



Capital Projects Contract Administration, Capital Planning & Development
Oregon State University 3015 SW Western Blvd, Corvallis, Oregon 97333
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May 23, 2014

Oregon State University
Capital Projects Contract Administration
Goss Stadium Expansion

ADDENDUM NO. 1

THIS ADDENDUM IS BEING ISSUED for clarification and/or revisions of the drawings and specifications as noted. This document is hereby made a part of the Contract Documents to the extent as though it was originally included herein.

The following changes shall be made to the TECHNICAL SPECIFICATIONS:

- Item 1 Add signed certification sheet as the first page to Volume 1 of the Project Manual as shown on Attachment PM-1.
- Item 2 Replace Bid Form in its entirety with the attached "Revised 5/23/14" Bid Form. Bid Closing and Opening *times* were added.
- Item 3 Add Section 042000 as shown on Attachment PM-2.
- Item 4 Add Section 047200 as shown on Attachment PM-3.
- Item 5 Add Section 071113 as shown on Attachment PM-4.
- Item 6 Add Section 074616 as shown on Attachment PM-5.
- Item 7 Add Section 095426 as shown on Attachment PM-6.
- Item 8 Add Section 109000 as shown on Attachment PM-7.



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CLARIFICATIONS/QUESTIONS:

- Item 9 Addendum No. 2 will address locations and dimensions on the drawings for wall and post padding that are referenced in the attached Section 109000 – Baseball Equipment.
- Item 10 Question: Civil DWG C4.0 shows the grease interceptor under civil scope, but the information to procure the unit is on the plumbing DWG P5.1. We the mechanical contractor will be providing as the civil drawings state a capped line for the civil contractor to make their final connection. Please confirm that the installation of the grease interceptor is part of the civil scope and not plumbing scope.
Answer: The division of work is between the General Contractor and the Subcontractor. Addendum No. 2 will address product and installation requirements for the grease interceptor.
- Item 11 Geotechnical Report dated 8/13/13 is attached for reference.

END OF ADDENDUM NO. 1



Goss Stadium Expansion

Oregon State University, Corvallis, Oregon

Project Manual – Bid & Permit Set
DLR Group Project No. 74-13115-00

April 29, 2014



**Robert
J. Esau**

Digitally signed by
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DLR Group Architecture & Planning inc., an Oregon corporation

Architecture Planning Interiors

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Attachment PM-1 to Addendum 1 dated May
23, 2014

OREGON UNIVERSITY SYSTEM

STANDARD PUBLIC IMPROVEMENT CONTRACT

BID FORM

OUS CAMPUS: OREGON STATE UNIVERSITY

PROJECT: GOSS STADIUM EXPANSION

BID CLOSING: JUNE 5, 2014 2:00PM

BID OPENING: JUNE 5, 2014 2:00PM

FROM: Name of Contractor

TO: The State of Oregon, acting by and through the Oregon State Board of Higher Education, on behalf of Oregon State University ("Owner") Capital Projects Contract Administration 3015 SW Western Blvd. Corvallis, Oregon 97333

1. The Undersigned (check one of the following and insert information requested):

- a. An individual doing business under an assumed name registered under the laws of the State of ; or
b. A partnership registered under the laws of the State of ; or
c. A corporation organized under the laws of the State of ; or
d. A limited liability corporation/company organized under the laws of the State of ;

hereby proposes to furnish all material and labor and perform all work hereinafter indicated for the above project in strict accordance with the Contract Documents for the Basic Bid as follows:

Dollars (\$)

and the Undersigned agrees to be bound by the following documents:

- Notice of Public Improvement Contract Opportunity
• Instructions to Bidders
• Public Improvement Agreement Form
• Performance Bond and Payment Bond
• Supplemental OUS Public Improvement General Conditions
• Payroll and Certified Statement Form
• Drawings and Details
• ADDENDA numbered through, inclusive (fill in blanks)
• Supplemental Instructions to Bidders
• OUS Public Improvement General Conditions
• Prevailing Wage Rates
• Plans and Specifications

2. The work shall be completed within the time stipulated and specified in Division 1, Section 01 11 00, of the Specifications.

3. The Undersigned certifies that: (1) This Bid has been arrived at independently and is being submitted without collusion with and without any agreement, understanding, or planned common course of action with any other vendor of materials, supplies, equipment or services described in the invitation to bid designed to limit independent bidding or competition; and (2) The contents of the Bid have not been communicated by the Undersigned or its employees or agents to any person not an employee or agent of the Undersigned or its surety on any Bond furnished with the Bid and will not be communicated to such person prior to the official opening of the Bid.

5. The undersigned **HAS, HAS NOT** (*circle applicable status*) paid unemployment or income taxes in Oregon within the past 12 months and **HAS, HAS NOT** (*circle applicable status*) a business address in Oregon..

6. The Undersigned agrees, if awarded a contract, to comply with the provisions of ORS 279C.800 through 279C.870 pertaining to the payment of the prevailing rates of wage.

7. Contractor's CCB registration number is _____. As a condition to submitting a bid, a Contractor must be registered with the Oregon Construction Contractors Board in accordance with ORS 701.035 to 701.055, and disclose the registration number. Failure to register and disclose the number will render the bid unresponsive and it will be rejected, unless contrary to federal law.

8. The successful Bidder hereby certifies that all subcontractors who will perform construction work as described in ORS 701.005(2) were registered with the Construction Contractors Board in accordance with ORS 701.035 to 701.055 at the time the subcontractor(s) made a bid to work under the Contract.

9. The successful Bidder hereby certifies that, in compliance with the Worker's Compensation Law of the State of Oregon, its Worker's Compensation Insurance provider is _____, Policy No. _____, and that Contractor shall submit Certificates of Insurance as required.

10. Contractor's Project Manager for this project is: _____,
Office Phone: _____ Cell Phone: _____.

11. The Undersigned certifies that it has not discriminated against minority, women, or emerging small businesses in obtaining any subcontracts for this project.

12. The Undersigned agrees, if awarded the Contract, to execute and deliver to Owner, within twenty (20) calendar days after receiving the Contract Documents, an Agreement Form and a satisfactory Performance Bond and Payment Bond, each in an amount equal to one hundred (100) percent of the Contract sum, using forms provided by the Owner. The surety requested to issue the Performance Bond and Payment Bond will be: _____.

(*name of surety company - not insurance agency*)

The Undersigned hereby authorizes said surety company to disclose any information to the Owner concerning the Undersigned's ability to supply a Performance Bond and Payment Bond each in the amount of the Contract.

By signature below, Contractor agrees to be bound by this Bid.

NAME OF FIRM _____

ADDRESS _____

FEDERAL TAX ID _____

TELEPHONE NO _____

FAX NO _____

SIGNATURE 1) _____

Sole Individual - Signature

Sole Individual - Printed Name

or 2) _____

Partner

or 3) _____

Authorized Officer of Corporation - Signature

Authorized Officer of Corporation Printed Name

(SEAL)

Attested: Secretary of Corporation

Payment information will be reported to the IRS under the name and taxpayer ID # provided above. Information not matching IRS records could subject Contractor to 31 percent backup withholding.

******* END OF BID *******

SECTION 042000 - UNIT MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

1. Concrete masonry units (CMUs).
2. Decorative concrete masonry units.
3. Clay face brick.
4. Steel reinforcing bars.
5. Mortar and grout.
6. Embedded flashing.
7. Miscellaneous masonry accessories.

- B. Related Sections:

1. Section 034500 "Precast Architectural Concrete" for decorative concrete members installed with unit masonry.
2. Section 051200 "Structural Steel Framing" for installing anchor sections of adjustable masonry anchors for connecting to structural steel frame.
3. Section 052100 "Steel Joist Framing."
4. Section 055000 "Metal Fabrications" for furnishing steel accessories for unit masonry.
5. Section 070800 "Commission of Continuous Air Barrier System" for performance and testing of building envelope.
6. Section 071900 "Water Repellents" for water repellents applied to unit masonry.
7. Section 076200 "Sheet Metal Flashing and Trim" for exposed sheet metal flashing and for furnishing manufactured reglets installed in masonry joints.

1.3 DEFINITIONS

- A. CMU(s): Concrete masonry unit(s).
- B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For the following:
 1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.

2. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement." Show elevations of reinforced walls.
3. Embedded Items: Show elevations of all walls showing all embedded steel items for connection to by others, blockouts, openings, lintels, bearing angles, plates and other misc. provisions for structure and architectural design features. These drawings shall be fully coordinated with other trades
4. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.
5. Control Joint Layout for all structural masonry walls: Indicate proposed control joints required to construct the structure. See notes on structural drawings for control joint location.
 - a. Location of control joints is subject to approval of the Architect.

A. Samples for Verification: For each type and color of the following:

1. Decorative CMUs.
2. Colored Mortar

B. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.

1. Submittal is for information only. Neither receipt of list nor approval of mockup constitutes approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of Architect and approved in writing.

C. Shop Drawings: For reinforcing steel. Detail bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315. Show elevations of reinforced walls.

D. Samples for Verification: For each type and color of exposed concrete and brick masonry unit and colored mortar.

1.5 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each type and size of product. For masonry units, include data on material properties consisting of material test reports substantiating compliance with requirements.

B. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91/C 91M for air content.
2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

1.6 QUALITY ASSURANCE

- A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.
- B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.
- C. Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 602 unless modified by requirements in the Contract Documents.
- D. Sample Panels: Build sample panels to verify selections made under sample submittals and to demonstrate aesthetic effects. Comply with requirements in Division 01 Section "Quality Requirements" for mockups.
 - 1. Build sample panels for each type of decorative exposed unit masonry construction in sizes approximately 48 inches (1200 mm) long by 48 inches (1200 mm) high by full thickness.
 - 2. Clean one-half of exposed faces of panels with masonry cleaner indicated.
 - 3. Protect approved sample panels from the elements with weather-resistant membrane.
 - 4. Approval of sample panels is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by Architect in writing.
 - a. Approval of sample panels does not constitute approval of deviations from the Contract Documents contained in sample panels unless such deviations are specifically approved by Architect in writing.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Deliver preblended, dry mortar mix in moisture-resistant containers designed for use with dispensing silos. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in covered weatherproof dispensing silos.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

- F. Temporary Wall Bracing: Comply with the latest edition of the following standards as published by the Masonry Contractor's Association of America.
1. Standard Practice for Bracing Masonry Walls Under Construction.
 2. The Masonry Wall Bracing Handbook.

1.8 PROJECT CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
1. Extend cover a minimum of 24 inches (600 mm) down both sides of walls and hold cover securely in place.
- B. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
 2. Protect sills, ledges, and projections from mortar droppings.
 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- C. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.
- D. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.1 MASONRY UNITS, GENERAL

- A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects will be exposed in the completed Work.

2.2 CONCRETE MASONRY UNITS (CMUs)

- A. Concrete Masonry Units: ASTM C 90 . For units of all types indicated following.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 1900 psi (13.1 MPa)
 2. Weight Classification: Medium weight, unless otherwise indicated.
 3. Shapes: Provide square-edged units for outside corners, unless otherwise indicated
- B. CMU not exposed to view: (concealed by other work)
1. CMU-1: Provide units which meet the structural requirements indicated on the drawings.
 - a. Shapes: Provide shapes indicated on the drawings.
 - b. Finish: Standard (Smooth-face).
 - c. Concrete Color: Standard
- C. Exterior CMUs: Provide units which meet the structural requirements indicated on the drawings and as follows.
1. Split Face CMU-2
 - a. Exposed at the exterior.
 - b. Size: 8 x 16 nominal by 4" in depth as indicated on drawings.
 - c. Finish: Split-face.
 - d. Concrete Color: Match color of CMU at wainscot on existing building
- D. Integral Water Repellent: Provide units made with integral water repellent for units exposed to the exterior.
1. Integral Water Repellent: Liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested according to ASTM E 514 as a wall assembly made with mortar containing integral water-repellent manufacturer's mortar additive, with test period extended to 24 hours, shall show no visible water or leaks on the back of test specimen.
 - a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Grace Construction Products, W. R. Grace & Co. - Conn.; Dry-Block.

2.3 BRICK

- A. General: Provide shapes indicated and as follows, with exposed surfaces matching finish and color of exposed faces of adjacent units:
1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
 2. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.
- B. Clay Face Brick: Facing brick complying with ASTM C 216.
1. Products: Subject to compliance with requirements, provide the following or approved equal:
 - a. Mutual Materials: "Inca - Smooth."

2. Grade: SW.
3. Type: FBS.
4. Initial Rate of Absorption: Less than 30 g/30 sq. in. (30 g/194 sq. cm) per minute when tested according to ASTM C 67.
5. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."
6. Size (Actual Dimensions): 3-1/2 inches (89 mm) wide by 3-1/2 inches (89 mm) high by 7-1/2 inches (190 mm) long or 3-5/8 inches (92 mm) wide by 3-5/8 inches (92 mm) high by 7-5/8 inches (194 mm) long.

2.4 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.
- D. Mortar Cement: ASTM C 1329.
- E. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C 979. Use only pigments with a record of satisfactory performance in masonry mortar.
 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. Davis Colors; True Tone Mortar Colors.
 - b. Lanxess Corporation; Bayferrox Iron Oxide Pigments.
 - c. Solomon Colors, Inc.; SGS Mortar Colors.
- F. Colored Cement Product: Packaged blend made from portland cement and hydrated lime masonry cement or mortar cement and mortar pigments, all complying with specified requirements, and containing no other ingredients.
 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. Colored Portland Cement-Lime Mix:
 - 1) Capital Materials Corporation; Riverton Portland Cement Lime Custom Color.
 - 2) Holcim (US) Inc.; Rainbow Mortamix Custom Color Cement/Lime.
 - 3) Lafarge North America Inc.; Eaglebond Portland & Lime.
 - 4) Lehigh Cement Company; Lehigh Custom Color Portland/Lime Cement.

2. Formulate blend as required to produce color indicated or, if not indicated, as selected from manufacturer's standard colors.
3. Pigments shall not exceed 10 percent of portland cement by weight.
4. For use with decorative CMU.

G. Aggregate for Mortar: ASTM C 144.

1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
3. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

H. Aggregate for Grout: ASTM C 404.

I. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.

J. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with concrete masonry units, containing integral water repellent by same manufacturer.

1. Products: Subject to compliance with requirements, provide the following:
 - a. Grace Construction Products, W. R. Grace & Co. - Conn.; Dry-Block Mortar Admixture.

K. Water: Potable.

2.5 REINFORCEMENT

A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60.

B. Masonry Joint Reinforcement, General: Where required by structural drawings, mill galvanized, carbon-steel wire for interior walls and hot-dip galvanized, carbon-steel wire for exterior walls in conformance with ASTM A 951/A 951M.

2.6 TIES AND ANCHORS

A. General: Ties and anchors shall extend at least 1-1/2 inches (38 mm) into veneer but with at least a 5/8-inch (16-mm) cover on outside face.

B. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:

1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M, with ASTM A 153/A 153M, Class B-2 coating.
2. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, with ASTM A 153/A 153M, Class B coating.

3. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- C. Individual Wire Ties: Rectangular units with closed ends and not less than 4 inches (100 mm) wide.
 1. Wire: Fabricate from 3/16-inch- (4.76-mm-) diameter, hot-dip galvanized-steel wire.
- D. Adjustable Anchors for Connecting to Structural Steel Framing and Steel Stud Framing: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
- E. Partition Top Anchors: 0.105-inch- (2.66-mm-) thick metal plate with a 3/8-inch- (9.5-mm-) diameter metal rod 6 inches (152 mm) long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from steel, hot-dip galvanized after fabrication.
- F. Rigid Anchors: Fabricate from steel bars 1-1/2 inches (38 mm) wide by 1/4 inch (6.35 mm) thick by 24 inches (610 mm) long, with ends turned up 2 inches (51 mm) or with cross pins unless otherwise indicated.
 1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A 153/A 153M or Epoxy coating 0.020 inch (0.51 mm) thick.
- G. Adjustable Masonry-Veneer Anchors:
 1. General: Provide anchors that allow vertical adjustment but resist a 100-lbf (445-N) load in both tension and compression perpendicular to plane of wall without deforming or developing play in excess of 1/16 inch (1.5 mm).
 2. Fabricate sheet metal anchor sections and other sheet metal parts from 0.075-inch- (1.90-mm-) thick steel sheet, galvanized after fabrication.
 3. Fabricate wire ties from 0.187-inch- (4.76-mm-) diameter, hot-dip galvanized-steel wire unless otherwise indicated.
 4. Seismic Masonry-Veneer Anchors: Connector section and rib-stiffened, sheet metal anchor section with screw holes top and bottom, and having slotted holes for inserting connector section. Connector section consists of a rib-stiffened, sheet metal bent plate, sheet metal clip, or wire tie with rigid PVC extrusion designed to engage continuous wire.
 5. Coated, Steel Drill Screws for Steel Studs: ASTM C 954 except with hex washer head and neoprene or EPDM washer, No. 10 (4.83-mm) diameter, and with coating with salt-spray resistance to red rust of more than 800 hours according to ASTM B 117.

2.7 EMBEDDED FLASHING MATERIALS

- A. Flexible Flashing: Use one of the following unless otherwise indicated:
 1. Rubberized-Asphalt Flashing: Composite flashing product consisting of a pliable, adhesive rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of not less than 40 mil.

- a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) Dayton Superior Corporation, Dur-O-Wal Division; Dur-O-Barrier Thru-Wall Flashing.
 - 2) Grace Construction Products, W. R. Grace & Co. - Conn.; Perm-A-Barrier Wall Flashing.
 - 3) Heckmann Building Products Inc.; No. 82 Rubberized-Asphalt Thru-Wall Flashing.
 - 4) Hohmann & Barnard, Inc.; Textroflash.
 - 5) W. R. Meadows, Inc.; Air-Shield Thru-Wall Flashing.
 - b. Accessories: Provide preformed corners, end dams, other special shapes, and seaming materials produced by flashing manufacturer. Provide termination bars for use in securing top of concealed flashings.
- B. Metal Flashing: Provide metal flashing, where flashing is exposed or partly exposed and where indicated, complying with SMACNA's "Architectural Sheet Metal Manual Division 07 Section "Sheet Metal Flashing and Trim" and as follows:
1. Stainless Steel: ASTM A 240/A 240M, Type 304, 0.025 inch thick.
 - a. Finish: Mill Finish.
 2. Fabricate continuous flashings in sections 96 inches long minimum, but not exceeding 12 feet. Provide soldered joints with a minimum 6-inch side lap with two lines of butyl sealant installed within lap.
 3. Metal Drip Edges: Fabricate from stainless steel. Extend at least 3 inches (75 mm) into wall and 1/2 inch (13 mm) out from wall, with outer edge bent down 30 degrees and hemmed.
- C. Solder and Sealants for Sheet Metal Flashings:
1. Solder for Stainless Steel: ASTM B 32, Grade Sn60, with acid flux of type recommended by stainless-steel sheet manufacturer.
 2. Elastomeric Sealant: ASTM C 920, chemically curing silicone sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

2.8 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; formulated from PVC.
- B. Preformed Control-Joint Gaskets: Made from PVC, complying with ASTM D 2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall.
- C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).
- D. Weep/Cavity Vent Products: Use one of the following unless otherwise indicated:
 1. Mesh Weep/Vent: Free-draining mesh; made from polyethylene strands, full height and width of head joint and depth 1/8 inch (3 mm) less than depth of outer wythe; in color selected from manufacturer's standard.

- E. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.
 - 1. Configuration: Provide one of the following:
 - a. Strips, full depth of cavity and 10 inches (250 mm) high, with dovetail shaped notches 7 inches (175 mm) deep that prevent clogging with mortar droppings.

2.9 MASONRY CLEANERS

- A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

2.10 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
 - 1. Do not use calcium chloride in mortar.
 - 2. Use portland cement-lime or mortar cement mortar unless otherwise indicated.
 - 3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification. Provide Type S unless another type is indicated.
 - 1. Provide standard color mortar at standard CMU and ground face CMU.
- D. Pigmented Mortar: Use colored cement product.
 - 1. Pigments shall not exceed 10 percent of portland cement by weight.
 - 2. Color: Match color of ground face CMU.
 - 3. Application: Use pigmented mortar for exposed mortar joints with the following units:
 - a. Ground Face CMU.
- E. Grout for Unit Masonry: Comply with ASTM C 476.
 - 1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
 - 2. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143/C 143M.
- F. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with concrete masonry units, containing integral water repellent by same manufacturer.

1. Products: Subject to compliance with requirements, provide the following:
 - a. Grace Construction Products, W. R. Grace & Co. - Conn.; Dry-Block Mortar Admixture.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.
- B. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- C. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.
 1. Mix units from several pallets or cubes as they are placed.
- D. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. (30 g/194 sq. cm) per minute when tested according to ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.

3.3 TOLERANCES

- A. Dimensions and Locations of Elements:
 1. For dimensions in cross section or elevation do not vary by more than plus 1/2 inch (12 mm) or minus 1/4 inch (6 mm).
 2. For location of elements in plan do not vary from that indicated by more than plus or minus 1/2 inch (12 mm).
 3. For location of elements in elevation do not vary from that indicated by more than plus or minus 1/4 inch (6 mm) in a story height or 1/2 inch (12 mm) total.
- B. Lines and Levels:
 1. For bed joints and top surfaces of bearing walls do not vary from level by more than 1/4 inch in 10 feet (6 mm in 3 m), or 1/2 inch (12 mm) maximum.

2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2 inch (12 mm) maximum.
3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2 inch (12 mm) maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2 inch (12 mm) maximum.
5. For lines and surfaces do not vary from straight by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2 inch (12 mm) maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), or 1/2 inch (12 mm) maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch (1.5 mm) except due to warpage of masonry units within tolerances specified for warpage of units.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm), with a maximum thickness limited to 1/2 inch (12 mm); do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch (3 mm).
2. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm). Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch (3 mm).

3.4 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less than nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.
- C. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.
- D. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- E. At masonry bearing conditions fill space between steel frames and masonry solidly with mortar unless otherwise indicated.
- F. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

- G. At non-bearing conditions fill space between steel frames and masonry with backer rod and sealant as indicated in Division 07 Section Joint Sealants.

3.5 MORTAR BEDDING AND JOINTING

- A. Lay hollow CMUs as follows:
 - 1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
 - 2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
 - 3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
 - 4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.
- B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- C. Tool exposed joints as follows:
 - 1. Slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

3.6 CONTROL AND EXPANSION JOINTS

- A. General: Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.

3.7 REINFORCED UNIT MASONRY INSTALLATION

- A. Temporary Formwork, Shores and Bracing: Construct formwork, shores and bracing as needed to support reinforced masonry elements during construction.
 - 1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
 - 2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other loads that may be placed on them during construction.
 - 3. Temporarily brace and support walls securely in position against loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to walls are secured.
- B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.
- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.

1. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
2. Limit height of vertical grout pours to not more than 60 inches (1520 mm).

3.8 ANCHORED MASONRY VENEERS

- A. Anchor masonry veneers to wall framing with seismic masonry-veneer anchors to comply with the following requirements:
1. Fasten seismic anchors through sheathing to wall framing and to concrete and masonry backup with metal fasteners of type indicated. Use two fasteners unless anchor design only uses one fastener.
 2. Embed tie sections in masonry joints.
 3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
 4. Space anchors as indicated, but not more than 18 inches (458 mm) o.c. vertically and horizontally. Install additional anchors within 12 inches (305 mm) of openings and at intervals, not exceeding 24 inches (610 mm), around perimeter.

3.9 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

- A. Anchor masonry to structural steel and concrete, where masonry abuts or faces structural steel or concrete, to comply with the following:
1. Provide an open space not less than 2 inches (50 mm) wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
 2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
 3. Space anchors as indicated, but not more than 24 inches (610 mm) o.c. vertically and 36 inches (915 mm) o.c. horizontally.

3.10 FLASHING, WEEP HOLES, CAVITY DRAINAGE AND VENTS

- A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated. Install vents at shelf angles, ledges, and other obstructions to upward flow of air in cavities, and where indicated.
- B. Install flashing as follows unless otherwise indicated:
1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape; adhere to recommendations of flashing manufacturer.
 2. At lintels and shelf angles, extend flashing a minimum of 6 inches (150 mm) into masonry at each end. At heads and sills, extend flashing 6 inches (150 mm) at ends and turn up not less than 2 inches (50 mm) to form end dams.

3. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch (13 mm) back from outside face of wall, and adhere flexible flashing to top of metal drip edge.
 4. Install metal flashing termination beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch (13 mm) back from outside face of wall, and adhere flexible flashing to top of metal flashing termination.
- C. Install weep holes in exterior wythes and veneers in head joints of first course of masonry immediately above embedded flashing.
1. Use specified weep/cavity vent products to form weep holes.
 2. Space weep holes 24 inches (600 mm) o.c. unless otherwise indicated.
 3. Cover cavity side of weep holes with plastic insect screening at cavities insulated with loose-fill insulation.
- D. Place cavity drainage material in cavities and airspace behind veneers to comply with configuration requirements for cavity drainage material in "Miscellaneous Masonry Accessories" Article.
- E. Install cavity vents in head joints in exterior wythes at spacing indicated. Use specified weep/cavity vent products to form cavity vents.
1. Close cavities off vertically and horizontally with blocking in manner indicated. Install through-wall flashing and weep holes above horizontal blocking.

3.11 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Contractor shall contact testing agency when ready for inspections of prescribed tasks and owner shall not be held responsible for contractor delays if testing agency is not allowed sufficient time to perform its inspections. Allow inspectors access to scaffolding and work areas, as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.
- B. Inspections: Level 1 special inspections according to the "International Building Code."
1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
 2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
 3. Place grout only after inspectors have verified proportions of site-prepared grout.
- C. Testing Frequency: One set of tests for each 5000 sq. ft. (464 sq. m) of wall area or portion thereof.
- A. Clay Masonry Unit Test: For each type of unit provided, according to ASTM C 67 for compressive strength.
- B. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.

3.12 PARGING

- A. Parge exterior faces of below-grade masonry walls, where indicated, in 2 uniform coats to a total thickness of 3/4 inch (19 mm). Dampen wall before applying first coat and scarify first coat to ensure full bond to subsequent coat.
- B. Use a steel-trowel finish to produce a smooth, flat, dense surface with a maximum surface variation of 1/8 inch per foot (3 mm per 300 mm). Form a wash at top of parging and a cove at bottom.
- C. Damp-cure parging for at least 24 hours and protect parging until cured.

3.13 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints. Do not allow material to accumulate in cavities.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
 - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 - 2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
 - 3. Protect adjacent non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
 - 4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
 - 5. Clean brick by bucket-and-brush hand-cleaning method described in "BIA Technical Notes 20."
 - 6. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.
 - 7. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.

3.14 MASONRY WASTE DISPOSAL

- A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

- B. Excess Masonry Waste: Remove excess clean masonry waste and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 042000

SECTION 047200 - CAST STONE MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Cast-stone trim including the following:
 - a. Coping.

- B. Related Sections:

- 1. Section 042000 "Unit Masonry" for installing cast-stone units in unit masonry.

1.3 ACTION SUBMITTALS

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

- 1. For cast-stone units, include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

- B. Shop Drawings: Show fabrication and installation details for cast-stone units. Include dimensions, details of reinforcement and anchorages if any, and indication of finished faces.

- 1. Include building elevations showing layout of units and locations of joints and anchors.

- C. Samples for Initial Selection: For colored mortar.

- D. Samples for Verification:

- 1. For each color and texture of cast stone required, 10 inches (250 mm) square in size.
 - 2. For each trim shape required, 10 inches (250 mm) in length.
 - 3. For mortar, make Samples using same sand and mortar ingredients to be used on Project.

- E. Full-Size Samples: For each shape of cast-stone unit required.

- 1. Make available for Architect's review at Project site.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer and testing agency.

1. Include copies of material test reports for completed projects, indicating compliance of cast stone with ASTM C 1364.
- B. Material Test Reports: For each mix required to produce cast stone, based on testing according to ASTM C 1364, including test for resistance to freezing and thawing.
 1. Provide test reports based on testing within previous two years.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer of cast-stone units similar to those indicated for this Project, that has sufficient production capacity to manufacture required units, and is a plant certified by the Cast Stone Institute, the Architectural Precast Association, or the Precast/Prestressed Concrete Institute for Group A, Category AT.
- B. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.
- C. Mockups: Furnish cast stone for installation in mockups specified in Section 042000 "Unit Masonry."
- D. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 1. Build mockup of typical coping at parapet, 5-sf. area as shown on Drawings.
 2. Build mockup of coping at parapet / column intersection, 5-sf. area as shown on Drawings.
 3. Mock-up may remain as part of the completed Work.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Coordinate delivery of cast stone with unit masonry work to avoid delaying the Work and to minimize the need for on-site storage.
- B. Pack, handle, and ship cast-stone units in suitable packs or pallets.
 1. Lift with wide-belt slings; do not use wire rope or ropes that might cause staining. Move cast-stone units if required, using dollies with wood supports.
 2. Store cast-stone units on wood skids or pallets with nonstaining, waterproof covers, securely tied. Arrange to distribute weight evenly and to prevent damage to units. Ventilate under covers to prevent condensation.
- C. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- D. Store mortar aggregates where grading and other required characteristics can be maintained and contamination can be avoided.

1.7 PROJECT CONDITIONS

- A. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Comply with cold-weather construction requirements in TMS 602/ACI 530.1/ASCE 6.
 - 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and above and will remain so until cast stone has dried, but no fewer than seven days after completing cleaning.
- B. Hot-Weather Requirements: Comply with hot-weather construction requirements in TMS 602/ACI 530.1/ASCE 6.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations for Cast Stone: Obtain cast-stone units from single source from single manufacturer.
- B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color, from one manufacturer for each cementitious component and from one source or producer for each aggregate.

2.2 CAST-STONE MATERIALS

- A. General: Comply with ASTM C 1364.
- B. Portland Cement: ASTM C 150/C 150M, Type I or Type III, containing not more than 0.60 percent total alkali when tested according to ASTM C 114. Provide natural color or white cement as required to produce cast-stone color indicated.
- C. Coarse Aggregates: Granite, quartz, or limestone complying with ASTM C 33/C 33M; gradation and colors as needed to produce required cast-stone textures and colors.
- D. Fine Aggregates: Natural sand or crushed stone complying with ASTM C 33/C 33M, gradation and colors as needed to produce required cast-stone textures and colors.
- E. Color Pigment: ASTM C 979/C 979M, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, free of carbon black, nonfading, and resistant to lime and other alkalis.
- F. Admixtures: Use only admixtures specified or approved in writing by Architect.
 - 1. Do not use admixtures that contain more than 0.1 percent water-soluble chloride ions by mass of cementitious materials. Do not use admixtures containing calcium chloride.
 - 2. Use only admixtures that are certified by manufacturer to be compatible with cement and other admixtures used.

3. Air-Entraining Admixture: ASTM C 260/C 260M. Add to mixes for units exposed to the exterior at manufacturer's prescribed rate to result in an air content of 4 to 6 percent, except do not add to zero-slump concrete mixes.
 4. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 5. Water-Reducing, Retarding Admixture: ASTM C 494/C 494M, Type D.
 6. Water-Reducing, Accelerating Admixture: ASTM C 494/C 494M, Type E.
- G. Reinforcement: Deformed steel bars complying with ASTM A 615/A 615M, Grade 60 (Grade 420). Use galvanized or epoxy-coated reinforcement when covered with less than 1-1/2 inches (38 mm) of cast-stone material.
1. Epoxy Coating: ASTM A 775/A 775M.
 2. Galvanized Coating: ASTM A 767/A 767M.
- H. Embedded Anchors and Other Inserts: Fabricated from stainless steel complying with ASTM A 240/A 240M, ASTM A 276, or ASTM A 666, Type 304.

2.3 CAST-STONE UNITS

- A. Approved Manufacturers:
1. Arcis Corp (P.O. Box 1250, North Plains OR 97133 (503) 647-5042 (www.arcis-corp.com) or approved equal.
- B. Regional Materials: Cast-stone units shall be manufactured within 500 miles (800 km) of Project site from aggregates and cement that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.
- C. Cast-Stone Units: Comply with ASTM C 1364.
1. Units shall be manufactured using the **vibrant dry tamp [wet-cast]** method.
 2. Units shall be resistant to freezing and thawing as determined by laboratory testing according to ASTM C 666/C 666M, Procedure A, as modified by ASTM C 1364.
- D. Fabricate units with sharp arris and accurately reproduced details, with indicated texture on all exposed surfaces unless otherwise indicated.
1. Slope exposed horizontal surfaces 1:12 to drain unless otherwise indicated.
 2. Provide raised fillets at backs of sills and at ends indicated to be built into jambs.
 3. Provide drips on projecting elements unless otherwise indicated.
- E. Fabrication Tolerances:
1. Variation in Cross Section: Do not vary from indicated dimensions by more than 1/8 inch (3 mm).
 2. Variation in Length: Do not vary from indicated dimensions by more than 1/360 of the length of unit or 1/8 inch (3 mm), whichever is greater, but in no case by more than 1/4 inch (6 mm).
 3. Warp, Bow, and Twist: Not to exceed 1/360 of the length of unit or 1/8 inch (3 mm), whichever is greater.

4. Location of Grooves, False Joints, Holes, Anchorages, and Similar Features: Do not vary from indicated position by more than 1/8 inch (3 mm) on formed surfaces of units and 3/8 inch (10 mm) on unformed surfaces.

F. Cure Units as Follows:

1. Cure units in enclosed, moist curing room at 95 to 100 percent relative humidity and temperature of 100 deg F (38 deg C) for 12 hours or 70 deg F (21 deg C) for 16 hours.
2. Keep units damp and continue curing to comply with one of the following:
 - a. No fewer than five days at mean daily temperature of 70 deg F (21 deg C) or above.
 - b. No fewer than six days at mean daily temperature of 60 deg F (16 deg C) or above.
 - c. No fewer than seven days at mean daily temperature of 50 deg F (10 deg C) or above.
 - d. No fewer than eight days at mean daily temperature of 45 deg F (7 deg C) or above.

G. Acid etch units after curing to remove cement film from surfaces to be exposed to view.

H. Colors and Textures: As selected by Architect from manufacturer's full range.

I. Colors and Textures: Provide units with fine-grained texture and buff color resembling smooth-finished Indiana limestone.

J. Colors and Textures: Provide units with fine texture and red-brown color resembling brownstone on adjacent buildings.

2.4 MORTAR MATERIALS

A. Provide mortar materials that comply with Section 042000 "Unit Masonry."

B. Regional Materials: Aggregate for mortar, cement, and lime shall be manufactured within 500 miles (800 km) of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.

C. Portland Cement: ASTM C 150/C 150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

D. Hydrated Lime: ASTM C 207, Type S.

E. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.

F. Masonry Cement: ASTM C 91/C 91M.

G. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C 979/C 979M. Use only pigments with a record of satisfactory performance in masonry mortar.

- H. Aggregate for Mortar: ASTM C 144.
 - 1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
 - 2. For joints less than 1/4 inch (6 mm) thick, use aggregate graded with 100 percent passing the No. 16 (1.18-mm) sieve.
 - 3. White-Mortar Aggregates: Natural white sand or crushed white stone.
 - 4. Colored Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.
- I. Water: Potable.

2.5 ACCESSORIES

- A. Anchors: Ashlar Anchor, fabricated from Type 304 stainless steel complying with ASTM A 240/A 240M, ASTM A 276, or ASTM A 666.
- B. Dowels: 1/2-inch- (12-mm-) diameter round bars, fabricated from Type 304 stainless steel complying with ASTM A 240/A 240M, ASTM A 276
- C. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cast-stone manufacturer and expressly approved by cleaner manufacturer for use on cast stone and adjacent masonry materials.

2.6 MORTAR MIXES

- A. Comply with requirements in Section 042000 "Unit Masonry" for mortar mixes.
- B. Do not use admixtures including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
 - 1. Do not use calcium chloride in mortar or grout.
 - 2. Use portland cement-lime mortar unless otherwise indicated.
- C. Comply with ASTM C 270, Proportion Specification.
 - 1. For setting mortar, use Type S
 - 2. For pointing mortar, use Type N.

2.7 SOURCE QUALITY CONTROL

- A. Engage a qualified independent testing agency to sample and test cast-stone units according to ASTM C 1364.
 - 1. Include one test for resistance to freezing and thawing.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SETTING CAST STONE IN MORTAR

- A. Install cast-stone units to comply with requirements in Section 042000 "Unit Masonry."
- B. Set cast stone as indicated on Drawings. Set units accurately in locations indicated, with edges and faces aligned according to established relationships and indicated tolerances.
 - 1. Install anchors, supports, fasteners, and other attachments indicated or necessary to secure units in place.
 - 2. Coordinate installation of cast stone with installation of flashing specified in other Sections.
- C. Wet joint surfaces thoroughly before applying mortar or setting in mortar.
- D. Set units in full bed of mortar with full head joints unless otherwise indicated.
 - 1. Set units with joints 1/4 to 3/8 inch (6 to 10 mm) wide unless otherwise indicated.
 - 2. Build anchors and ties into mortar joints as units are set.
 - 3. Fill dowel holes and anchor slots with mortar.
 - 4. Fill collar joints solid as units are set.
 - 5. Build concealed flashing into mortar joints as units are set.
 - 6. Keep head joints in copings and between other units with exposed horizontal surfaces open to receive sealant.
 - 7. Keep joints at shelf angles open to receive sealant.
- E. Rake out joints for pointing with mortar to depths of not less than 3/4 inch (19 mm). Rake joints to uniform depths with square bottoms and clean sides. Scrub faces of units to remove excess mortar as joints are raked.
- F. Point mortar joints by placing and compacting mortar in layers not greater than 3/8 inch (10 mm). Compact each layer thoroughly and allow it to become thumbprint hard before applying next layer.
- G. Tool exposed joints slightly concave when thumbprint hard. Use a smooth plastic jointer larger than joint thickness.
- H. Rake out joints for pointing with sealant to depths of not less than 3/4 inch (19 mm). Scrub faces of units to remove excess mortar as joints are raked.

- I. Point joints with sealant to comply with applicable requirements in Section 079200 "Joint Sealants."
 - 1. Prime cast-stone surfaces to receive sealant and install compressible backer rod in joints before applying sealant unless otherwise indicated.
- J. Provide sealant joints at head joints of copings and other horizontal surfaces; at expansion, control, and pressure-relieving joints; and at locations indicated.
 - 1. Keep joints free of mortar and other rigid materials.
 - 2. Build in compressible foam-plastic joint fillers where indicated.
 - 3. Form joint of width indicated, but not less than 3/8 inch (10 mm).
 - 4. Prime cast-stone surfaces to receive sealant and install compressible backer rod in joints before applying sealant unless otherwise indicated.
 - 5. Prepare and apply sealant of type and at locations indicated to comply with applicable requirements in Section 079200 "Joint Sealants."

3.3 SETTING ANCHORED CAST STONE WITH SEALANT-FILLED JOINTS

- A. Set cast stone as indicated on Drawings. Set units accurately in locations indicated, with edges and faces aligned according to established relationships and indicated tolerances.
 - 1. Install anchors, supports, fasteners, and other attachments indicated or necessary to secure units in place.
 - 2. Shim and adjust anchors, supports, and accessories to set cast stone in locations indicated with uniform joints.
- B. Keep cavities open where unfilled space is indicated between back of cast-stone units and backup wall; do not fill cavities with mortar or grout.
- C. Fill anchor holes with sealant.
 - 1. Where dowel holes occur at pressure-relieving joints, provide compressible material at ends of dowels.
- D. Set cast stone supported on clip or continuous angles on resilient setting shims. Use material of thickness required to maintain uniform joint widths. Hold shims back from face of cast stone a distance at least equal to width of joint.
- E. Keep joints free of mortar and other rigid materials. Remove temporary shims and spacers from joints after anchors and supports are secured in place and cast-stone units are anchored. Do not begin sealant installation until temporary shims and spacers are removed.
 - 1. Form open joint of width indicated, but not less than 3/8 inch (10 mm).
- F. Prime cast-stone surfaces to receive sealant and install compressible backer rod in joints before applying sealant unless otherwise indicated.
- G. Prepare and apply sealant of type and at locations indicated to comply with applicable requirements in Section 079200 "Joint Sealants."

3.4 INSTALLATION TOLERANCES

- A. Variation from Plumb: Do not exceed 1/8 inch in 10 feet (3 mm in 3 m), maximum.
- B. Variation from Level: Do not exceed 1/8 inch in 10 feet (3 mm in 3 maximum.
- C. Variation in Joint Width: Do not vary joint thickness more than 1/8 inch in 36 inches (3 mm in 900 mm) or one-fourth of nominal joint width, whichever is less.
- D. Variation in Plane between Adjacent Surfaces (Lipping): Do not vary from flush alignment with adjacent units or adjacent surfaces indicated to be flush with units by more than 1/16 inch (1.5 mm), except where variation is due to warpage of units within tolerances specified.

3.5 ADJUSTING AND CLEANING

- A. Remove and replace stained and otherwise damaged units and units not matching approved Samples. Cast stone may be repaired if methods and results are approved by Architect.
- B. Replace units in a manner that results in cast stone matching approved Samples, complying with other requirements, and showing no evidence of replacement.
- C. In-Progress Cleaning: Clean cast stone as work progresses.
 - 1. Remove mortar fins and smears before tooling joints.
 - 2. Remove excess sealant immediately, including spills, smears, and spatter.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed cast stone as follows:
 - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 - 2. Test cleaning methods on sample; leave one sample uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of cast stone.
 - 3. Protect adjacent surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
 - 4. Wet surfaces with water before applying cleaners; remove cleaners promptly by rinsing thoroughly with clear water.
 - 5. Clean cast stone by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
 - 6. Clean cast stone with proprietary acidic cleaner applied according to manufacturer's written instructions.

END OF SECTION 047200

SECTION 071113 - BITUMINOUS DAMPPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Cold-applied, emulsified-asphalt dampproofing.
- B. Related Requirements:
 - 1. Division 03 Section "Cast-in-Place Concrete".
 - 2. Division 07 Section "Hot-Fluid-Applied Rubberized Asphalt Waterproofing".
 - 3. Division 07 Section "Fluid-Applied Membrane Air Barriers"

1.3 ACTION SUBMITTALS

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

1.4 FIELD CONDITIONS

- A. Weather Limitations: Proceed with application only when existing and forecasted weather conditions permit dampproofing to be performed according to manufacturers' written instructions.
- B. Ventilation: Provide adequate ventilation during application of dampproofing in enclosed spaces. Maintain ventilation until dampproofing has cured.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Source Limitations: Obtain primary dampproofing materials and primers from single source from single manufacturer. Provide protection course and auxiliary materials recommended in writing by manufacturer of primary materials.
- B. VOC Content: Products shall comply with VOC content limits of authorities having jurisdiction unless otherwise required.

2.2 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. APOC, Inc.; a division of Gardner-Gibson.
 - 2. BASF Construction Chemicals - Building Systems; Sonneborn Brand Products.
 - 3. Brewer Company (The).
 - 4. ChemMasters, Inc.
 - 5. Euclid Chemical Company (The); an RPM company.
 - 6. Gardner-Gibson, Inc.
 - 7. Henry Company.
 - 8. Karnak Corporation.
 - 9. Koppers Inc.
 - 10. Malarkey Roofing Products.
 - 11. Meadows, W. R., Inc.
- B. Trowel Coats: ASTM D 1227, Type II, Class 1.
- C. Fibered Brush and Spray Coats: ASTM D 1227, Type II, Class 1.
- D. Brush and Spray Coats: ASTM D 1227, Type III, Class 1.
- E. VOC Content: 30 g/L or less.

2.3 AUXILIARY MATERIALS

- A. General: Furnish auxiliary materials recommended in writing by dampproofing manufacturer for intended use and compatible with bituminous dampproofing.
- B. Emulsified-Asphalt Primer: ASTM D 1227, Type III, Class 1, except diluted with water as recommended in writing by manufacturer.
- C. Asphalt-Coated Glass Fabric: ASTM D 1668, Type I.
- D. Patching Compound: Epoxy or latex-modified repair mortar of type recommended in writing by dampproofing manufacturer.
- E. Protection Course: ASTM D 6506, 1/8-inch- thick, semirigid sheets of fiberglass or mineral-reinforced-asphaltic core, pressure laminated between two asphalt-saturated fibrous liners.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions with Applicator present, for compliance with requirements for surface smoothness, surface moisture, and other conditions affecting performance of bituminous dampproofing work.

1. Test for surface moisture according to ASTM D 4263.

B. Proceed with application only after substrate construction and penetrating work have been completed and unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Mask or otherwise protect adjoining exposed surfaces from being stained, spotted, or coated with dampproofing. Prevent dampproofing materials from entering and clogging weep holes and drains.

B. Clean substrates of projections and substances detrimental to the dampproofing work; fill voids, seal joints, and remove bond breakers if any, as recommended in writing by prime material manufacturer.

C. Apply patching compound to patch and fill tie holes, honeycombs, reveals, and other imperfections.

3.3 APPLICATION, GENERAL

A. Comply with manufacturer's written instructions for dampproofing application, cure time between coats, and drying time before backfilling unless more stringent requirements are indicated.

1. Apply dampproofing to provide continuous plane of protection.

2. Apply additional coats if recommended in writing by manufacturer or to achieve a smooth surface and uninterrupted coverage.

B. Where dampproofing footings and foundation walls, apply from finished-grade line to top of footing; extend over top of footing and down a minimum of 6 inches over outside face of footing.

1. Extend dampproofing 12 inches onto intersecting walls and footings, but do not extend onto surfaces exposed to view when Project is completed.

2. Install flashings and corner protection stripping at internal and external corners, changes in plane, construction joints, cracks, and where shown as "reinforced," by embedding an 8-inch-wide strip of asphalt-coated glass fabric in a heavy coat of dampproofing. Dampproofing coat for embedding fabric is in addition to other coats required.

3.4 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

A. Concrete Foundations: Apply one fibered brush or spray coat at not less than 3 gal./100 sq. ft. or one trowel coat at not less than 4 gal./100 sq. ft.

B. Unparged Masonry Foundation Walls: Apply primer and one fibered brush or spray coat at not less than 3 gal./100 sq. ft. or primer and one trowel coat at not less than 5 gal./100 sq. ft.

3.5 INSTALLATION OF PROTECTION COURSE

- A. Install protection course over completed-and-cured dampproofing. Comply with dampproofing-material and protection-course manufacturers' written instructions for attaching protection course.
 - 1. Support protection course over cured coating with spot application of adhesive type recommended in writing by protection-board manufacturer.
 - 2. Install protection course within 24 hours of installation of dampproofing (while coating is tacky) to ensure adhesion.

3.6 CLEANING

- A. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended in writing by manufacturer of affected construction.

END OF SECTION 071113

SECTION 074616 - ALUMINUM SIDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes aluminum siding and soffit.

1.3 COORDINATION

- A. Coordinate siding installation with flashings and other adjoining construction to ensure proper sequencing.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Samples for Verification: For each type, color, texture, and pattern required.
 - 1. 12-inch- (300-mm-) long-by-actual-width Sample of siding.

1.6 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of aluminum siding and soffit.
- B. Research/Evaluation Reports: For each type of aluminum siding required, from ICC-ES.
- C. Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of product, including related accessories, to include in maintenance manuals.

1.8 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and to set quality standards for fabrication and installation.
 - 1. Build mockups for siding and soffit including accessories.
 - a. Size: 48 inches long by 60 inches high.
 - b. Include outside corner on one end of mockup and inside corner on other end.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with labels intact until time of use.
- B. Store materials on elevated platforms, under cover, and in a dry location.

1.10 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace products that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - 2. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain products, including related accessories, from single source from single manufacturer.

2.2 ALUMINUM SOFFIT

- A. Aluminum Soffit: Formed and coated product complying with AAMA 1402.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Longboard Premium Soffit and Siding.
- B. Pattern: 6-inch nominal exposure in V-groove style as indicated on drawings.
- C. Texture: Smooth.

- D. Thickness: 1.57 mm.
- E. Finish: Manufacturer's standard.
 - 1. Colors: Light Fir.

2.3 ACCESSORIES

- A. Siding Accessories, General: Provide starter strips, edge trim, outside and inside corner caps, and other items as recommended by siding manufacturer for building configuration.
 - 1. Provide accessories made from same material as and matching color and texture of adjacent siding unless otherwise indicated.
- B. Flashing: Provide aluminum flashing complying with Section 076200 "Sheet Metal Flashing and Trim" at window and door heads and where indicated.
 - 1. Finish for Aluminum Flashing: High-performance organic finish, same color as siding.
- C. Fasteners:
 - 1. For fastening to metal, use ribbed bugle-head screws of sufficient length to penetrate a minimum of 1/4 inch, or three screw-threads, into substrate.
 - 2. For fastening aluminum, use aluminum fasteners. Where fasteners are exposed to view, use prefinished aluminum fasteners in color to match item being fastened.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of aluminum siding and soffit and related accessories.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of projections and substances detrimental to application.

3.3 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.
 - 1. Center nails in elongated nailing slots without binding siding to allow for thermal movement.
- B. Install aluminum siding and soffit and related accessories according to AAMA 1402.

1. Install fasteners no more than 24 inches o.c.
- C. Install joint sealants as specified in Section 079200 "Joint Sealants" and to produce a weathertight installation.
- D. Where aluminum siding contacts dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape or installing nonconductive spacers as recommended by manufacturer for this purpose.

3.4 ADJUSTING AND CLEANING

- A. Remove damaged, improperly installed, or otherwise defective materials and replace with new materials complying with specified requirements.
- B. Clean finished surfaces according to manufacturer's written instructions and maintain in a clean condition during construction.

END OF SECTION 074616

SECTION 095426 – LINEAR WOOD CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes:
 - 1. Concealed suspension system for Linear Wood Ceiling Panels
 - 2. Linear Wood Ceiling Panels for concealed suspension system.
 - 3. Trim and accessories.
 - 4. Seismic restraints for suspended ceiling system.

1.3 DEFINITIONS

- A. LR: Light Reflectance coefficient.
- B. NRC: Noise Reduction Coefficient.
- C. ASTM A 641: Standard Specification for Zinc Coated (Galvanized) Carbon Steel Wire; 1992.
- D. ASTM C 423: Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method; 1990.
- E. ASTM C 635: Standard Specifications for Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings.
- F. ASTM C 636: Standard Practice for Installation of Wood ceiling Suspension Systems for Acoustical Tile and Lay-in Panels; 1992.
- G. ASTM E 84: Standard Test Method for Surface Burning Characteristics of Building Materials; 1991.
- H. ASTM E 580: Standard Practice for Application of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Requiring Seismic Restraint; 1991.
- I. AWI (QSI): Architectural Woodwork Quality Standards Illustrated; 2003.
- J. CISCA: Ceiling Systems Handbook.

1.4 COORDINATION

- A. Coordinate layout and installation of linear wood ceiling system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples for Initial Selection: For components with factory-applied color and other decorative finishes.
- C. Installation Details: Provide installation details indicating compliance with performance requirements.
- D. Delegated-Design Submittal: For suspended cloud ceilings or other suspended ceiling assemblies not in compliance with prescriptive performance criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.7 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each linear wood ceiling, for tests performed by a qualified testing agency.
- B. Evaluation Reports: For linear wood ceiling and components and anchor and fastener type.
- C. Field quality-control reports.

1.8 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For finishes to include in maintenance manuals.

1.9 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer, approved by wood ceiling manufacturer, who has completed panel ceilings similar in species, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- B. Inspection: All work must pass inspection and approval of architect, as well as the local codes and regulations or authorities having jurisdiction.

- C. Single-Source Responsibility for Wood Ceiling System: Obtain each type of Linear Wood Ceiling Panels from a single fabricator, with in-house Shop Drawing capabilities, in-house assembly and finishing capabilities, and with resources to provide products of consistent quality in appearance and physical properties without delaying the project.
- D. Single-Source Responsibility for Suspension System: Obtain each type of suspension system from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying project.
- E. Seismic Standard: Provide acoustical panel ceilings designed and installed to withstand the effects of earthquake motions according to the following:
 - 1. ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads."

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Delivery & Unloading: Coordinate crate sizes, weights, unloading options, and delivery schedule with manufacturer prior to fabrication. Deliver wood panels and suspension system components to Project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other mistreatment.
- B. Acclimatization: Before installing wood panels, permit them to reach room temperature and a stabilized moisture content (at least 72 hours) per AWI standards.
- C. Handle linear wood ceiling panels carefully to avoid chipping edges or damaging units in any way.
- D. Protection:
 - 1. Personnel: Follow good safety and industrial hygiene practices during handling and installing of all products and systems, with personnel to take necessary precautions and wear appropriate protective equipment as needed. Read related literature for important information on products before installation. Contractor to be solely responsible for all personal safety issues during and subsequent to installation; architect, specifier, owner, and manufacturer will rely on contractor's performance in such regard.
 - 2. Existing completed work: Protect completed work above suspension system from damage during installation of suspension system components.

1.11 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install linear wood ceiling panels until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.12 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Linear Wood Ceiling Panels: Furnish quantity of full-size units equal to 2.0 percent of amount installed.
 - 2. Suspension System Components: Furnish quantity of each component equal to 2.0 percent of amount installed.
- B. Warranties: Provide owner with a (1) year warranty for material and workmanship on all installed products.
 - 1. Manufacturers: All materials, wood ceiling and grid, shall be warranted for (1) one year for material and workmanship.
 - 2. Installer: All work shall be warranted for (1) year from final acceptance of completed work.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer to design seismic restraints and attachment devices.
- B. Structural Performance: Linear wood ceilings shall withstand the effects of gravity loads and the following loads and stresses without showing permanent deformation of ceiling system components including pans and suspension system; noise or metal fatigue caused by vibration, deflection, and displacement of ceiling pans; or permanent damage to fasteners and anchors:
 - 1. Seismic Criteria: Provide linear wood ceilings designed and installed to withstand the effects of earthquake motions according to the following:
 - a. ASCE/SEI 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads."
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
 - 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F material surfaces.
- D. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: Comply with ASTM E 1264 for Class C materials.
 - 2. Smoke-Developed Index: 450 or less.

2.2 LINEAR WOOD CEILING PANELS AND SUSPENSION SYSTEM

- A. General: The following manufacturer is basis of design:
 - 1. 9Wood, Inc. (www.9wood.com): 2100 Panelized Linear.
 - 2. Or equal, as prior approved by Architect.

2.3 LINEAR WOOD CEILING PANELS

- A. Basis-of-Design Product: 9Wood, Inc. Linear, Series 2000
 - 1. Wood Panels: 2100 Panelized Linear, SKU 2113-4
 - a. Species: Doug Fir – Solid, Vertical Grain.
 - b. Member Size: 2 ¼” x 5/8”.
 - c. Edge Profile: Square.
 - d. Reveal: ¾.
 - e. Members/LF: 4 Members/LF.
 - f. Assembly Style: Standard Backer (black).
 - g. Panel Sizes: Varies, see reflected ceiling plan.
 - h. Finish: Clear Satin Sheen Finish.
 - i. Reveal Scrim: Standard Black reveal scrim.
 - j. Access Panels: Allow two (2) 2’ x 8’-4” and one (1) 2’ x 6’-0” Access Panels with Caddy Clips for each panel.

2.4 METAL SUSPENSION SYSTEMS, GENERAL

- A. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635.
- B. Metal T-Grid Suspension System: Provide standard interior Metal Heavy Duty 15/16 suspension T-Grid system using Main Runners, Cross-tees, Wall Angle or Shadow Moldings of types, structural classifications, and black finishes indicated and that comply with applicable ASTM C 635 requirements. Comply with all applicable seismic codes and ordinances.
- C. Attachment Devices: Size for 3 times the design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.
- D. Wire, Braces, Ties, Hanger Rods, Flat Hangers and Angle Hangers: Provide wires, rods and hangers that comply with applicable ASTM specifications.

- E. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.
- F. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. General: Examine substrates and structural framing to which ceilings attach or abut, with installer present, for compliance with requirements specified in this and other sections that affect ceiling installation and anchorage. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Coordination: Furnish layouts for cast-in-place anchors, clips, and other ceiling anchors whose installation is specified in other Sections.
- B. Layout: Measure each ceiling area and establish the layout of Linear Wood Ceiling Panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and conform to the layout shown on reflected ceiling plans in accordance with wood ceiling manufacturer's approved Shop Drawings.

3.3 INSTALLATION

- A. General: Install 9Wood, Inc. Interior Panelized Linear, Style 2100 to comply with ASTM C 636 and seismic design requirements indicated, per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
- B. Suspend ceiling hangers from building's structural members and as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 - 2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
 - 4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.

5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both structure to which hangers are attached and type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
 6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, post-installed mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
 7. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
 8. Do not attach hangers to steel deck tabs.
 9. Do not attach hangers to steel roof deck. Attach hangers to structural members.
 10. Space hangers not more than 48 inches (1200 mm) o.c. along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 8 inches (200 mm) from ends of each member.
 11. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
- C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or post-installed anchors.
- D. Installation of Panelized Linear Wood (Style 2100): Install Linear Wood ceiling panels in accordance with manufacturer's installation instructions and in compliance with all local codes and regulations. Install with undamaged edges and fitted accurately to suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit, as required.
- E. Suspension Runners: Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members. Install number and use on-center spacing per wood ceiling manufacturer's instructions, as indicated on approved Shop Drawings and in compliance with all local codes.

3.4 CLEANING

- A. Clean exposed wood surfaces of 9Wood, Inc. Style 2100 Linear Wood Ceiling Panels. Comply with manufacturer's instructions for cleaning and touchup of minor finish damage. Remove and replace wood ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage

END OF SECTION 095426

SECTION 109000 – BASEBALL EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Types of miscellaneous specialties required include:
 - 1. Stadium Wall Padding.
 - 2. Post Padding.

1.3 SUBMITTALS

- A. Shop Drawings: Provide drawings of the manufacturer's recommended installation and foundation requirements prior to actual field installation work, for Architect's review.
- B. Product Data: Submit manufacturer's technical data and installation instructions for all items specified herein.
- C. Samples: Padding and standard manufacturer's colors.

PART 2 - PRODUCTS

2.1 BASEBALL EQUIPMENT

- A. Stadium Wall Padding. Basis of Design: PROZone® Stadium Padding as manufactured by Promats Athletics, LLC (P.O. Box 2489, Salisbury, NC 28145, P. 800-617-7125; F: 704-637-2145; <http://www.promatsathletics.com/>) or approved equal.
 - 1. Components:
 - a. 2" SKYDEX combined with 1" High Impact Polyurethane Foam
 - b. Corrugated Plastic Sheet Backer Board
 - c. 18 oz. High UV Laminated Vinyl
 - d. G-max Rating – 37 (ASTM F2440)
 - e. Colors per manufactures standard selection as selected by architect
 - f. 1 Year Limited Warranty
- B. Post Padding. Basis of Design: PROZone® Post Padding, Model # CLP as manufactured by Promats Athletics, LLC (P.O. Box 2489, Salisbury, NC 28145, P. 800-617-7125; F: 704-637-2145; <http://www.promatsathletics.com/>) or approved equal.
 - 1. Components:
 - a. Vinyl Covering:
 - 1) EcoGuard® 18 oz. per sq. yard extruded vinyl, manufactured using 33% reprocessed vinyl

- 2) Fabric: 1000 Denier Polyester Basic Fabric
 - 3) Tear strength test: warp 78 lbs., fill 65 lbs
 - 4) Tensile strength: warp 224 lbs., fill 220 lbs
 - 5) Weft insertion: 9 x 9, Superior UV inhibitors
 - 6) Cold crack: minus 20 degrees Fahrenheit, Class A flame retardant
 - 7) Vinyl cover is stitched using 6 lb. bonded polyester black thread
 - 8) Colors per manufactures standard selection as selected by architect
 - 9) 5 year limited no fade warranty
- b. 3" High impact foam
 - c. 18 oz. High UV Laminated Vinyl
 - d. 1 1/2" vinyl flap with #2 Stainless Steel grommets every 12" O.C.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install Baseball Equipment in accordance with applicable standards, manufacturer's published instructions and current recommendations, and approved shop drawings.

END OF SECTION



Lori Fulton
Oregon State University
Design and Construction
130 Oak Creek
Corvallis, Oregon 97331

August 13, 2013

**Goss Stadium Expansion
Geotechnical Consultation
Corvallis, Oregon**

Project 2131053

Dear Ms. Fulton:

We have completed the requested update to the Seismic Hazard Study Report completed by Foundation Engineering, Inc. (FEI), dated September 17, 2007, for the previous Goss Stadium expansion. In addition, recommendations for the design and construction of spread footing foundations and earthwork during wet weather are provided for the current expansion.

PROJECT DESCRIPTION

The expansion is a single-story structure with a roof deck and canopy. It will be located in the northeast corner of Goss Stadium, between the existing main concourse and a storage shed. A bridge will connect the existing main concourse with the new structure.

PREVIOUS STUDY

The 2007 seismic hazard study was completed to identify potential geologic and seismic hazards and evaluate the effect those hazards may have had on the proposed site. Results of the study suggested no seismic hazards were present that would preclude moving forward with the expansion or would require mitigation. The 2007 study was based on the requirements presented in the 2007 Oregon Structural Specialty Code (OSSC), Section 1802.7 for site-specific seismic hazard reports for Special Occupancy Structures.

A geotechnical investigation and site-specific seismic hazard evaluation for the stadium was completed by Geotechnical Resources, Inc. (GRI) in March, 1988. Borings drilled for GRI's work and adjacent borings completed by FEI were used to complete the previous and current study.

CURRENT STUDY

The current study is based on the requirements presented in the 2010 OSSC, Section 1802.7, which is based on the 2009 International Building Code (IBC). Modifications to the 2007 study are limited to sections addressing Seismic Hazards, Design Earthquakes and Site Response Spectrum.

SEISMIC HAZARDS

Code Requirement and Background Information

The OSSC (2010) Section 1803.7 requires the evaluation of risks from a range of seismic hazards including; ground motion amplification, ground rupture, earthquake induced landslides, liquefaction and lateral spread, and tsunami/seiche. Investigations have been completed by DOGAMI to identify geologic and seismic hazards in the Southern Willamette Valley and Eastern Benton County (Wang et al., 2001; Burns et al., 2008) We have also developed conclusions regarding seismic hazards based on previous geotechnical and seismic hazard studies performed within the project vicinity, our knowledge of the site geology, and the soil profile encountered in previous explorations at the site.

Ground Motion Amplification

The influence of a soil deposit on the earthquake motion is routinely evaluated in terms of Site Effects, in which an estimate of the amplification or de-amplification of the underlying bedrock/firm soil seismic motions is made. As seismic energy propagates up through the soil strata, the energy is typically increased (i.e., amplified) or decreased (i.e., attenuated) to some extent. The new building will be constructed on alluvial soils. The typical profile consists of medium stiff to stiff, clayey silt followed by dense, silty gravel to gravelly sand. Stiff to very stiff, silty clay extends below the sand and gravel to the limits of the explorations. Based on the subsurface conditions, it is our opinion that the amplification hazard is moderate. This conclusion is consistent with DOGAMI's amplification hazard map, C to D Soil Type (low to moderate hazard) (Wang et al., 2001). The relative ground-shaking amplification susceptibility map for Benton County indicates that there is a moderate to high susceptibility to amplification (C to D, NEHRP Site Class) (Burns et al., 2008).

A recently completed liquefaction hazard study for the OSU Student Experience Center revealed the seismic hazard is dominated by CSZ events, capable of producing Peak Ground Accelerations on rock (PGA_{rock}) of $\pm 0.20g$. Ground response analyses using the equivalent linear model SHAKE (FEI, 2003) were completed by Theodore and Dickenson (1999) for various Corvallis sites (with two on campus). Results of the study indicate amplification ratios in the range of ± 1.4 to 1.8, for ground motions associated with CSZ events with a PGA_{rock} of $\pm 0.20g$ (Theodore and Dickenson, 1999). In addition, amplification ratios for CSZ events for the study completed by FEI for Reser Stadium yielded similar values. This range of PGA amplification ratios was developed for sites having a soil profile corresponding to a Site Class D (IBC, 2009; OSSC, 2010), consistent with the Goss Stadium site. On the basis of the location of the ground motion studies relative to this site, an amplification ratio of 1.6 would be applied to the PGA_{rock} to estimate the PGA at the ground surface.

Liquefaction and Lateral Spread

Liquefiable soils typically consist of loose, fine sand and non-plastic or low plasticity (i.e., plasticity index less than 8) silt below the ground water table (Boulanger and Idriss, 2004; Boulanger and Idriss, 2006). Soils meeting these criteria were not encountered in previous explorations at the site by GRI. Therefore, it is our opinion that the risk of cyclically-induced liquefaction, ground subsidence or bearing capacity failure due to liquefaction is negligible. The relative liquefaction susceptibility is mapped as low (Wang et al., 2001; Burns et al., 2008) and is consistent with our findings.

The risk of seismically-induced lateral spread is also negligible due to the flat terrain. Additional background citations for the liquefaction hazard section are found in the references (Youd and Idriss, 1996; Youngs et al., 1997; Youd et al., 2001).

Ground Rupture

The risk of ground rupture is non-existent due to the lack of known faulting beneath the site. However, hidden and/or deep-seated active faults could remain undetected. Additionally, recent crustal seismic activity cannot always be tied to observable faults. In the event of a catastrophic earthquake with a large seismic moment, inactive faults could potentially be reactivated.

Landslides and Earthquake-Induced Landslides

The potential risk of an earthquake-induced landslide at the site is low due to relatively flat terrain. The landslide and earthquake induced landslide hazard maps for the project area also classifies this hazard as low and with no identified landslide areas (Wang et al., 2001; Burns et al., 2008).

Tsunami/Seiche

Tsunami inundation is not applicable to this site since Corvallis is not on the Oregon Coast. Seiche (the back and forth oscillations of a water body during a seismic event) is also not a concern due to the absence of large bodies of water near the site.

DESIGN EARTHQUAKES AND SITE RESPONSE SPECTRUM

Design Earthquakes

The OSSC (2010), Section 1803.3.2.1, requires the design of structures classified as essential or hazardous facilities, and major and special-occupancy structures address, at a minimum, the following earthquakes:

- Crustal: A shallow crustal earthquake on a real or assumed fault near the site with a minimum moment magnitude (M_w) of 6.0 or the design earthquake ground motion acceleration determined in accordance with the 2010 OSSC Section 1613.

Intraplate: A deep subduction earthquake (Benioff Zone earthquake) with a moment magnitude (M_w) of 7.0 or greater on the seismogenic part of the subducting plate (Juan de Fuca) of the CSZ.

Interface: A subduction earthquake with a minimum moment magnitude (M_w) of 8.5 on the seismogenic part of the interface between the Juan de Fuca and the North American Plates on the CSZ.

The design maximum considered earthquake ground motion maps provided in the OSSC (2010) are based on the USGS 2002 maps for an earthquake with a 2% probability of exceedence in 50 years (i.e., a $\pm 2,475$ -year return period). The USGS 2002 maps were established based on probabilistic studies and include aggregate hazards from a variety of seismic sources. This information obtained from the USGS National Earthquake Hazard Mapping website indicates the following earthquake magnitudes and source-to-site distances were used for the USGS 2002 maps (USGS, 2002a):

Crustal: M_w 6.1 earthquake located ± 7 miles from the site.

Subduction: M_w 8.3 earthquake located ± 29 to 48 miles from the site.

Subduction: M_w 9.0 earthquake located ± 29 to 48 miles from the site.

The earthquake magnitudes and source-to-site distances used to generate the USGS 2002 maps satisfy the requirements of the 2010 OSSC.

Peak Bedrock Acceleration

Peak ground accelerations and spectral accelerations (on rock) were obtained from the USGS (2002) ground motion maps for an earthquake with a 2% probability of exceedence in 50 years (i.e., a $\pm 2,475$ -year return period). The peak ground acceleration (on rock) and 0.2 second and 1.0 second spectral accelerations for the site are summarized in Table 1 (USGS, 2002b).

Table 1. Peak Ground Acceleration and the 0.2 and 1.0 Second Spectral Accelerations (on rock) for the Maximum Considered Earthquake 2,475-Year Return Interval

USGS Maps	Location (Latitude, Longitude)	Peak Ground Acceleration (on rock)	Spectral Acceleration at 0.2 Sec.	Spectral Acceleration at 1.0 Sec.
2002	44.5628°, 123.2771°	0.34g	0.82g	0.40g

Site Response Spectrum

A site response spectrum was generated based on the IBC (2009) criteria. Results from previous field explorations at and near the site suggest the upper ± 100 feet of the subsurface profile consists primarily of stiff fine-grained soils and medium dense to very dense sand and gravel. Based on the SPT values recorded in the soils, we

have concluded a Site Class D is appropriate for the site. Therefore, the procedure outlined in the IBC (2009) Section 1613 was used to establish the site response spectrum. The design parameters are summarized in Table 2. The General Procedure response spectrum developed using these parameters is plotted on Figure 1 (attached). The figure includes a factored response spectrum with the two-thirds reduction of S_{MS} and S_{M1} as discussed in the IBC (2009).

Table 2. OSSC 2010/IBC 2009 Seismic Design Parameters

Site Class	PGA	S_s	S_1	F_a	F_v	S_{MS}	S_{M1}	S_{DS}	S_{D1}
D	0.34g	0.82	0.40	1.17	1.60	0.96	0.64	0.64	0.43

Notes:

1. S_s and S_1 were established using USGS (2002) maximum considered earthquake spectral acceleration maps for 2% probability of exceedence in 50 years.
2. F_a and F_v were established based on IBC 2009, Tables 1613.5.3(1) and 1613.5.3(2) using the selected S_s and S_1 values.
3. S_{DS} and S_{D1} values include a 2/3 reduction on S_{MS} and S_{M1} as discussed in IBC 2009 Section 1613.5.4.

CONCLUSION

Based on the updated information presented herein and the geologic findings summarized in our 2007 report, it is our opinion there are no geologic or seismic hazards that require mitigation or would preclude construction of the proposed building.

CONSTRUCTION RECOMMENDATIONS

Construction recommendations provided below are based on the earthwork occurring during or extending into wet weather. Depending on the actual time of year construction begins, modifications to the wet weather recommendations may be required. Therefore, we recommend a preconstruction conference with the earthwork subcontractor to review the recommendations and make any necessary adjustments at that time.

General Earthwork and Material Specifications

1. Select Fill as defined in this report should consist of 1 or ¾-inch minus, clean (i.e., less than 5% passing the #200 U.S. Sieve), well-graded crushed gravel or rock. We should be provided a sample of the intended fill for approval, prior to delivery to the site.
2. Drain Rock should consist of 2-inch minus, clean (less than 2% passing the #200 sieve), open-graded crushed gravel or rock. The actual gradation will depend on availability by local suppliers. We should be provided a sample of the intended fill for approval, prior to delivery to the site.

3. The Separation Geotextile should have Mean Average Roll Value (MARV) strength properties meeting the requirements of an AASHTO M 288-06 Class 2 geotextile.

The geotextile shall have MARV hydraulic properties meeting the requirements of AASHTO M 288-06 (geotextile for separation) with a permittivity greater than 0.25 sec^{-1} and an Apparent Opening Size (AOS) less than 0.6 mm. The permittivity is required to reduce the risk of subgrade pumping while constructing the building pad during wet weather. We should be provided a specification sheet on the selected geotextile for approval prior to delivery to the site.

4. Filter Fabric should have Mean Average Roll Value (MARV) strength properties meeting the requirements of an AASHTO M 288-06 Class 3 geotextile (subsurface drainage geotextile) with a maximum AOS of 0.3 mm and a permittivity greater than 0.1 sec^{-1} .
5. Compact the Select Fill and Granular Site Fill to 95% relative compaction. The maximum dry density of ASTM D 698 should be used as the standard for estimating the relative compaction.

Efficient compaction of granular fills will require a smooth drum vibratory roller. Walk-behind plate compactors or hoe-mounted compactors will be required for smaller foundation excavations where access with self-propelled equipment is not feasible. Field density tests should be run frequently to confirm adequate compaction of imported granular fill.

6. Place and compact all Select Fill in loose lifts not exceeding 12 inches to the standard specified above. However, the initial lift of rock for construction of the building pad should be increased to 18 inches to protect the fine-grained subgrade during wet weather.
7. Anticipate ground water infiltration in the footing excavations and in utility trenches. Excavations should be pumped dry prior to placing the backfill.
8. Where temporary slopes are not feasible, provide the required shoring in all trenches and excavations to protect workers from sloughing or caving soils.

Site Grading

The existing site is primarily covered with turf with minor quantities of fill for the pitcher's mounds and a concrete surface adjacent to the existing storage shed. The condition of the subgrade underlying the turf section and other surfaces is unknown at this time and will be verified in the field during construction. We recommend the site grading be completed as follows for construction during wet weather:

9. Remove existing turf section, pitcher's mounds and concrete. Strip the underlying fill as required to remove existing base rock. Dispose of all debris and spoils outside of construction areas.
10. Excavate to the required grade to accommodate a 24-inch thick building pad. An FEI representative will be required to verify the subgrade is suitable to support the new structure prior to covering. Do not expose more subgrade than can be covered with a Separation Geotextile and Select Fill the same day.
11. Complete the final excavation using a hoe equipped with a smooth bucket to minimize disturbance to the subgrade. The excavator should operate from outside of the excavation or from a thickened rock section. Do not compact the subgrade or permit vehicles or construction equipment on the subgrade unless they are supported on a minimum of 18 inches of compacted, non-yielding Select Fill.
12. Place a Separation Geotextile beneath the building pad. The geotextile should be laid smooth, without wrinkles or folds in the direction of construction traffic. Overlap adjacent rolls a minimum of 2 feet. Pin fabric overlaps or place the fill in a manner that will not separate the overlap during construction. Seams that have separated will require removal of the base rock to establish the required overlap.
13. Construct the building pad using Select Fill. The Select Fill should be placed in a manner that will not disturb the subgrade, or require construction equipment to operate directly on the exposed subgrade or Separation Geotextile. A minimum \pm 18-inch thick initial lift should be placed prior to allowing equipment on the pad, and the Select Fill should be spread using a low ground-pressure dozer. Overexcavate any soft areas or areas of subgrade pumping and replace with compacted Select Fill.

Foundation Design and Construction

Foundation design and construction should be completed in accordance with the following recommendations.

14. Design isolated spread footings and strip footings using an allowable bearing capacity of 2,500 psf. The design criteria assume the footings will be supported on a minimum of 12 inches of Select Fill underlain by undisturbed, stiff soils. Minimum undrained shear strength values of 1.0 ksf are required for fine-grained materials exposed in the footing excavations. Adequate compaction of the Select Fill should be verified by density tests prior to placing rebar.
15. Design the structure to accommodate a maximum total settlement of $\frac{3}{4}$ inch and a maximum differential settlement of $\frac{1}{2}$ inch.

16. Design the footings using a sliding coefficient of 0.35 per UBC (2009). The value is appropriate for foundations placed on Select Fill.

For passive toe resistance of the spread footings, an equivalent fluid density value of 250 pcf may be used for design. A factor of safety has been applied to this value, since it is unlikely the footings will move laterally enough to mobilize the full passive resistance. The recommended value assumes the backfill around the footings will consist of compacted Select Fill.

17. Design the slab using a modulus of subgrade reaction of 250 pci. This value is based on the slab being supported on a minimum of 24 inches of compacted Select Fill underlain by undisturbed, stiff native soil.
18. Excavate for the foundations using a hoe equipped with a smooth bucket. The excavation depth should be sufficient to accommodate 12 inches of compacted Select Fill. The thickness of select fill may be reduced to 6 inches if the excavation and footings are constructed prior to the onset of wet weather. Grade the bottom of the footing excavations to drain towards a common low point for dewatering, if required.
19. Dewater the foundation excavations prior to placing Select Fill. The contractor should assume that footing excavations may collect field runoff, depending on location and grade. Grading at the base of the excavations should direct ground water to sumps (or equivalent collection points) where it can be pumped out of the excavations.
20. Excavate all disturbed, wet or soft foundation subgrade material to the depth required, as directed by an FEI representative. Replace the overexcavated material with compacted Select Fill. We recommend the bid documents include a unit cost for overexcavation and replacement of soft or unsuitable soils.
21. Place and compact the Select Fill in maximum 12-inch thick loose lifts using a vibratory compactor that will not disturb the foundation subgrade. Thinner lifts and light compaction equipment may be required if subgrade soils are sensitive to disturbance. Backfill around foundations should also consist of compacted Select Fill.
22. Provide a suitable vapor barrier under the slabs that is compatible with the proposed floor covering and the method of slab curing. The proposed vapor barrier and installation plan should be reviewed by the flooring manufacturer and architect.

Foundation Drainage

23. Install a foundation drain along the perimeter of the building. The drain should consist of a 3 or 4-inch diameter, perforated or slotted PVC pipe. The flowline of the pipe should be set at the base of the perimeter foundation. The pipe should be bedded in at least 4 inches of Drain Rock and backfilled to within 6 inches of the ground surface with Drain Rock. The entire mass of Drain Rock should be wrapped in Filter Fabric that laps at least 12 inches at the top.
24. Provide clean-outs at appropriate locations for future maintenance of the drainage systems.
25. Discharge the foundation drain by gravity flow into the nearest storm drain or other appropriate location. If necessary, discharge the water into a common sump and pump it to an appropriate disposal location.

DESIGN REVIEW/CONSTRUCTION OBSERVATION/TESTING

We should be provided the opportunity to review all drawings and specifications that pertain to site preparation, foundation and slab-on-grade construction. Foundation preparation will require field confirmation of subgrade conditions in accordance with recommendations provided herein. We recommend that we be present to confirm soil conditions in the bottom of all excavations prior to backfilling. Mitigation of foundation subgrade pumping or persistent ground water infiltration will also require engineering review and judgment. That judgment should be provided by one of our representatives. Frequent field density tests should be run on all Select Fill. We recommend that we be retained to provide the necessary construction observation.

VARIATION OF SUBSURFACE CONDITIONS, USE OF THIS REPORT AND WARRANTY

The analyses, conclusions and recommendations contained herein are based on the assumption that the soil profiles and the ground water levels encountered in the borings completed in 1997 by GRI, and adjacent borings completed by FEI are representative of overall site conditions. The above recommendations assume that we will have the opportunity to review final drawings and be present during construction to confirm assumed foundation conditions. No changes in the enclosed recommendations should be made without our approval. We will assume no responsibility or liability for any engineering judgment, inspection or testing performed by others.

This report was prepared for the exclusive use of the OSU Department of Facilities Services and their design consultants for the Goss Stadium Expansion project in Corvallis, Oregon. Information contained herein should not be used for other sites or for unanticipated construction without our written consent. This report is intended for planning and design purposes. Contractors using this information to estimate construction quantities or costs do so at their own risk. Our services do

not include any survey or assessment of potential surface contamination or contamination of the soil or ground water by hazardous or toxic materials. We assume that those services, if needed, have been completed by others.

Climate conditions in western Oregon typically consist of wet weather for almost half of the year (typically between mid-October and late May). It is assumed that adequate drainage will be provided for construction. The recommendations for site preparation, foundation and slab-on-grade design are not intended to represent any warranty (expressed or implied) against the growth of mold, mildew or other organisms that grow in a humid or moist environment.

Our work was done in accordance with generally accepted soil and foundation engineering practices. No other warranty, expressed or implied, is made.

It has been a pleasure assisting you with this phase of your project. Please do not hesitate to call if you have questions.

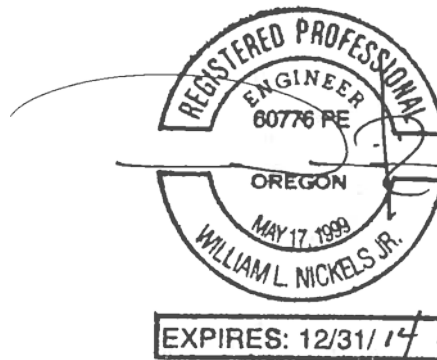
Sincerely,

FOUNDATION ENGINEERING, INC.



William L. Nickels, Jr., P.E., G.E.
President

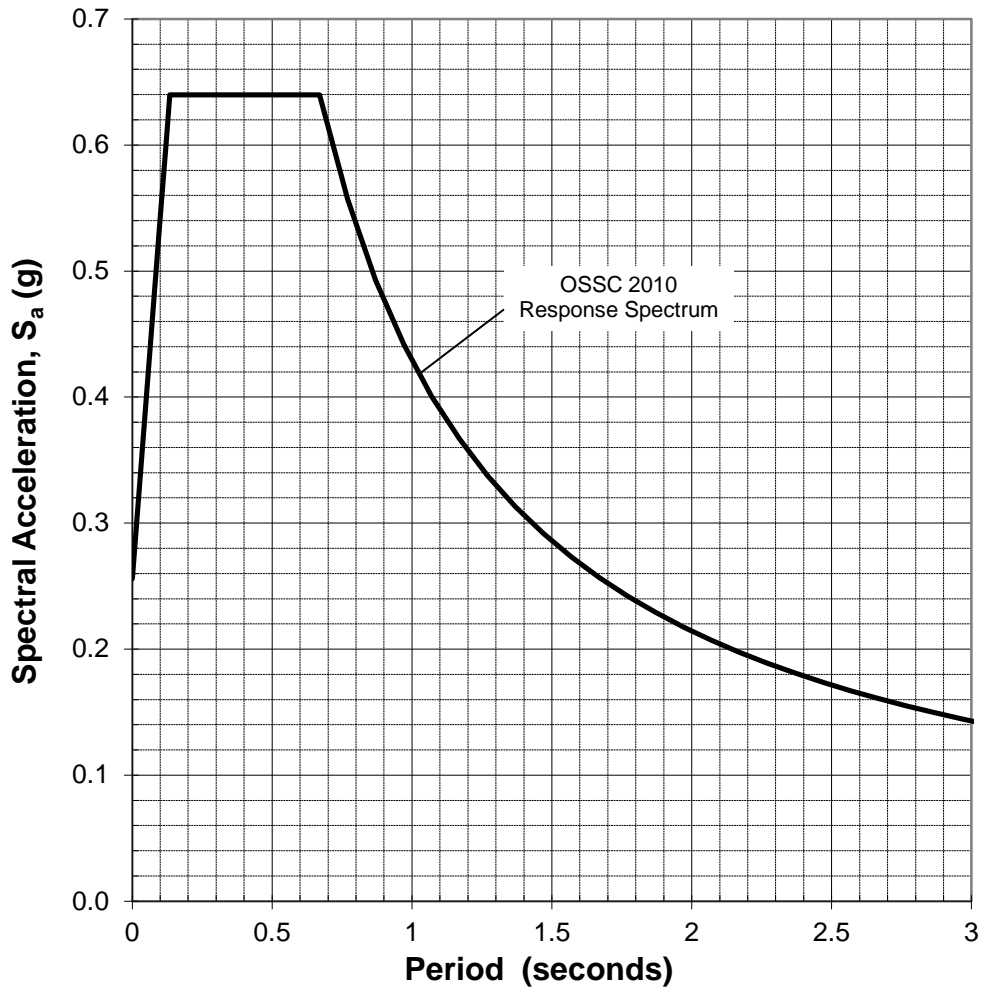
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Enclosure



REFERENCES

- Boulanger, R. W., and Idriss, I. M., 2004; Evaluating the Potential for Liquefaction or Cyclic Failure of Silts and Clays: Center for Geotechnical Modeling, Department of Civil and Environmental Engineering, University of California at Davis, Report No. UCD/CGM-04/01, December 2004.
- Boulanger, R. W., and Idriss, I. M., 2006; Liquefaction Susceptibility Criteria for Silts and Clays: ASCE Journal of Geotechnical and Environmental Engineering, v. 132, no. no. 11, p. 1413-1426.
- Burns, W. J., Hofmeister, R. J., and Wang, Y., 2008; Geologic Hazards, Earthquake and Landslide Hazard Maps, and Future Earthquake Damage Estimates for Six Counties in the Mid/Southern Willamette Valley; Including Yamhill, Marion, Polk, Benton, Linn, and Lane Counties, and the City of Albany, Oregon: Oregon Department of Geology and Mineral Industries, Interpretive Map Series IMS-24, 50 p.
- FEI, 2003; Seismic Site Hazard Investigation - Reser Stadium Expansion: Prepared for: Oregon State University Department of Facilities Services, Corvallis, Oregon, Foundation Engineering, Inc. (FEI), 19 p.
- IBC, 2009; International Building Code (IBC): International Code Council, Inc., ISBN: 978-1-58001-725-1.
- OSSC, 2010; Oregon Structural Speciality Code (OSSC): Based on the International Code Council, Inc., 2009 IBC, ISBN: 978-1-58001-955-2.
- Theodore, J., and Dickenson, S. E., 1999; Dynamic Soil Response and Earthquake Ground Motion Characteristics in the Corvallis, Oregon Area: Federal Emergency Management Agency, Benton County, Oregon, 82 p.
- USGS, 2002a; Geologic Hazards Science Center, 2002 Interactive Deaggregations: U.S. Geological Survey (USGS), 2% in 50 years return period, PGA spectral acceleration, latitude/longitude search, accessed August 2013, website: <https://geohazards.usgs.gov/deaggint/2002/>.
- USGS, 2002b; U.S. Design Maps: U.S. Geological Survey (USGS), geohazards.usgs.gov/designmaps/us/application.php; 2006/09 IBC, Class D, essential facility, lat. 44.5628, long. -123.2771.
- Wang, Z., Graham, G. B., and Madin, I. P., 2001; Preliminary Earthquake Hazard and Risk Assessment and Water-Induced Landslide Hazard in Benton County, Oregon: Oregon Department of Geology and Mineral Industries, Open-File Report O-01-05, 89 p.
- Youd, T. L., and Idriss, I. M., 1996; Proceedings of the NCEER Workshop on Evaluation of Liquefaction Resistance of Soils: Professional Paper, 40 p.

- Youd, T. L., Idriss, I. M., Andrus, R. D., Arango, I., Castro, G., Christian, J. T., Dobry, R., Liam Finn, R. D., Harder, J., J.F., Hynes, M. E., Ishihara, K., Koester, J. P., Liao, S. S. C., Marcuson III, W. F., Martin, G. R., Mitchell, J. K., Moriwaki, Y., Power, M. S., Robertson, P. K., Seed, R. B., and Stokoe II, K. H., 2001; Liquefaction Resistance of Soils: Summary Report from the 1996 NCEER and 1998 NCEER/NSF Workshops on Evaluation of Liquefaction Resistance of Soils: ASCE Journal of Geotechnical and Environmental Engineering, v. 127, no. 10, October 2011, p. 817-833.
- Youngs, R. R., Chiou, S. J., Silva, W. J., and Humphrey, J. R., 1997; Strong Ground Motion Attenuation Relationships for Subduction Zone Earthquakes: Seismological Research Letters, v. 68, no. 1, January/February 1997, p. 58-73.



Notes:

- The Design Response Spectrum is based on OSSC 2010 Section 1613 using the following parameters:

Site Class= D	Damping = 5%		
$S_S = 0.82$	$F_a = 1.17$	$S_{MS} = 0.96$	$S_{DS} = 0.64$
$S_1 = 0.40$	$F_v = 1.60$	$S_{M1} = 0.64$	$S_{D1} = 0.43$
- S_S and S_1 values for 5% damping are based on the USGS 2002 mapped maximum considered earthquake spectral accelerations for 2% probability of exceedence in 50 years. The corresponding peak ground acceleration on rock is 0.34g.
- F_a and F_v were established based on OSSC 2010, Tables 1613.5.3(1) and 1613.5.3(2) using the selected S_S and S_1 values. S_{DS} and S_{D1} values include a 2/3 reduction on S_{MS} and S_{M1} as discussed in OSSC 2010 Section 1613.5.4.
- Site location is: Latitude 44.5628, Longitude -123.2771.

FIGURE 1
OSSC 2010 SITE RESPONSE SPECTRUM
Goss Stadium Expansion
Corvallis, Oregon
FEI Project 2131053