SP-150336
(New)

SPECIAL PROVISIONS
FOR
ORNAMENTAL BRICK COLUMNS

Woodbury County
IM-NHS-029-6(204)148--03-97

Effective Date
XXXXX XX, 2017

THE STANDARD SPECIFICATIONS, SERIES 2015, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE SPECIAL PROVISIONS AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.

150336.01 DESCRIPTION.

A. General.
These Special Provisions specify requirements for ornamental brick columns to be constructed on the bridge abutment towers at each of four locations on the project, including but not limited to, the following:

1. Brick masonry work for column construction.

2. Masonry reinforcing, accessories and similar items as may pertain to masonry work.

B. Submittals.

1. Samples: Submit representative samples for each material as follows. Delivered materials shall closely match accepted samples.
- **a. Brick.**
  - **1)** Selection Samples: Submit samples of all manufacturer's available dark brown and light buff colored bricks for selection of final color to be used on the project. Samples may be less than full bricks, but all samples shall represent bricks available in the sizes and shapes required for the project. All samples shall be velour textured. Deliver samples to: Iowa Department of Transportation, Office of Bridges and Structures, Attn: Aesthetic Bridge Specialist, 800 Lincoln Way, Ames Iowa 50010.
  - **2)** Verification Samples: Following selection of final brick colors by the Contracting Authority, submit a minimum of four bricks of each type, size, and color selected.
- **b.** Welded steel wire mesh: Submit one 6 inch by 6 inch sample of mesh to be used.

2. Product Data: Submit product data of materials and systems to be used as masonry accessories. Include manufacturer's test data, installation instructions, use limitations, and recommendations for each material used.

3. Submit certifications of compliance demonstrating that brick meets or exceed the requirements of this specification.

4. Test Results: Submit certified test results of ASTM standards specified. Submit mortar and grout mix designs and results of trial testing.

5. Proposed Construction Practices: If cold weather or hot weather masonry work is anticipated, submit methods proposed to show compliance with cold-weather and hot-weather procedure requirements of ACI 530.1/ASCE 6.

6. Mock-up: Prior to commencing primary work of these Special Provisions, construct a mock-up of a brick column and obtain Engineer's acceptance of visual qualities. Mock-up column may be constructed on a bridge abutment tower as one of the production columns in its final location. The mock-up shall demonstrate all features as detailed in the plans and its construction shall demonstrate all requirements outlined in these Special Provisions including final cleaning and pointing. If acceptable to the Engineer, the mock-up may remain in place as part of the work. Protect and maintain the mock-up throughout construction of the remaining columns to serve as criteria for acceptance of work. If rejected by the Engineer, demolish the mock-up without damage to the abutment tower or other construction and remove from the site. Construct another mock-up to the satisfaction of the Engineer for approval prior to commencing production ornamental brick column work.

C. Standards.

For each type of material required by these Special Provisions, provide primary materials which are products of a single manufacturer. Provide secondary materials which are acceptable to manufacturers of primary materials.

D. Tests.

1. Contractor is responsible for testing and quality control implementation of mortar, grout and other masonry materials as specified herein.

2. Efflorescence: Prior to commencing masonry work, test each type of brick and brick mortar materials proposed for exterior exposure to ensure freedom from efflorescence.

- **a.** Brick Test: Select ten pairs of unbroken specimens from each type brick proposed, each pair being of similar appearance. Test units for efflorescence in conformance with ASTM C 67. Reject proposed units rated as "effloresced".
- **b.** Mortar Test: Prepare 3 oz. mortar specimen for each proposed mix, using as little water as possible. While still in a plastic condition and prior to initial set, place each mortar specimen and a brick (tested and rated as "not effloresced") on end, in a receptacle of such size that 4 ounces of water will have a depth between 1/2 and 1 inch. Thoroughly stir distilled water and mortar for five minutes before placing brick in water. Maintain water level by addition of distilled water. Remove brick after seven days and air dry for 24 hours. Visible efflorescence on brick, when viewed from a distance of 10 ft. with normal vision under an illumination to affect its appearance when compared to untreated brick, shall be cause for rejection of mortar.
- **c.** If tests show mortar is cause of efflorescence, test components in separate receptacles, each containing a brick on end which has been tested and rated as "not effloresced". Fill and maintain receptacle with distilled water to a depth between 1/2 and 1 inch. Use one ounce of each cementitious ingredient and 3 ounces of each aggregate for testing, each mixed in 4 ounces of distilled water. Visual test of material for efflorescence, and rejection of faulty materials, shall be as described for mortar, in previous paragraph.

3. Perform preconstruction testing of proposed mortar mix prior to start of masonry work.

Test mortar in accordance with ASTM C 109.

4. At start of field operations, and once per week during course of work, test mortar in accordance with ASTM C 780 Annex A-1, A-5, A-6, and A-7 and conduct on-job inspections of measuring, mixing, laying, and curing of mortar and masonry materials.

5. Prepare and test 7 day and 28 day prisms for each group of five brick columns constructed at each abutment tower in conformance with ASTM E 447 (Method B), to ensure compliance with these specifications. Height : thickness ratio for brick prisms shall be 5:1.

E. Project Conditions.

1. Hot Weather Protection: Hot weather construction is defined as occurring when ambient temperatures exceed 100°F or 90°F when wind velocity is greater than 8 mph. Use mortar within 1 1/2 hours after mixing. Discard mortar over 1 1/2 hours old and mortar stiffened due to hydration (setting).

2. Cold Weather Protection: Cold weather construction is defined as occurring when ambient temperatures fall below 40°F or when the temperature of masonry units is below 40°F. Strictly comply with Brick Institute of America (BIA) Technical Note 1 A, Cold Weather Masonry Construction and Protection Recommendations, and Recommended Practices & Guide Specifications for Cold Weather Masonry Construction, Portland Cement Association.

3. Protection: As the work progresses, continuously protect brick and all surrounding surfaces which could be stained by mortar. Cover columns at end of each day's work. Extend cover down sides of columns and hold securely in place. Turn scaffold boards on edge at end of day and protect base of columns to prevent rain splashed mud or mortar from contacting masonry.

4. Loading: Do not apply loads until work has set and cured and is ready to accept loading.

F. Product Delivery, Storage and Handling.

1. Materials shall be delivered, stored, and handled fully protected from wetting, staining, chipping, and other damage. Store masonry materials on raised timber or platforms, above ground, under weathertight covers or indoors, and kept clean and dry.

2. Deliver and store cement, lime, and other perishable materials in their original containers, plainly marked with brand name and manufacturer's name, indoors or in weathertight sheds.

3. Protect masonry accessories from elements. Immediately before placing, remove loose rust, dirt, and other foreign materials.

150336.02 MATERIALS.

A. Brick.

Provide face brick conforming to ASTM C 216, Grade SW, Type FBS. Brick of one color shall be from the same production run. Provide brick masonry as follows:

1. Compressive strength, individual: Not less than 2500 psi.

2. Compressive strength, average of five: Not less than 3000 psi.

3. Water absorption, individual: Not more than 10%; ASTM C 67.

4. Water absorption, average of five: Not more than 8%.

5. Initial rate of absorption (suction), as defined in Section 9 of ASTM C67 shall not be greater than 10 gallons per minute per 30 square inches.

6. Size: Modular, 2 1/4 inch by 3 5/8 inch by 7 5/8 inch.

7. **Shapes.**
   a. Provide special shapes and coursings as necessary or as indicated.
   b. Bricks used for the three projected courses near the top of each column as detailed in the plans shall be 100 percent solid with no cores or frogs.

8. **Color and Texture.**
   a. For all column bricks except the three courses of projected brick near the top of each column as detailed in the plans, color shall be a dark brown and texture shall be velour. See the sample submittal requirements for details.
   b. For the three courses of projected brick near the top of each column as detailed in the plans, color shall be light buff and texture shall be velour. See the sample submittal requirements for details.

9. **Acceptable brick manufacturers include the following.**
   a. Sioux City Brick and Tile Company (Sioux City, IA).
   b. Endicott Clay Products Company (Fairbury, NE).
   c. Belden Brick Company (Canton, OH).
   d. Other suppliers submitted to and approved by the Engineer.

10. Joint Size: 3/8 inch typical uniform width.

B. Mortar and Grout Materials.

1. Portland cement: ASTM C 150, Type I, free from water soluble salts and alkalis. Provide cement which exhibits no efflorescence when tested in conformance with these specifications.

2. Lime: ASTM C 207, hydrated, Type S.

3. Grout Aggregate: Complying with ASTM C 404.

4. Mortar Aggregate: Complying with ASTM C 144, well graded and free of gypsum.

5. Water: Clean, potable

C. Reinforcing, Welded Steel Wire Fabric.

1. In accordance with ASTM A 185.

2. Minimum gauge: 20.

3. Mesh: 1/2 inch.

4. Hot-dipped galvanized wire in accordance with ASTM A 82, with ASTM A 153, Class B-2 coating.

5. Width: 1 inch less than width of masonry.

D. Miscellaneous Materials.
Provide one of the following products as applicable for cleaning mortar stains, job dirt, and job stains from masonry work:

1. Cleaning Material for Dark Colored Masonry.
- **a.** Sure Klean 600 Detergent; ProSoCo, Inc., Kansas City, KS
- **b.** 202 New Masonry Detergent, Diedrich Technologies Inc., Oak Creek, WI
- **c.** NMD-80, EaCO Chem Inc., New Castle, PA

2. Cleaning Material for Light Colored Masonry.
- **a.** Sure Klean 101 Lime Solvent; ProSoCo, Inc., Kansas City
- **b.** 200 Lime Solv, Diedrich Technologies Inc., Oak Creek, WI
- **c.** SafeRestore, EaCO Chem Inc., New Castle, PA

E. Mortar Mix.
Provide mortar complying with ASTM C 270. Mix using known volume measures. Do not batch by shovel.

1. Provide Type N mortar for exterior masonry and reinforced masonry, except as indicated otherwise.

2. Limit cementitious materials in mortar to Portland cement-lime.

F. Grout Mix.
Provide grout complying with ASTM C 476. Use grout of consistency at time of placement which will completely fill column interior cavity intended to receive grout. Ensure consistency of grout will completely consolidate around mesh reinforcing without voids.

1. Use grout of type (fine or coarse) in accordance with ACI 530.1/ASCE 6/TMS 602 Table 1.15.1 for dimensions of grout spaces and pour height.

2. Provide grout with a slump of 8 to 11 inches as measured in accordance with ASTM C 143.

150336.03 CONSTRUCTION.

A. Masonry Construction, General.

1. Masonry work shall be done by skilled masons, fully instructed as to requirements of these Special Provisions, and adequately supervised during the work. Masonry work quality shall comply with applicable recommendations of the Brick Institute of America (BIA), except as modified below.

2. Cold weather masonry shall conform to BIA Technical Note 1A, Cold Weather Masonry Construction and Protection Recommendations, and International Masonry Institute (IMI) Recommended Practices & Guide Specifications for Cold Weather Masonry Construction and the following:
- **a.** Do no masonry work when outdoor temperature is less than 40°F unless provisions are made to adequately protect materials and finished work from frost by heating materials, enclosing work, and heating enclosed spaces.
- **b.** If masonry work must be done when ambient temperature is freezing or below, all masonry material must be at temperature between 50°F and 90°F, and mortar, when used, shall have a temperature between 60°F and 80°F. In addition, all masonry shall be protected from temperatures below 40°F for at least 48 hours after being laid.

3. Lay masonry plumb, true to line, and with level courses, with straight, clean, uniform joints, and true surfaces, and plumb corners. Maintain vertical alignment of joints as required by bond patterns indicated. Lay units in solid partitions to provide same evenness of surface on each side. Head and bed joints shall be approximately 3/8 inches wide. Use brick from at least two different pallets concurrently to prevent striping or patching or noticeable color variation.

4. If cutting of bricks is required, cut bricks with a motor driven saw to obtain true, even and undamaged edges. Do not use over-burned or oil- or grease-marked bricks. Do not use bricks with cracks or splits in any face, or with chips extending more than 1/8 inch from edges or 1/4 inch from corners. Do not break bricks with mason's hammer. Do not lay bricks until they are at least 60 days old.

5. Mix mortar using quantity of water to ensure good workability. For each batch, measure cement and lime in full bags; sand by weight or measure in suitable calibrated containers, with allowance made for moisture content, bulking, and consolidation. Do not use split sacks. Do not use shovel measurements of sand. Discard hardening mortar. Mix by machine only, for at least 3 minutes, but not more than 5 minutes. Use mortar within 2 hours of mixing at temperatures over 74°F, and 2 1/2 hours at temperatures between 50°F and 74°F.

6. Adjust each brick in final position while mortar is still soft and plastic. Remove bricks disturbed after mortar has stiffened and re-lay with fresh mortar.

7. Do not use installed masonry work to support or in any way receive scaffolding or other temporary supports.

8. Maintain masonry clean as work progresses. Exercise extreme care at exposed work to prevent smearing or staining with mortar.

9. At completion of work cut out and rejoint holes and defective joints, leaving entire work free of blemishes.

10. Contractor is responsible for adequately bracing all masonry work during construction.

B. Tolerances.

1. Maximum variation from plumb for vertical lines and surfaces of columns: 1/4 inch in 10 feet.

2. Maximum variation in cross section dimensions and thicknesses of brick columns from plan dimensions shown: -1/4 inch; +1/2 inch.

C. Brick Masonry Work.

1. Lay all masonry without wetting, unless given written permission by the Engineer to wet the brick. At connections to masonry previously laid, wet the existing masonry surfaces with clean water before laying new masonry. Avoid standing water on masonry surfaces. At closure bricks, butter all sides of all surfaces of the brick to be placed, and butter the abutting surfaces of the in-place bricks.

2. Lay face brick in "Running Bond" pattern unless otherwise indicated. Construct brickwork to conform to approved mock-up. Lay bed mortar only a few bricks ahead of the work to prevent drying out. Use only soft and plastic mortar. Butter all four edges on ends of bricks to be laid with sufficient mortar so that some mortar will ooze out on top when the brick is laid. After spreading the mortar, bevel the cavity edge of the bed with flat of trowel to slope

mortar away from the cavity. Roll brick into place to reduce the amount of mortar oozing from bed joint into cavity. Strike bed and head joints on inner face of wythe flush with brick surface and scoop up excess mortar with trowel or parge across inner face to prevent mortar from falling into cavity.

3. Shove bricks into place (do not lay) in full mortar beds, with vertical and horizontal joints completely filled. Do not slush. Strike exposed joints flush with face of brick, then finish as specified below.

4. When mortar at exposed joints has become partially set, but still sufficiently plastic to flow under pressure (i.e., is "thumb-print" hard), tool joints to a glassy hard, smooth, concave finish using 1 inch sled-type stainless steel jointer. During tooling of joints, enlarge any voids or holes and completely fill with mortar. Point up all joints including corners to provide a neat, uniform appearance.

5. Rake joints between brickwork and concrete base approximately 3/8 inch deep, ready to receive joint backing and sealant, if required.

D. Brick Masonry Reinforcing Installation.

1. Furnish and install welded steel wire mesh reinforcing. Keep all mesh flat and true to plane. Do not install kinked, warped, rusting or damaged mesh.

2. Mesh reinforcing shall extend into the column cavity to engage the column cavity grout. Cleanly cut or punch openings in mesh to accommodate projected reinforcing bars from tower concrete through column cavity.

3. Mesh reinforcing shall be installed at every third course of brick in each column. Place mesh reinforcing without delay as brickwork progresses.

4. Place reinforcing so that mesh will be entirely embedded within mortar and no wires will be exposed at the exterior face of brick after joint finishing.

5. Reinforced mortar joints shall not be increased in dimension due to inclusion of mesh reinforcing.

6. Use only continuous single pieces of mesh reinforcing in any single mortar joint. No splicing is allowed.

E. Column Cavity Grouting.

1. Keep column cavity clean from mortar and drippings.

2. Brace masonry as necessary to resist grouting pressures.

3. Grout column cavity in lifts of 6 to 8 inches as column is built.

4. Agitate or puddle grout during and after placement to ensure complete filling and to ensure bond with reinforcing.

5. Stop grout 1 1/2 inches below top of masonry when grouting is stopped for 1 hour or more, except when completing grouting of finished column.

F. Cleaning and Pointing.

1. Soon after masonry work is completed, remove excess mortar and aggregate projections

using wooden paddles or other non-metallic scrape hoes or chisels.

2. Upon completion, thoroughly clean exposed exterior masonry with a solution of specified detergent and water, using stiff fiber or stainless steel brushes. Thoroughly saturate masonry areas to be cleaned with clear water prior to application of any cleaners or other solutions. Protect adjacent surfaces that are not to be cleaned. Cleaners or other solutions which may cause discoloration or damage will not be permitted. Muriatic acid is not permitted.
   a. Prior to applying any cleaning materials on finished masonry work, demonstrate cleaning method on a sample wall area in a location acceptable to the Engineer. Do not proceed with cleaning until sample area is approved by the Engineer.
   b. Test cleaning techniques and solutions to determine the best methods for the conditions encountered. Demonstrate Contractor's quality control system to ensure uniform final appearance. Test adjacent non-masonry surfaces for possible adverse reactions to cleaning methods.
   c. Use all cleaning products in strict compliance with the manufacturers' instructions and recommendations. Work from top to bottom, cleaning small sections at a time. Immediately rinse cleaned sections with clear water.
   d. Keep accurate, detailed records of concentrations, solutions, and techniques used to assist in replicating satisfactory results.

3. Rake out imperfect mortar joints of masonry work and re-point to match appearance of surrounding acceptable work. Leave entire work free of defects.

150336.04 METHOD OF MEASUREMENT.
The quantity of Ornamental Brick Columns will be the number shown in the plans.

150336.05 BASIS OF PAYMENT.
Ornamental Brick Columns satisfactorily completed and in place will be paid for at the contract unit price. This payment shall be full compensation for all labor, materials, equipment, services, and incidentals necessary to perform the work of this section.