

**BOSTON VALLEY TERRA COTTA SPECIFICATIONS
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**Standard Specification for Restoration
for the
Manufacture, Furnishing and Setting
of
Architectural Terra Cotta and Veneer**

SECTION 04914

TERRA COTTA RESTORATION

******* Founded in 1889, Boston Valley Terra Cotta specializes in manufacturing architectural terra cotta for restoration and new construction. Terra cotta is a molded or extruded clay shape that is fired. Terra cotta can be unglazed or glazed in a wide variety of colors. Terra cotta exterior veneer and decoration was widely used a century ago. Hence there are numerous buildings, many of historical significance, that require new terra cotta pieces to replace damaged or deteriorated items or to use for additions and alterations. Terra cotta panels used for exterior facing of buildings are referred to as ceramic veneer. This veneer is often plain and flat but the plasticity of the material also allows sculptured surfaces. The decorative terra cotta used for copings, column capitals, bandings, gargoyles, and other ornamentation is referred to as architectural terra cotta.**

This guide specification, SECTION 04914 - TERRA COTTA RESTORATION, can be used to specify the fabrication and installation of terra cotta to match existing veneer and ornamentation. Usually restoration requires an extensive site survey, removal of illustrative pieces to use as models for preparing new molds or extrusion dyes, and experimentation to match the color and texture of glazes. Boston Valley Terra Cotta has extensive experience in this type of work and is an acknowledged expert terra cotta manufacturer.

This specification guide focuses on terra cotta for restoration. However, the application of terra cotta on new, contemporary buildings is an ever increasing use of an old product that has stood the test of time. This section can be modified to specify architectural terra cotta for completely new buildings.

Throughout this guide specification, references are made to other specification sections that might be contained in the project manual. These references are presented as examples and coordination reminders. For each project, these references will need to be revised to reflect actual sections being used.

Within the specification text, Imperial dimensions are presented first in brackets followed by System International Metric (SI) equivalents also in brackets. Depending on project requirements, either the Imperial or the SI metric equivalents will need to be deleted.

This product specification will need to be edited by the specifier for a specific project to reflect the options and applications being used. The guide section has been written so that most editing can be accomplished by deleting unnecessary requirements and options. Depending on project requirements, some additional information may need to be added by the specifier. Options are indicated by []. Notes to assist the specifier in selecting options and editing the specification guide are printed in bold and indicated with ***. For final editing, all brackets and notes will need to be deleted from the guide. *******

PART 1 - GENERAL

1.1 SUMMARY

******* The scope of terra cotta restoration work will vary depending on the project. Site investigation may be required to determine extent of required restoration, to photograph and measure existing terra cotta, and to remove samples for use in producing molds for fabricating new items. In other projects, site investigation may have been conducted previously and restoration requirements determined. Edit the following paragraph to reflect exact project scope. *******

A. Section includes:

1. Site investigation to determine restoration requirements.
2. Cleaning existing terra cotta.
3. Repairing damaged terra cotta.
4. Repointing existing terra cotta joints.
5. Design and fabrication of architectural terra cotta [to match terra cotta of existing building].
6. Removal of damaged and deteriorated terra cotta on existing building.
7. Installation of terra cotta on [existing building to replace damaged and deteriorated terra cotta.] [building addition to existing building.]

******* List other specification sections dealing with work directly related to this section such as the following. *******

B. Related sections:

******* For restoration work, the quantity of terra cotta pieces to be removed and**

replaced may not be determined until an extensive site investigation is conducted or work has actually begun. Hence, it is often practical to base terra cotta restoration on unit prices. *****

1. Section 01200 - Price and Payment Procedures: Unit price procedures for removal and replacement of terra cotta pieces.
2. Section 01735 - Selective Demolition: General requirements for removal and salvage of existing building components.
3. Section 04800 - Unit Masonry Assemblies - [Brick] [Concrete masonry unit] walls to receive terra cotta.
4. Section 03300 - Cast-In-Place Concrete: Concrete structural frame [and walls] to receive terra cotta.
5. [Section 05120 - Structural Steel] [Section 05500 - Metal Fabrications]: Beams, channels, angles, plates, structural members, and fabrications for supporting terra cotta.
6. Section 07600 - Flashing and Sheet Metal: Sheet metal flashings and coverings used in conjunction with terra cotta installation.
7. Section 07900 - Joint Sealers: Sealants used in conjunction with terra cotta expansion joints and sheet metal flashings.

******* List by number and full title reference standards referred to in remainder of the specification section. Delete non-applicable references. *******

1.2 REFERENCES

- A. American Institute of Architects (AIA) File No. 9 - Public Works Specifications for Ceramic Veneer, October 1961.
- B. ASTM A36 - Structural Steel.
- C. ASTM A123 - Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- D. ASTM A167 - Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.
- E. ASTM C67 - Sampling and Testing Brick and Structural Clay Tile.
- F. ASTM C126 - Ceramic Glazed Structural Clay Facing Tile, Facing Brick, and Solid Masonry Units.
- G. ASTM C144 - Aggregate for Masonry Mortar.
- H. ASTM C150 - Portland Cement.
- I. ASTM C207 - Hydrated Lime for Masonry Purposes.
- J. ASTM C270 - Mortar for Unit Masonry.
- K. ASTM C404 - Aggregates for Masonry Grout.
- L. ASTM C476 - Grout for Masonry.
- M. ASTM C484 - Thermal Shock Resistance of Glazed Ceramic Tile.
- N. ASTM C920 - Elastomeric Joint Sealants.
- O. US Department of the Interior - Secretary of the Interior's Standards for Rehabilitation and Guidelines for Rehabilitating Historic Buildings.

1.3 PERFORMANCE REQUIREMENTS

- A. Terra cotta to consist of modular, manufactured, fired clay pieces attached to structural substrate to form a weathertight veneer and ornamentation.
- B. Method of attachment shall be designed to adequately resist wind pressure, uplift, and other loads for project location.
- C. Method of installation and expansion joints shall accommodate stresses caused by deflection, settlement, wind pressure, and temperature changes without failure of joints, undue stress on fasteners, or other detrimental effects.

1.4 SUBMITTALS

A. Provide in accordance with Section 01330 - Submittal Procedures:

1. Product data: Include material descriptions.
2. Mortar design mixes and compressive strength analysis of existing mortar.
3. Shop drawings: Show details of construction, profiles of pieces, ornamentation, dimensions, joints, flashings, sheet metal, reglets, anchors, connections, and installation details. Details shall be drawn at 1:8 minimum scale. Illustrate complicated parts in perspective view.
4. Setting drawings: Show layout of terra cotta pieces, numbering of pieces, and joint sizes.
5. Samples:
 - a. 6 by 6 by 3/4 inch tiles illustrating range of colors and textures for clay body and ceramic finish.
 - b. Mortar samples illustrating color.
 - c. Sealant samples illustrating color.

******* Include the following paragraph if terra cotta pieces are complex or elaborately sculptured and a full size sample is required for approval. *******

6. Full size prototype with ceramic finish: Provide for each major terra cotta piece.
7. Manufacturer's installation instructions.

1.5 QUALITY ASSURANCE

- A. Manufacturer: Company with 20 years minimum successful experience manufacturing architectural terra cotta.
- B. Installer: Company with 5 years minimum successful experience installing architectural terra cotta.
***** Depending on the scope of the project, it may be advisable for a manufacturer's representative to observe, advise, and assist in terra cotta installation. *****
- C. Manufacturer's field representative shall be available on site to observe installation, interpret setting drawings, advise, and assist in sorting, handling cutting, and fitting terra cotta pieces.
- D. Single source responsibility: Terra cotta pieces and required anchors shall be furnished by single manufacturer.
- E. Sole installation responsibility: The following components shall be installed by a single installer:
 1. Terra cotta pieces and anchors specified in this Section.
 2. Sheet metal and flashings adjoining terra cotta specified in Section 07600 - Flashing and Sheet Metal.
 3. Sealants used for terra cotta expansion joints [specified in Section 07900 - Joints Sealers].

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Prior to shipping, pack and crate terra cotta pieces to prevent damage during transit and storage.
- B. Schedule deliveries in sequence of installation.
- C. Inspect terra cotta immediately upon delivery at site. Notify manufacturer of damage and non-conformity.
- D. Keep pieces in original packing material until ready to install. Protect from weather to prevent

- staining.
- E. Store and maintain crates in upright position. Do not stack crates.

1.7 EXISTING CONDITIONS

******* Describe existing structure and type of terra cotta to be replaced. List special conditions affecting restoration. *******

- A. Existing structure is a [_____] story building constructed in [(year)]. Original construction drawings for building including terra cotta details [are available at Architect's office for review by Contractor.] [will be provided by Owner for use by Contractor.]
******* Building requiring terra cotta restoration may be listed on the National Register of Historic Places or other state or municipal registers of historic and cultural properties. Hence, renovations and repairs may be need to comply with preservation regulations. If so, edit the following paragraph to reflect applicable requirements. *******
- B. Existing structure is a historic building and listed on [the National Register of Historic Places] [_____] . As such, noticeable modifications to exterior of building are not permitted and demolition and restoration shall be conducted to comply with the intent of the Secretary of the Interior's Standards for Rehabilitation. Existing historic items of construction not indicated to be removed or restored, shall be protected during construction operations.
******* Location and quantity of terra cotta pieces to be replaced can be indicated on drawings or in this section. To avoid potential conflicts, do not state information in both locations. *******

- A. Terra cotta pieces to be replaced include the following. [Refer to Drawings for locations and quantities.]

******* If not shown on Drawings, indicate location, quantities, sizes, and pertinent information. *******

1. Veneer panels: [_____].
2. Copings: [_____].
3. Column capitals: [_____].
4. Gargoyles: [_____].
5. [_____].

******* Depending on project, illustrative samples of terra cotta may be removed by others under separate contract to owner and provided to manufacturer or sample removal may be included as part of this section. *******

- B. Illustrative samples of terra cotta pieces to be duplicated [will be removed, packed, and shipped to manufacturer's plant by Owner.] [shall be removed to manufacturer's plant by Contractor.] At completion, samples shall be [returned to Owner.] [be retained by manufacturer.]

1.7 ENVIRONMENTAL REQUIREMENTS

- A. Maintain materials and surrounding air temperature to the following limits prior to, during, and 48 hours after completion of terra cotta work:

1. Minimum: [40 degrees F.] [4 degrees C.]
2. Maximum: [90 degrees F.] [32 degrees C.]

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Boston Valley Terra Cotta, 6860 South Abbott Road, Orchard Park, New York 14127; 716-649-7490; www.BostonValley.com. Local contact: Arcspec, 225 Peterson Rd., Libertyville, IL 60048, phone: 847-362-1590, fax: 847-362-1557

2.2 MATERIALS

- A. Terra cotta: Fired clay, modular pieces with [glazed] [unglazed] finish as manufactured by Boston Valley Terra Cotta.
- B. Minimum averaged characteristics based on testing 10 samples in accordance with referenced standards:
 1. Compressive strength, ASTM C67 and ASTM C126: 6,000 PSI.
 2. Shear strength: 1,500 PSI.
 3. Absorption, ASTM C67:
 - a. 11.5 percent after 5 hours boil.
 - b. 7.5 percent after 24 hours soak.

******* Saturation coefficient is ratio of absorption during 24 hours cold water submersion to absorption during 5 hours boiling water submersion. *******

4. Saturation coefficient, ASTM C67: 0.69.
5. Coefficient of thermal expansion: 0.0000025 inch/inch/degree F.
6. Craze resistance, AIA File No. 9: No crazing, spalling, or cracking after one cycle of autoclaving.
7. Glaze absorption, ASTM C67: 0.15 percent.
8. Freeze-thaw resistance, ASTM C67: 300 cycles without degradation.
9. Thermal shock resistance of glazed terra cotta, ASTM C484: Passes one test cycle.
10. Glaze adhesion, AIA File No. 9: 1,200 PSI.

2.3 DESIGN

- A. Design terra cotta pieces to satisfy performance requirements specified in Paragraph 1.3.
- B. Pieces shall be structurally sound with adequate provision for anchorage and setting:

******* Ceramic veneer panels are typically extruded, flat panels with ribs or scoring on backside. *******

 1. Ceramic veneer panels: Thin, solid slabs with scored or ribbed backs. Minimum thickness:
 - a. Adhesion set veneer: [1 inch.] [25 mm.]
 - b. Mechanically anchored veneer: [1-1/4 inches] [32 mm.]

******* Ornamental shapes are typically produced by pressing plastic clay into molds resulting in a hollow form with an exposed front wall strengthened by perpendicular partitions and top and bottom beds. *******

2. Ornamental and special shapes:
 - a. Exposed wall faces: [1 inch] [25 mm] minimum.
 - b. Partitions: Thickness and spacing to provide required structural support.
 - c. Beds: [4 inches] [102 mm] deep minimum.
- C. Provide required anchor and hand holes.
- D. Provide projecting pieces with drips.
- E. Terra cotta veneer shall be continuously supported at each floor level on shelf supports rigidly connected to structural building frame. Shelf supports shall be located in mortar joints.
- F. Flashing and sheet metal:
 1. Provide for flashings, gutters, parapet coverings, sills, and other sheet metal indicated on Drawings or required to provide weathertight installation.
 2. Flashings and sheet metal shall be embedded in terra cotta joints or [3/4 inch] [19 mm] reglets formed in terra cotta pieces.

2.4 FABRICATION

- A. Fabricate terra cotta pieces in accordance with approved shop and setting drawings.
- B. Duplicate existing terra cotta pieces based on [illustrative samples from existing building] [photographs] [measured drawings] [original building drawings].
- C. Produce molds for forming terra cotta pieces. Allow for clay shrinkage resulting from drying and firing.
- D. Form clay pieces by hand pressing, ram pressing, or extruding as determined by manufacturer as best method for shapes, sizes, and complexity of terra cotta. Hand finish pieces as required to produce high quality component.
- E. Dry pieces 3 to 14 days using regulated temperature and humidity.

2.5 FINISH

******* Terra cotta pieces can be left unglazed or finished with a mixture of metallic oxides, chemicals, clays, and water sprayed on piece which is then fired to fuse the ceramic finish to the terra cotta body. *******

- A. Finish: Terra cotta pieces shall be [unglazed.] [finished with colored glazes.]
******* Include the following paragraph if unglazed terra cotta is used. *******
- B. Color and texture [to match approved samples.] [to match finish of existing terra cotta.]
******* Include the following paragraphs if glazed terra cotta is used. Glazes may be high-fired type which are sprayed on pieces prior to firing. Low-fired glazes are applied to pieces that have already been fired. These pieces are then fired again at a lower temperature to fuse the ceramic finish to the terra cotta piece. Consult Boston Valley Terra Cotta to determine if a high-fired or a low-fired glaze is required for the desired color and finish. Edit the following paragraphs to reflect type of finish required. *******
- C. Glaze: [High-fired type spray applied to unfired piece and then fired to vitrify clay and fuse finish to terra cotta piece.] [Low-fired type spray applied to fired terra cotta piece. Fire piece again at lower temperature to fuse ceramic finish to terra cotta.]

***** Matte, satin, and gloss finishes are available for glazes. *****

1. Finish: [Matte] [Satin] [Gloss].
2. Color:

***** Either a single color or multiple colors can be applied to a terra cotta piece. A mottled appearance can be achieved by blending two or more colors during application. *****

- a. [Single solid color.] [Mottled color obtained by blending two or more colored glazes during application.] [Polychrome application of two or more colored glazes in designated areas of single terra cotta piece.]
- b. Color to match [approved samples.] [finish of existing terra cotta.]

2.6 FIRING

***** Include the following paragraph if terra cotta is glazed. Edit to reflect use of low-fired or high-fired glaze. *****

- A. Fire pieces [prior to application of low-fired glaze.] [after application of high-fired glaze.]
- B. Pieces shall be kiln fired at [2100 degrees F] [649 degrees C] in accordance with manufacturer's standard method to obtain characteristics specified in paragraph 2.2.

2.7 SOURCE QUALITY CONTROL

- A. After fabrication and prior to packing for shipment, carefully inspect terra cotta pieces for chips, cracks, and other defects. Verify dimensions comply with shop drawing dimensions and finishes match approved samples.
- B. Verify pieces meet fabrication tolerances:
 1. Warpage for extruded terra cotta veneer: [0.005 inch per inch length] [0.127 mm per 25 mm length] maximum variation from true plane.
 2. Tolerance for handmade terra cotta pieces: [1/8 inch] [3 mm] maximum variation from shop drawing dimensions.
- C. Shop assembly:
 1. Layout terra cotta pieces in accordance with setting drawings. Verify that joints when installed will be straight, true, and uniform width. Verify that decorative elements continuous from one piece to next are aligned.
 2. Notify Architect 10 days prior to shop assembly. [Architect will visit factory and inspect layout.]
- D. Correct deficiencies.

2.8 MORTAR AND GROUT

- A. Materials:

1. Portland cement ASTM C150, Type I, low alkali.
2. Lime: ASTM C207, Type S, hydrated.
3. Aggregates: Free of organic contaminants. Chloride ions not to exceed 50 parts per million.
 - a. Fine: ASTM C144 sand [with color and texture to match aggregate used for original mortar].
 - b. Coarse: ASTM C404, [1/2 inch] [13 mm] maximum diameter.
4. Water: Potable, clean, and free of deleterious amounts of acids, alkalis, and organic materials.

B. Mortar:

1. Mixes: Mortar for rebuilding existing terra cotta and repointing existing joints shall be mixed so that compressive strength does not exceed that of existing mortar and terra cotta. Adjust the following requirements such that existing compressive strengths are not exceeded. Mortars shall not contain calcium chloride or air-entraining agents.
 - a. Setting mortar: ASTM C270, Type M.
 - 1) Cement: 1 part.
 - 2) Lime: 1 part.
 - 3) Sand: 6 parts.
 - b. Pointing mortar: ASTM C270, Type N.
 - 1) Cement: 1 part.
 - 2) Lime: 1/4 part.
 - 3) Sand: 3-1/2 parts.

******* Mortar color can be achieved by using colored sand or mineral oxide pigments. However, mineral oxides must not exceed 10 percent by weight. *******

2. Color: [Mineral oxide pigment not to exceed 10 percent by weight.] [Obtain color by using colored sand.] Color [to match cleaned mortar on existing building.] [as selected by Architect.]

- C. Grout: ASTM C476, 2,500 PSI strength and 1/2 inch diameter maximum aggregate. Design mix to accommodate field conditions.
- D. Thoroughly mix mortar and grout ingredients in quantities needed for immediate use in accordance with ASTM C270 and ASTM C476.
- E. Do not use anti-freeze compounds. Do not use admixtures without approval of Architect.
- F. Use mortar and grout within two hours after mixing.

2.9 ACCESSORIES

- A. Sealant: [Polyurethane type complying with ASTM C920.] [As specified in Section 07900 - Joint Sealers.] [Type as recommended by terra cotta manufacturer.]

1. Maximum movement: [25] [_____] percent expansion and contraction.
 2. Joint size limitation:
 - a. Width: [1/4 to 1 inch] [6 to 25 mm] [_____]
 - b. Depth: [1/4 to 1/2 inch] [6 to 13 mm] [_____].
 3. Color: [Shall match mortar color.] [As elected by Architect.]
- B. Joint backer rod: Round closed cell polyurethane rod oversized 30 percent larger than joint width.
- C. Terra cotta patching compound: Mortar type patching compound as recommended by terra cotta manufacturer.
- D. Paint for repaired terra cotta surfaces:
1. Primer: Waterborne, epoxy resin type, masonry and concrete primer and sealer.
 2. Finish: Exterior, acrylic, waterborne, [semi-gloss] [gloss] enamel, color to match existing terra cotta glaze.
- E. Angles, channels, and other secondary support members that are not part of the structural frame: Rolled steel sections, ASTM A36.
- F. Anchors, hangers, bolts, clips, straps, rods, pins, clamps, and other metal items for securing terra cotta: Stainless steel, ASTM A167, Type 304 or galvanized steel, ASTM A123 of the following minimum sizes.
1. Terra cotta courses supported directly on wall: [1/4 by 1/4 inch] [6 by 6 mm] or [1/8 by 5/8 inch] [3 by 16 mm] anchors or No. 6 gage galvanized wire.
 2. Projecting terra cotta courses: [5/8 inch] [16 mm] diameter bars.
 3. Hangers: [5/8 inch] [16 mm] diameter.
 4. Clips and straps: [3/8 by 2 inches.] [10 by 50 mm.]
 5. Pins: [1/2 inch] [13 mm] diameter.
 6. Continuous rods to receive terra cotta anchor clips: [5/8 inch] [16 mm] diameter bars secured to structure with [1/2 inch] [13 mm] diameter anchors at [24 inches] [610 mm] maximum.
- G. Weep holes: Preformed plastic tubes.

PART 3 - EXECUTION

******* Edit the following article to reflect scope and extent of site survey required for specific project. *******

3.1 SITE SURVEY

- A. Conduct site survey of existing building prior to submittal of shop drawings and fabrication of terra cotta pieces.
- B. Identify and code pieces to be replaced.
- C. Collect measurements, take photographs, make field sketches, and record other data as required for design and fabrication of replacement pieces.
- D. Sample and determine compressive strength of existing mortar. Identify joints to be repointed.
- E. Identify existing terra cotta surfaces to be cleaned.
- F. Illustrative samples:
 1. Carefully remove existing terra cotta pieces required as samples to use in

- preparation of molds for fabrication of replacement pieces.
- 2. Pack, crate, and delivery samples to manufacturer's plant.
- 3. Provide temporary protection to prevent moisture penetration into structure where terra cotta pieces are removed.

3.2 COORDINATION

- A. Coordinate requirements for steel support members, embedded anchors, flashings, and sheet metal with other work to ensure timely and accurate placement.

3.3 PRE-RESTORATION CONFERENCE

- A. Convene a pre-restoration conference prior to commencing work of this Section.
- B. Require attendance of entities directly concerned with work related to terra cotta restoration.
- C. Notify Architect 5 days in advance of meeting.
- D. Review:
 - 1. Items of restoration to be performed, procedures, and work sequence.
 - 2. Requirements for [steel] [concrete] support members and embedded anchors.
 - 3. Coordination with installation of flashings and sheet metal.
 - 4. Protection of installed items and finishes.
 - 5. Availability of materials.
 - 6. Preparation of substrate.
- E. Record minutes, and distribute copies within 5 days to Architect, Owner, and other participants.

******* If scope of project includes cleaning of existing terra cotta surfaces, include the following article. If terra cotta is severely stained or vandalized with graffiti, contact Boston Valley Terra Cotta for recommended procedures and cleaning agents. *******

3.4 CLEANING EXISTING TERRA COTTA

- A. Clean [all existing terra cotta surfaces.] [existing terra cotta surfaces identified by inspection specified in Paragraph 3.1.]
- B. Protect areas below cleaning operation.
- C. Clean with detergent and clean water. Use fiber brushes and cloths.
- D. Do not use metallic tools for cleaning and scraping.
- E. Thoroughly rinse and wash off cleaning solution and dirt.
******* If scope of project includes repointing of existing mortar joints, include the following article. *******

3.5 REPOINTING

- A. Repoint [all existing mortar joints.] [existing mortar joints identified by inspection specified in Paragraph 3.1.]
- B. Cut out loose and disintegrated mortar in joints to minimum [1/2 inch] [6 mm] depth or until sound mortar is reached.
- C. Use tools and methods that do not damage terra cotta.
- D. Remove dust and loose material by brushing, water spray, or air jet.
- E. Moisten joint. Tightly pack new mortar in [1/4 inch] [6 mm] layers. Form smooth, compact [concave] [flush] joint to match existing.

F. Moist cure for 72 hours.

******* Chipped terra cotta pieces can sometimes be repaired in the field by patching and painting. Contact Boston Valley Terra Cotta for information on techniques for field repair. Include the following article if minor repairs are required. *******

3.6 REPAIRING

- A. Repair chipped and broken terra cotta pieces [identified by inspection specified in Paragraph 3.1.] [indicated on Drawings.]
- B. Remove loose material and clean surfaces to be repaired.
- C. Apply patching compound in accordance with manufacturer's instructions. Sculpt material to match existing profiles and ornamental designs. Provide smooth transition between new and existing surfaces.
- D. After compound has set and cured, apply primer and two finish paint coats. Blend and distress paint to match appearance and color of existing terra cotta.

******* Pieces of terra cotta that are badly chipped, cracked, or the ornamentation is broken are difficult to repair. Replacement is often the best method of restoration. If scope of project includes removal and replacement of existing terra cotta pieces, include the following article. *******

3.7 REMOVAL FOR REBUILDING

- A. Cut out deteriorated terra cotta pieces to be replaced in manner to prevent damage to remaining terra cotta and adjoining materials.
- B. Cut away loose or unsound adjoining mortar and grout to provide clean surfaces and solid bearing for setting new pieces.

******* Include and edit the following article to specify installation of new terra cotta pieces to replace damaged and deteriorated pieces that have been removed. This article can also be used to install new terra cotta used for additions and alterations to existing buildings. *******

3.8 INSTALLATION OF NEW TERRA COTTA

- A. Install new terra cotta pieces in accordance with manufacturers recommended instructions and approved shop and setting drawings.
- B. Preparation:
 - 1. Securely attach anchors, hangers, bolts, clips, rods, and pins as required for securing terra cotta pieces. Use type of fastener and spacing recommended by terra cotta manufacturer. Ensure items are properly sized and accurately located.
 - 2. Soak walls to receive new terra cotta by spraying with clean water at beginning of day and again within one hour of setting pieces.
 - 3. Soak terra cotta pieces 60 minutes prior to installation.
- C. Field cutting: Where cutting is required to accommodate non-standard conditions, use power saw with abrasive or diamond blade and rigid cutting templates. Do not reduce strength of terra cotta by cutting webs and partitions.

- D. Set terra cotta plumb, true, and aligned. Maintain courses to uniform dimension.
- E. Projecting terra cotta shall be aligned and uniform such that shadow cast is true line.

******* Terra cotta may be applied to substrate with metal anchors or by adhering to substrate with mortar. Use the following paragraphs for anchor installation method. *******

- F. Anchor installation method: Attach new terra cotta pieces to substrate with metal anchors as detailed on approved shop and setting drawings. Set pieces in solid mortar bed. Fill all spaces between terra cotta and substrate with grout or mortar.
 - 1. Spaces greater than [3/4 inch] [19 mm]: Fill with grout.
 - 2. Spaces [3/4 inch] [19 mm] or less: Fill with mortar.

******* Use the following paragraphs for adhesion method of installing terra cotta. *******

- G. Adhesion installation method:
 - 1. Immediately before application of mortar, brush coat of portland cement and water on back of terra cotta piece and on portion of wall to receive terra cotta.
 - 2. Spread mortar on back of terra cotta piece and portion of wall to receive piece such that total mortar thickness averages [3/4 inch] [19 mm].
 - 3. Tap piece in place completely filling voids and extruding slight excess at joints and edges.
- H. Open back terra cotta shapes shall be filled solidly with grout prior to installation. Allow grout to set enough to permit handling.
- I. Ensure that all rebates in bed and cross joints on sides and back are filled solid with mortar. Leave no voids.
- J. Adjustments: Do not shift or tap terra cotta pieces after mortar has achieved initial set. If adjustments are required or pieces are disturbed after setting, remove, clean, and relay with fresh mortar.
- K. Flashing and sheet metal: As work progresses, install built-in flashings and sheet metal in accordance with Section 07600 - Flashing and Sheet Metal. Embed in mortar joints or reglets as indicated on approved shop and setting drawings.
- L. Grouting: Fill terra cotta formed cavities containing reinforcement and other locations indicated on approved shop and setting drawings with grout. Place and consolidate grout without displacing reinforcement. Ensure that steel reinforcement, supports, anchors, and ties are encased with grout or mortar and permanently protected from corrosion.
- M. Weep holes: Provide weep holes through mortar joints as indicated on approved shop and setting drawings. Keep weep holes free of mortar and grout.

3.9 JOINTS

- A. Mortar joints:
 - 1. Size: [1/4 inch] [6 mm] wide unless otherwise indicated on approved shop and setting drawings.
 - 2. Form [concave] [flush] vertical and horizontal joints of uniform thickness. Point joints as work progresses. When repointing is required, rake joint [1/2 inch] [13 mm], drive pointing mortar into joint, and strike with jointing tool.
 - 3. Joints in overhanging pieces, balustrades, parapets, and free standing terra cotta

features: Rake out [1/2 inch] [13 mm] and point with joint backing and sealant.

******* Requirements and location of expansion joints with vary with project conditions. Expansion joints should extend through terra cotta veneer and mortar setting bed to substrate. Coordinate the following paragraphs with joint details on drawings. *******

- B. Expansion joints: Provide expansion joints in linear terra cotta runs, at shelf supports, and other locations indicated on approved shop and setting drawings to accommodate deflection, thermal changes, and settlement.

******* Expansion joints for terra cotta should be formed every 25 to 30 linear feet (8 to 9 m). *******

1. Maximum distance between expansion joints: [[25] [30] feet.] [[8] [9] m.]
2. Rake out expansion joints to full depth of setting bed at time terra cotta is installed.
3. Install joint backing with blunt instrument. Do not twist rod. Backing shall be [1/4 inch] [6 mm] from terra cotta surface.
4. Apply sealant with minimum exposure to air using pressure gun with nozzle cut to fit joint width. Install sealant free of air pockets, foreign embedded material, ridges, and sags.
5. Tool joints concave unless otherwise noted. Do not lap or feather onto adjacent surfaces.

3.10 FIELD QUALITY CONTROL

******* Include the following paragraph if manufacturer's field representative is required by Paragraph 1.5.C. *******

- A. Manufacturer's field representative shall inspect terra cotta restoration and installation, identify defects, and submit report to Architect in accordance with Section 01400 - Quality Requirements. Correct deficiencies identified by manufacturer's field representative.
- B. After restoration is complete, inspect joints. Replace defective mortar. Match adjacent work.

3.11 PROTECTION AND CLEANUP

- A. During erection: Cover uncompleted terra cotta and backing with waterproof sheeting at end of each day and hold securely in place.
- B. Protect face of adjacent walls and surfaces from water, mortar, and grout used for terra cotta installation.
- C. Remove excess mortar and mortar smears as work progresses.
- D. Clean soiled surfaces with detergent and clean water. Use fiber brushes and cloths. Do not use metallic tools.
- E. Protect terra cotta from subsequent construction operations. If damage occurs, remove and replace damaged components as required to provide terra cotta in original, undamaged condition.

END OF SECTION

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