exhibit Rockwork Contractor at no additional cost to the Owner. Sample panels shall not be removed until the completion of the work.
- D. At the discretion of the Architect larger sample panels may be installed in their final location and used as part of the final work, if accepted.
- E. Model: Not required

1.9 ACTION SUBMITTAL

- A. All submittals shall be in accordance with - General Conditions for Submittals Division 01 Section "Submittal Procedures". The Exhibit Rockwork Contractor shall submit the following shop drawings for review:

1. Layout Plan: The layout plan shall indicate and identify the following:
 - a. All rockwork by indicated categories.
 - b. Locations of all required footings and foundations.
 - c. Footing and foundation types and all pertinent dimensions.
 2. Steel Reinforcing: Indicate sizes, types and locations of all steel reinforcing involved in Work of this Section. Provide the seal and signature of a licensed professional Engineer within project site jurisdiction to steel reinforcement shop drawings, indicating compliance with all government codes for reinforced concrete structures. Include structural calculations for all conditions.
 3. Literature, Specifications and Mix Designs: Submit all product literature, specifications and mix designs used in the production of rockwork.
- B. Delegated-Design Submittal: For rockwork indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.10 PRE-CONSTRUCTION CONDITIONS

- A. All artificial rockwork locations shall be approved by the Architect prior to actual shotcrete application and texturing.
- B. Exhibit Rockwork Theming Pages: The Exhibit Images as provided by Architect indicates all rockwork color ranges, texture types, and respective location. For the purpose of duplicating three dimensionally the design concept and establishing the character, configuration and the amount of simulated rock to be constructed, the Exhibit Rockwork Contractor shall work from drawings and photographs furnished by the Architect/Exhibit Designer. Exhibit Images are considered part of the contract documents.
- C. Structural Reinforcement: The structural reinforcement indicated on the plans and in the specifications are to establish minimum design criteria for the Exhibit Rockwork Contractor to incorporate into the rockwork design. The Exhibit Rockwork Contractor shall be responsible to design structural reinforcement for all work in this section and shall provide a licensed structural engineer seal within project site jurisdiction certifying all structural reinforcement sections at no additional cost to the owner. Alternative methods may be recommended for greater cost efficiency. Rockwork shown on the drawings is for "order of magnitude" quantity projections. Exhibit Rockwork contractor is responsible for providing actual amounts needed within bid price.
- D. Methods of Construction: The Exhibit Rockwork Contractor shall submit with bid proposal proposed methods of construction for all work in this section. Such documentation shall include the following:
 1. Statement of understanding of the overall project schedule and required completion of all rockwork and artifacts.
 2. Submit a detailed description of proposed fabrication and finish techniques (including materials) for artificial geology and alternate structural systems (if applicable). Exhibit Contractor is responsible for effective waterproofing of all water features including but not limited to all rockwork interfacing with drains, skimmers, walls, etc.
 3. Recommend additional cost effective alternative methods of construction prior to start of work for consideration by Architect and Owner.

E. Excavation, Subdrainage and Backfill:

1. The Exhibit Rockwork Contractor is responsible for the excavation, dewatering, shoring and maintenance of all excavation, subdrainage, wall drainage and aggregate for shotcrete features up to the shotcrete subgrade.
2. The Exhibit Rockwork Contractor shall be responsible for all additional backforming and backfilling required for shotcrete work as a result of his over excavation in areas where not required. It is the Exhibit Rockwork Contractor's responsibility to avoid such over excavation and to coordinate with the General Contractor to facilitate excavation as close to final subgrade as possible.
3. The Exhibit Rockwork Contractor must accept the subgrade in written form for each individual exhibit or portion of an exhibit and submit to the Owner's Representative for approval. If not accepted, the Exhibit Rockwork Contractor must notify the Owner's Representative in writing immediately.
4. Following the acceptance of the subgrade by the Exhibit Rockwork Contractor and approval by the Owner's Representative, the Exhibit Rockwork Contractor shall be responsible for the following at no additional cost to the Owner:
 - a. All additional subgrade adjustment and reinstallation of drainage systems and sleeves required for his work.
 - b. All maintenance required to maintain the accepted subgrade, with the exception of any dewatering device which shall be the responsibility of the Site Contractor.
5. All backfill behind, around, within and on top of the shotcrete features to complete the rock simulation work to the satisfaction of the Architect shall be the responsibility of the Site Contractor in coordination with the Exhibit Rockwork Contractor.
6. Soil survey is available for reference and is not considered a part of the contract documents.

1.11 PROJECT SITE CONDITIONS

- A. Protection of Property: Take note of requirements for protection of trees and soils as specified. In particular, do not discharge cement bearing water onto the ground on site except as specifically approved by the Owner's Representative. Account for all debris generated by operations and remove from site regularly, especially small bits of reinforcement and hardware.
- B. Surveying:
 1. Provide surveying as frequently as is required to accurately locate features as detailed on drawings. Confirm location, elevations and profiles of work by optical or laser survey immediately before and after placement of each contiguous surface.
 2. Tolerance for location of any point defined on the drawings in one tenth of one foot in both horizontal and vertical dimensions.
- C. Protection:
 1. Be responsible for protection of project materials, including waterproofing susceptible to damage during forming, placing or reinforcement of shotcrete. Provide masks or remove damageable materials before beginning work.

1.12 ARCHITECT/EXHIBIT DESIGNER'S DIRECTION

- A. It is intended that the configuration, texturing and coloring for exposed shotcrete be executed under the detailed direction of the Architect/Exhibit Designer, at least until such time as satisfactory examples of the desired character have been developed. Notify the Owner's Representative at least forty eight hours before beginning placement of first example of each type of shotcrete to be exposed and schedule time when the Architect/Exhibit Designer can observe and direct the finishing work as it is executed.

1.13 TESTING SERVICE

- A. Owner will contract and pay for testing services. Exhibit Rockwork Contractor shall cooperate and coordinate testing with Owner provided testing service.

1.14 GUARANTEE

- A. Guarantee work in this section for one year from date of Final Acceptance.
- B. Repair or replace materials if there is a failure to perform as required due to failures of materials or workmanship.

1.15 PRICES

- A. Waste, Rebound and Extra Material Required for Realistic Natural Simulations: Past experience in similar zoo projects indicates that up to 25% extra concrete material (above what appears on the drawings) is or may be required to create realistic, natural simulations of the items to be provided. All bids should reflect this extra material and labor for application.
- B. Bids shall include cost of all subsurface footings and other requirements needed to complete the work.

PART 2 - PRODUCTS

2.1 ARTIFICIAL ROCKWORK (SHOTCRETE) MATERIALS

- A. Reinforcing Materials:
 - 1. Refer to Division 03 Section "Shotcrete" for requirements.
- B. Concrete Materials
 - 1. Refer to Division 03 Section "Shotcrete" for further concrete mix design requirements.

2.2 EXHIBIT ARTIFACT AND MISCELLANEOUS MATERIAL

- A. Paint shall be acrylic latex, highest quality exterior grade, matte finish.
- B. Drains: As indicated on drawings.

PART 3 - EXECUTION

3.1 GENERAL

- A. Scope:
 - 1. Coordinate excavation and backfill with site grading contractor, allowing for use of earth face as backform where appropriate. Maintain earth grades and shapes once shotcrete work has commenced.
 - 2. Coordinate exhibit construction in a pre-scheduled manner to allow proper access and operation with other trades.
 - 3. Cooperate with Architect and respond to directions for the purpose of achieving the artistic effects illustrated by the contract documents and reference photos.
 - 4. Coordinate and install exhibit elements required by this and other Sections required for a complete installation as detailed on the Drawings.
 - 5. Finish, color and detail shotcrete construction with skill and sensitivity for the exhibit purpose, the character of the simulated landscape and the care of the animals.

3.2 TESTING REQUIREMENTS

- A. Refer to testing requirements as required in Division 03 Section "Shotcrete."

3.3 PLACEMENT OF EXHIBIT FEATURES

- A. Layout: All items shall be placed at locations on the site and grades shown on the Drawings and as directed by the Architect.

3.4 FORMING SHOTCRETE STRUCTURES

- A. At structural pool slabs, side walls, shoring and bracing wall and background concrete walls, where artificial rockwork is to be constructed, use the backup construction described below or provide the Architect/Exhibit Designer with an alternate construction system for approval.
 - 1. Construct an armature of metal lath on the unexposed side of the shotcrete structure as the backup construction material behind the steel reinforcing bars to which the shotcrete is applied.
 - 2. Metal lath shall be bent to conform approximately to the welded and steel reinforcing frame and shall be held away from the nearest bars a minimum distance of 2" min. In order to facilitate the installation of metal lath the contractor may increase the thickness of the shotcrete to do away with matching exactly the steel reinforcing outline. However, all variances from the steel outline must be approved by the Exhibit Designer.

3. Metal lath shall be fastened to the reinforcing bars by means of tie wires or anchor spacers. Ties or spaces shall be spaced not more than 10" on center in all directions. Space lath away from reinforcing rods such that reinforcing rods will be in the center of the finished structure. There must be a 2" minimum thickness of concrete between reinforcing bars and lath.

- B. Wherever a flash coat is to be applied to a concrete surface, the concrete surface shall be roughened texture within minimum 2" thickness. Test cores shall be taken to verify.
- C. The finish form, color and texture of the finish surface must meet with the approval and be completed to the satisfaction of the Exhibit Designer, which approval, when given, must be in writing. Contractor shall bear all costs of any and all work required to secure such approval.

3.5 PROVISIONS FOR OTHER TRADES

- A. The Exhibit Rockwork Contractor shall be responsible for coordinating of all other trades in contact with their work and Owner supplied items to fully complete the habitat setting.
- B. Provide sleeved openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, drains, cavities, and chases from trades providing such items. All non sleeved piping shall be set by the appropriate contractor except that sleeves shall be provided by the appropriate contractor and installed by the Exhibit Rockwork Contractor. Accurately place and securely support items built into forms.

3.6 STEEL REINFORCEMENT

- A. Reinforcing sizes: The Exhibit Rockwork Contractor shall develop reinforcement sizing and placement to facilitate his/her work. All structural calculations for reinforcement must be fully and clearly documented by a registered professional structural engineer, licensed in the local project jurisdiction.
- B. General:
 1. Clean reinforcement of loose rust, mill scale, earth, ice, and other materials which reduce bond with concrete.
 2. Accurately position, support and secure reinforcement against displacement by construction or concrete placement operation. Locate and support reinforcing by metal chairs, runners, bolsters, spacers and hangers, as required.
 3. Notify Owner's Representative upon completion of reinforcing and prior to placing shotcrete.
- C. Minimum Standards: The following minimal steel placement standards are supplemental to the steel reinforcement notes shown on the drawings and Division 03 Section "Shotcrete." Following Shotcrete specifications if any discrepancies arise and immediately bring to Architect's attention.
 1. No. 3 reinforcing bars shall be placed on 10" centers both ways as the minimum acceptable amount of bar reinforcing and shall be continuous around corners. The

spacing shall remain the same but the bar size will increase where, in the opinion of the Engineer, it is deemed necessary. A No. 4 bar acting as a key rod shall be placed at intersections of all plan surfaces.

2. Tack weld or wire bars where they contact or cross each other. The bars must form a rigid framework. All bars are to lap thirty (30) diameters at splices. However, a lap of 4" will be allowed if one continuous fillet weld of 3" in length is used to tie or weld the bars together at the splice. All welding to be in accordance with Division 05 Section "Structural Steel Framing." Touch up bars at welds.
3. Reinforcing bars shall be placed and bent around circles and curves, openings, corners, and angles to conform with the drawings. Bends are to be permanently shaped, not sprung into place. Particular attention shall be made to follow the outline of the stratified rock formations to eliminate excess non reinforced rockwork outcroppings
4. The tie bars and tie anchors which are exposed to air and which do NOT come in contact with any backfill material shall be given a protective covering of asphalt coating of at least one heavy coat or Rustoleum, or equal.
5. Tie bars and tie anchors which come in contact with backfill material shall be encased with a coating of shotcrete. Steel shall be covered by a minimum of 1" of shotcrete.
6. Additional #4 bars shall be used diagonally across corners of all openings, and wherever shotcrete formations act as beams additional #5 bars shall be placed at points of maximum stress, i.e., one in top and one in bottom extending 12" into supports. Additional #4 bars shall be integrated into the steel framework if such steel is necessary to provide a stable structure.
7. The mesh shall be placed on steel reinforcing on side opposite the backup material and shall be securely wired to the reinforcing bars at not less than 20" intervals in both directions. Mesh shall lap at least 2" at adjacent ends.
8. Place reinforcing for pools and slabs uniformly 1 1/2" to 2" from the bottom of shotcrete slabs.

3.7 MIXING CONCRETE

- A. Mix concrete to obtain the compressive strengths identified in Division 03 Section "Shotcrete."
- B. Mix integral color into the concrete mix to the recommendations of the color manufacturer and requirements of mix design.

3.8 PLACING CONCRETE

- A. All shotcrete shall be placed to a minimum thickness of 6", unless otherwise noted.
- B. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, or other debris just before concrete is placed.
- C. Maintain reinforcing in the proper position during concrete placement operations.
- D. Rebound: All rebound or accumulated loose aggregate shall be removed from the surface to be covered prior to placing the initial or any succeeding layers of pneumatically placed concrete. Rebound may be re used if it conforms to the requirements for aggregate, but not in excess of 25% of the total aggregate in any batch.
- E. Joints:

1. Unfinished work shall not be allowed to stand for more than 30 minutes unless all abrupt edges are tapered to a thin edge. Before resuming work, this sloped portion shall be cleaned and a bonding agent applied.
2. All construction joints in shotcrete rocks shall be tapered off to an edge. Before shooting the adjacent section the sloped portion shall be thoroughly cleaned and wetted with compressed air and water blast. No square joints will be permitted. All construction joint locations must be so positioned as to conform to the natural rock appearance as shown on the models.

F. Damage: All pneumatically placed concrete which subsides after placement shall be removed.

3.9 WATERPROOFING INSTALLATION

A. Mix waterproofing material in proportions recommended by manufacturer.

B. Apply waterproofing material in quantities by manufacturer's specified recommendations. The following minimal standards are supplemental to manufacturer's recommendations found in Division 07 waterproofing sections. Request clarification from exhibit designer on any discrepancies.

1. Apply at 90 mils thickness.
2. Apply, using stainless steel trowel, fampico brush, or appropriate compressed-air spray equipment.
3. Waterproofing material can be applied on walls in one coat by trowel or spraying up to 1/8" thickness provided the surface is immediately covered by a protection fabric, supplied by the waterproofing manufacturer.
4. If needed, such as in zones posed to movement or cracking, the waterproofing material can be additionally reinforced with a reinforcing mesh (supplied by waterproofing manufacturer), embedded between two waterproofing layers.
5. Apply only when surface and ambient temperatures are 40 – 45 degrees F. and rising. At high temperatures (i.e. 90 degrees and above) protect application from direct sun and wind to prevent premature surface shrinkage. Apply material in two coats minimum. Apply second coat within one hour.
6. Application thickness should not exceed 1/8".
7. Do not bridge cracks greater than 1/16".
8. Bridge dynamic cracks or joints with elastomeric joint sealing tape, as supplied by waterproofing manufacturer.
9. Do not overcoat waterproofing material with solvent-based materials.
10. Curing: Follow manufacturer's general instructions for curing and hardening of waterproofing material and protect surfaces from rain, frost and drying out.

3.10 FINISHES

A. The Exhibit Rockwork Contractor shall provide experts to complete the desired finishing for all work to receive a natural appearance. Such finishing and coloring shall cover all surfaces exposed to public viewing and extend at least 12" beyond view or below final backfill or grading. Architect to provide color samples as a point of beginning for painting work.

- B. Carved Rockwork Formations: Artificially constructed geology and sedimentary geologic formations, as illustrated on the drawings and photographs.

3.11 CURING SHOTCRETE CONCRETE

- A. Cover and cure Shotcrete concrete as described in Division 03 Sections "Shotcrete," taking special care not to disturb special textures achieved for this work.

3.12 PLANTERS, POOLS, AND STREAMS TESTS

- A. All planters, Pools and Streams shall be filled to capacity prior to installing any finishes. Water must hold a stable level at a predetermined static water level for 48 hours. If the test as positive, finishes may be applied if the test is negative, locate and repair the leak and retest until the test is positive.
- B. Tests shall be as follows:
 - 1. 48-Hour Test Procedure: All planters, Pools and Streams will be filled to capacity following structural coat and application of waterproofing. Water must hold a stable level at a predetermined static water level for 48 hours. If the test is positive, the application of the shotcrete carving coat and subsequent finishes may be applied if the test is negative, locate and repair the leak and retest until the test is positive.
 - 2. 2-Week Test Procedure: After all shotcrete, finishes and equipment are applied and installed each planter shall be tested for leaks while the recirculation equipment is on, for a continuous time period of 2 weeks. A constant water level must be maintained during this time period. If water levels drop, locate the source of the leak, and repair as required. Retest for an additional 48-hour period with equipment turned on. Retest for 48 hours each time until the test is positive.
 - 3. Final Inspection Test Procedure: Planters are to be tested again as a condition of Final Inspection. If the test is negative, locate and repair and retest at no additional cost to Project. Repeat until tests are successful.

3.13 PAINTING

- A. Paint all exposed surfaces of shotcrete. Painting shall make exhibit artifacts look as natural as possible, using provided references photos. Exhibit Designer shall be final judge of acceptable quality of painting.
- B. In order to blend in with surrounding artificial rockwork, additional items in and around shotcrete such as, miscellaneous hardware, concrete walls, and paving segmental retaining wall, etc., are to receive matching paint finishes in order to achieve an overall uniform look.
- C. Rockwork items to be painted, including theme painted concrete and boulders should have a minimum of three different paint colors.

3.14 BOULDERS

- A. Excavate as needed, place and backfill “natural” boulders as specified, and as directed and located by the Architect/Exhibit Designers. Boulders to be theme painted to match surrounding rock.

3.15 CLEAN-UP

- A. Clean-up rebound from operations and dispose of as void fill, as structural fill more than 3' -0" below finish grade, or off-site on a daily basis.
- B. Do not leave or bury loose pieces of reinforcing, sheet or expanded metal, tie wire, plastics or any other material not fully embedded in concrete.
- C. Clean overspray and rebound from adjacent work (including natural boulders) at the completion of each day's placing (or sooner if required). Leave all surfaces broom-clean and unstained at the completion of the work.

3.16 FINAL COMPLETION

- A. Contractor shall repair and patch all punchlist items to the satisfaction of the Architect.
- B. Contractor shall carefully inspect all construction areas to remove all debris, particularly stones, steel bars, and other materials, which could be uncovered by the Animals.

3.17 INSTRUCTIONS ON OPERATIONS AND MAINTENANCE.

- 1. Schedule an on-site instructional seminar with all required Zoo personnel. Instruct for the operations, proper usage, and maintenance of all items installed.


3.18 SCHEDULE OF IMAGES: REFER TO EXHIBIT ROCKWORK PAGES

- A. The Exhibit Rockwork Theming and Pages (at the end of this spec section) identifies images for the rockwork and rockwork type adjacencies in order to give the contractor the intent of the design. These should be used as a guide for the form, texturing and transition of rockwork types. Additional images can be provided for further clarification during construction.

END OF SECTION 033712

Flagstone Paving & Seat Wall


Flagstone Paving

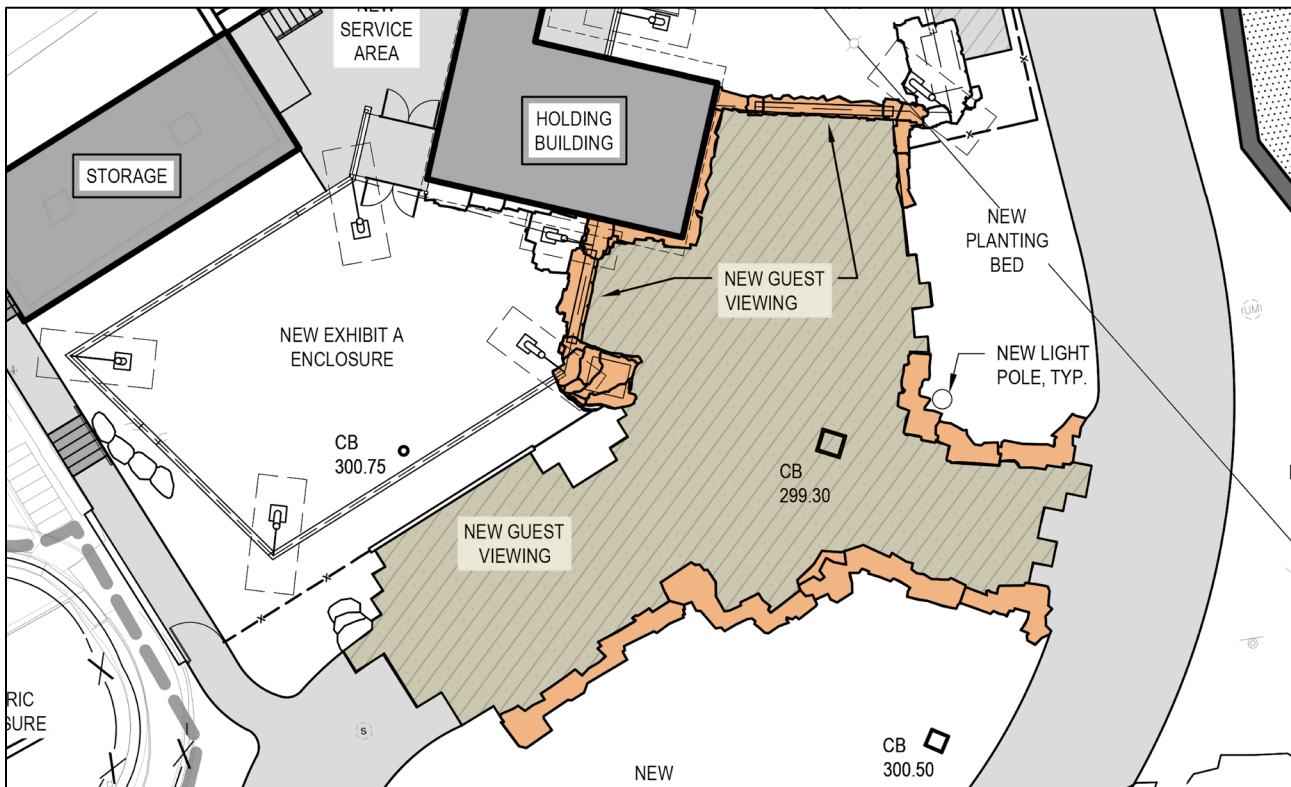

Seat wall

- Flagstone size varies as seen in the photo
- Provide a smooth walking surface
- Space between flagstones should be less than seen in the photo
- Texture between flagstone is sand or mud
- Scale reference 18" x 18"



Seat wall "look and feel"

- Seat wall next to holding building and in viewing area "look and feel"
- Seat wall to be less rustic than shown in the image
- Provide even top for guest seating
- Stones that create the front wall should be uneven +/- 2"



Holding Building & Structures



Manufactured Stone

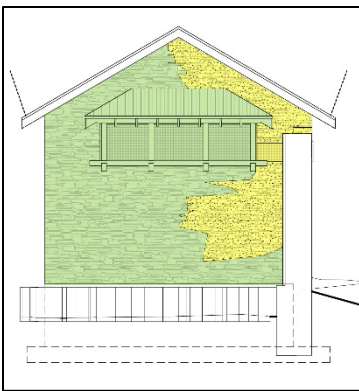
(provided and installed by GC)

- Color texture and size of stone walls
- Mortar schmear texture and color

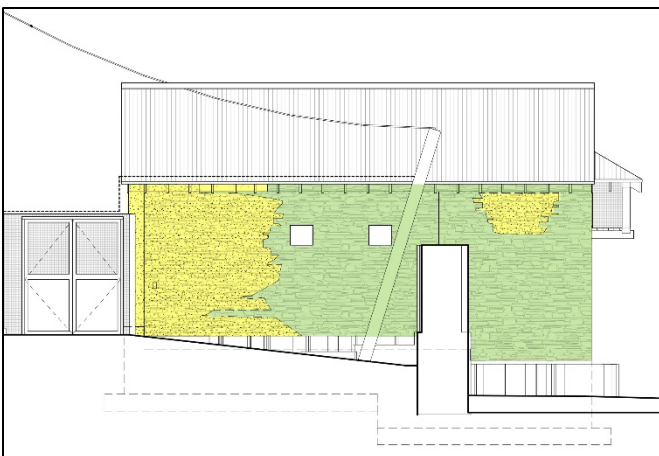


Mortar schmear over stone

(provided and installed by Rockwork subcontractor)



South Elevation



West Elevation



East Elevation