

SECTION 044203

STONE MASONRY

PART 1 - GENERAL

1.1 STIPULATIONS

- A. The specifications sections "General Conditions of the Construction Contract", "Special Conditions", and "Division 1 - General Requirements" form a part of this Section by this reference thereto, and shall have the same force and effect as if printed herewith in full.

1.2 SUMMARY

- A. Section includes the following interior stone masonry:
 - 1. Dimension stone stringer panels set with individual anchors.
 - 2. Dimension stone stair treads on shims and leveling bed with anchoring pins.
 - 3. Patching and fill-in of "rose colored" granite where new construction adjoins existing construction.
- B. Related Requirements:
 - 1. Section 042000 "Unit Masonry" for installing inserts in unit masonry for anchoring dimension stone cladding and for stone trim in unit masonry walls.
 - 2. Section 055000 "Metal Fabrications" for steel structure to support stone stair treads.
 - 3. Section 079200 "Joint Sealants" for sealing joints in dimension stone cladding system with elastomeric sealants.

1.3 PREINSTALLATION MEETINGS

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

1.4 SUBMITTALS

- A. Product Data: For each variety of stone, stone accessory, and manufactured product.
- B. Shop Drawings: Show fabrication and installation details for dimension stone cladding assembly, including dimensions and profiles of stone units.
 - 1. Show locations and details of joints both within dimension stone cladding assembly and between dimension stone cladding assembly and other construction.
 - 2. Include details of mortar joints, sealant joints and mortar joints pointed with sealant.
 - 3. Show locations and details of anchors and backup structure.
 - 4. Show direction of veining, grain or other directional pattern.
 - 5. Include large-scale shaded elevations and details of decorative surfaces and inscriptions.
- C. Stone Samples for Verification: Sets for each variety, color, and finish of stone required; not less than 12 inches (300 mm) square.

1. Sets shall consist of at least five Samples, exhibiting extremes of the full range of color and other visual characteristics expected and will establish the standard by which stone will be judged.
- D. Sealant Samples for Verification: For each type and color of joint sealant required.
- E. Qualification Data: For Installer, fabricator and professional engineer.
- F. Welding certificates.
- G. Material Test Reports:
 1. Stone Test Reports: For each stone variety proposed for use on Project, by a qualified testing agency, indicating compliance with required physical properties, other than abrasion resistance, according to referenced ASTM standards. Base reports on testing done within previous five years.
 2. For metal components, by a qualified testing agency, indicating chemical and physical properties of metal.
 3. Sealant Compatibility and Adhesion Test Report: From sealant manufacturer complying with requirements in Section 079200 "Joint Sealants" and indicating that sealants will not stain or damage stone. Include interpretation of test results and recommendations for primers and substrate preparation needed for adhesion.
- H. Preconstruction test reports.
- I. Source quality-control reports.

1.5 QUALITY CONTROL

- A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate dimension stone cladding assemblies similar to that required for this Project and whose products have a record of successful in-service performance.
- B. Installer Qualifications: A firm or individual experienced in installing dimension stone cladding assemblies similar in material, design, and extent to that indicated for this Project, whose work has a record of successful in-service performance.
- C. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.
- 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 mockups of stair tread and stringer panel.
 - a. Include typical components, attachments to building structure, and methods of installation.
 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Professional 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.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store and handle stone and related materials to prevent deterioration or damage due to moisture, temperature changes, contaminants, corrosion, breaking, chipping, and other causes.
 - 1. Lift stone with wide-belt slings; do not use wire rope or ropes that might cause staining. Move stone, if required, using dollies with cushioned wood supports.
 - 2. Store stone on wood skids or pallets with non-staining, waterproof covers. Arrange to distribute weight evenly and to prevent damage to stone. Ventilate under covers to prevent condensation.
- B. Mark stone units, on surface that will be concealed after installation, with designations used on Shop Drawings to identify individual stone units. Orient markings on vertical panels so that they are right side up when units are installed.
- C. Deliver sealants to Project site in original unopened containers labeled with manufacturer's name, product name and designation, color, expiration period, pot life, curing time, and mixing instructions for multicomponent materials.
- D. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- E. Store aggregates in locations where grading and other required characteristics can be maintained and where contamination can be avoided.

1.7 COORDINATION

- A. Coordinate installation of inserts that are to be embedded in concrete or masonry, and similar items to be used by dimension stone cladding Installer for anchoring, supporting, and flashing of dimension stone cladding assembly. Furnish setting drawings, templates, and directions for installing such items and deliver to Project site in time for installation.
- B. Time delivery and installation of dimension stone cladding to avoid extended on-site storage and to coordinate with work adjacent to dimension stone cladding.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations for Stone: Obtain each variety of stone, regardless of finish, from single quarry with resources to provide materials of consistent quality in appearance and physical properties.
 - 1. For stone types that include same list of varieties and sources, provide same variety from same source for each.
- B. Source Limitations for Other Materials: Obtain each type of stone accessory, sealant, and other material from single manufacturer for each product.

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer to design dimension stone anchors.
- B. General: Design stone anchors and anchoring systems according to ASTM C 1242.
 - 1. Stone anchors shall withstand not less than two times the weight of the stone cladding in both compression and tension.
- C. Structural Performance: Dimension stone cladding assembly shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Live Loads: Per 2018 IBC.
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
 - 1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- E. Safety Factors for Stone: Design dimension stone cladding assembly to withstand loads indicated without exceeding stone's allowable working stress determined by dividing stone's average ultimate strength, as established by testing, by the following safety factors:
 - 1. Safety Factor for Granite: 3.
- F. Design stone anchors to withstand loads indicated without exceeding allowable working stresses established by the following:
 - 1. For Structural Steel: AISC 360.
- G. Limit deflection in each prefabricated assembly caused by indicated loads and thermal movements, acting singly or in combination with one another, to not more than 1/720 of assembly's clear span or the following, whichever is smaller:
 - 1. 1/16-inch (1.5 mm), measured in plane of wall.
 - 2. 1/4-inch (6 mm), measured perpendicular to wall.

2.3 GRANITE

- A. Material Standard: Comply with ASTM C 615.
- B. Regional Materials: Granite shall be fabricated within 500 miles (800 km) of Project site from stone that has been extracted within 500 miles (800 km) of Project site.
- C. Varieties and Sources: Subject to compliance with requirements, provide the following:
 - 1. G-1: Virginia Mist Granite.
 - a. For new stair treads and stringers.

2. G-2: Laurentia Rose.
 - a. For parking and infill where new construction adjoins existing construction.
 - 1) Wall base.
 - 2) Glass railing sill pieces.

D. Cut: Vein.

1. G-1: Orientation of Veining: Horizontal.
2. G-2: Orientation of Veining: Horizontal.

E. Cut stone from one block or contiguous, matched blocks in which natural markings occur.

F. Finish:

1. G-1: Honed.
2. G-2: Polished

G. Match Professional's samples for color, finish, and other stone characteristics relating to aesthetic effects.

H. Thickness: As indicated on Drawings.

2.4 ANCHORS AND FASTENERS

- A. Fabricate anchors from cold rolled steel Type 304; temper as required to support loads imposed without exceeding allowable design stresses. Fabricate dowels and pins for anchors from stainless steel, ASTM A 276, Type 304.
- B. Post-installed Anchors: Chemical anchors made from stainless-steel components complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2 (ASTM F 738M and ASTM F 836M, Alloy Group A1 or A4) for bolts and nuts; ASTM A 240/A 240M, ASTM A 276, or ASTM A 666, Type 304 or 316, for anchors, with capability to sustain, without failure, a load equal to 4 times the loads imposed, for concrete, or 6 times the load imposed, for masonry, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.
- C. Threaded Fasteners: Heavy hexagon structural bolts, heavy hexagon nuts, and hardened washers.

2.5 MORTAR MATERIALS

- A. Portland Cement: ASTM C 150, Type I or Type II, except Type III may be used for cold-weather construction, natural color or white as required to produce mortar color indicated.
 1. Low-Alkali Cement: Portland cement for use with limestone shall contain not more than 0.60 percent total alkali when tested according to ASTM C 114.
- B. Hydrated Lime: ASTM C 207.
- C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime.

- D. Aggregate: ASTM C 144; except for joints narrower than 1/4-inch (6 mm) and pointing mortar, 100 percent shall pass No. 16 (1.18-mm) sieve.
- E. Water: Potable.

2.6 STONE ACCESSORIES

- A. Setting Shims: Strips of resilient plastic or vulcanized neoprene, Type A Shore durometer hardness of 50 to 70, non-staining to stone, of thickness needed to prevent point loading of stone on anchors and of depths to suit anchors without intruding into required depths of pointing materials.
- B. Sealants for Joints in Dimension Stone Cladding: Manufacturer's standard chemically curing, elastomeric sealants of base polymer and characteristics indicated below that comply with applicable requirements in Section 079200 "Joint Sealants" and do not stain stone:
 - 1. Silicone Joint Sealant: Single component, non-sag, neutral curing, Class 100/50.
 - 2. Joint-Sealant Colors: As selected by Professional from manufacturer's full range of colors.

2.7 STONE FABRICATION

- A. General: Fabricate stone units in sizes and shapes required to comply with requirements indicated.
 - 1. For granite, comply with recommendations in NBGQA's "Specifications for Architectural Granite."
- B. Control depth of stone and back check to maintain minimum clearance of 1 inch (25 mm) between backs of stone units and surfaces or projections of structural members, fireproofing (if any), backup walls, and other work behind stone.
- C. Dress joints (bed and vertical) straight and at right angle to face unless otherwise indicated. Shape beds to fit supports.
- D. Cut and drill sinkages and holes in stone for anchors, fasteners, supports, and lifting devices as indicated or needed to set stone securely in place.
- E. Finish exposed faces and edges of stone to comply with requirements indicated for finish and to match approved samples and mockups.
- F. Quirk-miter corners unless otherwise indicated; provide for cramp anchorage in top and bottom bed joints of corner pieces.
- G. Cut stone to produce uniform joints 3/8 inch (10 mm) wide and in locations indicated.
- H. Contiguous Work: Provide chases, reveals, reglets, openings, and similar features as required to accommodate contiguous work.
- I. Clean backs of stone to remove rust stains, iron particles, and stone dust.
- J. Inspect finished stone units at fabrication plant for compliance with requirements for appearance, material, and fabrication. Replace defective units.

1. Grade and mark stone for overall uniform appearance when assembled in place. Natural variations in appearance are acceptable if installed stone units match range of colors and other appearance characteristics represented in approved samples and mockups.

2.8 SHOP-PAINTED STEEL FINISHES

- A. General: Paint uncoated steel backup structure before delivering to Project site to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel."
- B. Surface Preparation: After fabricating steel items, prepare surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
- C. Apply one coat of fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#76. After primer has dried, apply one coat of exterior alkyd enamel complying with MPI#96 of a different color than primer.

2.9 MORTAR MIXES

- A. General: Comply with referenced standards and with manufacturers' written instructions for mix proportions, mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures needed to produce mortar of uniform quality and with optimum performance characteristics.
 1. Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated. Do not use calcium chloride.
 2. Combine and thoroughly mix cementitious materials, water, and aggregates in a mechanical batch mixer unless otherwise indicated. Discard mortar when it has reached initial set.
- B. Portland Cement-Lime Setting Mortar: Comply with ASTM C 270, Proportion Specification, Type S.
 1. Set granite with Type S mortar.
- C. Pointing Mortar: Comply with ASTM C 270, Proportion Specification, Type S.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces to receive dimension stone cladding and conditions under which dimension stone cladding will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of dimension stone cladding.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of dimension stone cladding.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SETTING DIMENSION STONE CLADDING, GENERAL

- A. For in-fill and patching of "rose colored" granite, the contractor may use existing granite salvaged from demolition work provided any reuse of salvaged granite is reviewed and approved by the Professional.
- B. Before setting stone, clean surfaces that are dirty or stained by removing soil, stains, and foreign materials. Clean stone by thoroughly scrubbing with fiber brushes and then drenching with clear water. Use only mild cleaning compounds that contain no caustic or harsh materials or abrasives.
- C. Contiguous Work: Provide reveals, reglets, and openings as required to accommodate contiguous work.
- D. Set stone to comply with requirements indicated. Install anchors, supports, fasteners, and other attachments indicated or necessary to secure dimension stone cladding in place. Shim and adjust anchors, supports, and accessories to set stone accurately in locations indicated, with uniform joints of widths indicated, and with edges and faces aligned according to established relationships and indicated tolerances.

3.3 SETTING MECHANICALLY ANCHORED DIMENSION STONE CLADDING

- A. Set dimension stone cladding with mechanical anchors without mortar unless otherwise indicated.
- B. Attach anchors securely to stone and to backup surfaces. Comply with recommendations in ASTM C 1242.
- C. Provide compressible filler in ends of dowel holes and bottoms of kerfs to prevent end bearing of dowels and anchor tabs on stone. Fill remainder of anchor holes and kerfs with sealant indicated for filling kerfs.
- D. Set stone supported on clips or continuous angles on resilient setting shims. Use material of thickness required to maintain uniform joint widths and to prevent point loading of stone on anchors. Hold shims back from face of stone a distance at least equal to width of joint.

3.4 JOINT-SEALANT INSTALLATION

- A. Prepare joints and apply sealants of type and at locations indicated to comply with applicable requirements in Section 079200 "Joint Sealants."

3.5 INSTALLATION TOLERANCES

- A. Variation from Plumb: For vertical lines and surfaces of walls, do not exceed 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (10 mm in 6 m), or 1/2 inch in 40 feet (12 mm in 12 m) or more. For external corners, corners and jambs within 20 feet (6 m) of an entrance, expansion joints, and other conspicuous lines, do not exceed 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 3/8 inch in 40 feet (10 mm in 12 m) or more.
- B. Variation from Level: For lintels, sills, water tables, parapets, horizontal bands, horizontal grooves, and other conspicuous lines, do not exceed 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 3/8-inch (10 mm) maximum.

- C. Variation of Linear Building Line: For positions shown in plan and related portions of walls and partitions, do not exceed 1/4 inch in 20 feet (6 mm in 6 m) or 1/2 inch in 40 feet (12 mm in 12 m) or more.
- D. Variation in Cross-Sectional Dimensions: For thickness of walls from dimensions indicated, do not exceed plus or minus 1/4 inch (6 mm).
- E. Variation in Joint Width: Do not vary from average joint width more than plus or minus 1/8 inch (3 mm) or a quarter of nominal joint width, whichever is less. For joints within 60 inches (1500 mm) of each other, do not vary more than 1/8 inch (3 mm) or a quarter of nominal joint width, whichever is less from one to the other.
- F. Variation in Plane between Adjacent Stone Units (Lipping): Do not exceed 1/32-inch difference between planes of adjacent treads.

3.6 ADJUSTING AND CLEANING

- A. Remove and replace broken, chipped, stained, or otherwise damaged stone, defective joints, and dimension stone cladding that does not match approved samples and mockups. Damaged stone may be repaired if Professional approves methods and results.
- B. Replace damaged or defective work in a manner that results in dimension stone cladding's matching approved samples and mockups, complying with other requirements, and showing no evidence of replacement.
- C. In-Progress Cleaning: Clean dimension stone cladding as work progresses. Remove mortar fins and smears before tooling joints. Remove excess sealant and smears as sealant is installed.
- D. Final Cleaning: Clean dimension stone cladding no fewer than six days after completion of pointing and sealing, using clean water and stiff-bristle fiber brushes. Do not use wire brushes, acid-type cleaning agents, cleaning agents containing caustic compounds or abrasives, or other materials or methods that could damage stone.

END OF SECTION 044203