

**SECTION 04 43 11
GRANITE MASONRY**

This guide specification utilizes recommendations and formats contained in references of the Construction Specifications Institute (CSI), including the CSI Practice Guides (formerly the Project Resource Manual), incorporating SectionFormat, PageFormat and MasterFormat, latest Editions, insofar as practicable.

This Section must be carefully reviewed and edited by the user to meet the Project requirements and should be coordinated with related Specification Sections and the Drawings.

Where Specification indicates information as "shown on Drawings" or similar phrases, the Drawings are required to show this information or the text needs to be modified appropriately.

Where Specification indicates bracketed text, e.g. [text], make appropriate selection and delete the remainder of text within additional brackets, highlighting, and bold face type.

Consult Dakota Granite Company for assistance in editing this Specification guide for the specific applications.

This Specification was current at the time of publication but is subject to change. Please confirm the accuracy of these specifications with the manufacturer prior to use.

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PART 1 - PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

01. Granite masonry anchored to the following:

SPECIFIER: Select backup wall construction in subparagraphs below which are applicable to Project.

- a. Concrete backup.
 - b. Unit masonry backup.
 - c. Cold-formed metal framing and sheathing.
 - d. Wood framing and sheathing.
02. Installation materials.
 03. Joint sealant and filler.
 04. Miscellaneous accessories.

1.02 RELATED REQUIREMENTS

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

B. Related Sections:

SPECIFIER: Select applicable Divisions or Sections in subparagraphs below related to the Work of this Section; adjust actual Section numbers and names as necessary.

- 01. [Division 03 Section "Cast-in-Place Concrete"] [Section 03 30 00 - Cast-In-Place Concrete];** for dovetail slots in concrete for anchoring stone.
- 02. [Division 05 Section "Xxxxx XXXXXXXX"] [Section 05 XX XX - XXXX XXXXXXXX];** for steel lintels and shelf angles for stone masonry.
- 03. [Division 07 Section "Joint Sealants"] [Section 07 92 00 - Joint Sealants];** for joint sealant and filler material requirements, and installation requirements.

1.03 DEFINITIONS

A. Definitions contained in ASTM C119 apply to this Section.

B. Metric conversions are shown in a table at the end of this Section.

1.04 REFERENCE STANDARDS

SPECIFIER: Use care when indicating the edition date of the referenced standards; these standards are subject to regular review, and updated accordingly. Edit list below to eliminate references not contained in the final text.

A. ACI International/American Society of Civil Engineers/The Masonry Society (ACI/ASCE/TMS)

01. ACI 530.1/ASCE 6/TMS 602-02, Specification for Masonry Structures

B. ASTM International (ASTM)

01. ASTM A82-07, Standard Specification for Steel Wire, Plain for Concrete Reinforcement
02. ASTM A153-09, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
03. ASTM A240-11a, Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
04. ASTM A276-10, Standard Specification for Stainless Steel Bars and Shapes
05. ASTM A580-08, Standard Specification for Stainless Steel Wire
06. ASTM A666-10, Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate and Flat Bar
07. ASTM A1008-11, Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy With Improved Formability, Solution Hardened, and Bake Hardenable
08. ASTM B221-08, Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
09. ASTM C9709, Standard Test Methods for Absorption and Bulk Specific Gravity of Dimension Stone
10. ASTM C99-09, Standard Test Method for Modulus of Rupture for Dimension Stone
11. ASTM C114-11b, Standard Test Methods for Chemical Analysis of Hydraulic Cement
12. ASTM C144-11, Standard Specification for Aggregate for Masonry Mortar

13. ASTM C150-11, Standard Specification for Portland Cement
 14. ASTM C17009, Standard Test Method for Compressive Strength of Dimension Stone
 15. ASTM C20706(2011), Standard Specification for Hydrated Lime for Masonry Purposes
 16. ASTM C27003, Standard Specification for Mortar for Unit Masonry
 17. ASTM C578-11, Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation
 18. ASTM C61511, Standard Specification for Granite Dimension Stone
 19. ASTM C88009, Standard Test Method for Flexural Strength of Dimension Stone
 20. ASTM C954-10, Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in (0.84 mm) to 0.112 in. (2.84 mm) in Thickness
 21. ASTM C1242-10, Standard Guide for Selection, Design, and Installation of Dimension Stone Attachment Systems
 22. ASTM C135409, Standard Test Method for Strength of Individual Stone Anchorages in Dimension Stone
 23. ASTM D1056-07, Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber
 24. ASTM D4637-10, Standard Specification for EPDM Sheet Used in Single-Ply Roof Membrane
 25. ASTM E488-10, Standard Test Methods for Strength of Anchors in Concrete Elements
 26. ASTM F59302(2008), Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs
 27. ASTM F59409e1, Standard Specification for Stainless Steel Nuts
- C. National Building Granite Quarries Association, Inc. (NBGQA)

NOTE: For the Specifier's convenience, a copy of the NBGQA document referenced below is published in the Dakota Granite "Architectural" Catalog, available upon request.

01. Specifications for Architectural Granite, 2010
- D. Sheet Metal and Air Conditioning Contractors National Association (SMACNA)
01. Architectural Sheet Metal Manual; 6th Edition

1.05 SEQUENCING

- A. Coordinate installation of concrete or masonry inserts. Furnish setting drawings, templates, and directions for installing such items.

1.06 ACTION AND INFORMATIONAL SUBMITTALS

SPECIFIER: Revise Section number in the paragraph below to match that used in the Project Manual.

- A. Submit in accordance with Section [01 33 00] [Other]:
01. Product Data:
 - a. For each granite type and each manufactured product shown on Drawings or specified.
 - b. For each granite variety used on Project, include physical property data.
 02. Shop Drawings: Show fabrication and installation details for granite cladding.
 - a. Include dimensions and profiles of granite units.
 - b. Show locations and details of joints.
 - c. Show locations and details of anchors.
 - d. Include structural analysis data signed and sealed by the qualified professional engineer.
 03. Granite Samples: Submit samples of each granite type required, exhibiting the full range of color characteristics expected in the completed Work.
 - a. Submit a minimum of 2 each, 12 inches by 12 inches (305 mm by 305 mm) in size, and in each color and finish specified.
 - b. In the case of more variegated granite, submit color photos in addition to the number of samples to show the full range of color and markings.
 04. Other Samples:
 - a. Mortar: Full range of exposed color and texture; furnish 2 mortar keys in each color selected.
 - b. Grout: Full range of exposed color and texture; furnish 2 grout keys in each color selected.
 - c. Sealant: For each type and color of joint sealant required; actual sealant installed within (between) 2 small representative samples of granite selections, not less than 3 inches (76 mm) square.
 05. Certificates: Submit a letter of certification from the granite fabricator, stating the material being furnished is the specified material and there are sufficient reserves available to supply the Project and furnish replacement units if needed.
- B. Quality Assurance/Control Submittals:

01. Stone Test Reports:

- a. Preliminary Test Reports: Submit test reports for proposed stones prior to final stone selection. Preliminary test reports shall be indicative of the granite to be proposed for the Project.
- b. Material Test Reports: From a qualified independent testing agency.
 - 1) Provide reports for each granite type.

SPECIFIER: Select Division 07 or Section 07 92 00 in subparagraph below; adjust actual Section number and name as necessary.

02. Sealant Compatibility Test Report: Submit test report from sealant manufacturer, in accordance with **[Division 07 Section "Joint Sealants"] [Section 07 92 00 - Joint Sealants]** stating that sealants will not stain granite.

03. Qualification Data: Submit qualification data specified under Article 1.06 QUALITY ASSURANCE.

- C. Cold-Weather Procedures: Detailed description of methods, materials, and equipment.
- D. Hot-Weather Procedures: Detailed description of methods, materials, and equipment.

1.07 QUALITY ASSURANCE

A. Compliance:

01. Comply with the provisions of the Building Code, these specifications, and standards referenced in Article 1.04 REFERENCE STANDARDS, except where more stringent requirements are shown on the Drawings or specified herein.

- B. Granite Supply: Each type of granite shall come from a single quarry, with sufficient reserves to satisfy the requirements of the Project. The granite supplier shall have the capabilities to cut and finish the stone without delaying the Project.

SPECIFIER: Delete Paragraph below if a mock-up is not required.

- C. Mock-up: Provide a mock-up of the granite installation in the approved colors and finishes, erected at the site in a location determined by the Architect, and agreed upon by the Contractor, and the fabricator.

SPECIFIER: Indicate size of mock-up or reference Drawings for location of mock-up in subparagraph below; approved mock-ups which are subsequently removed on or before Substantial Completion, and not incorporated in the Work, shall be provided at the Owner's expense.

- 01. Size: **[Insert dimensions] [Refer to Drawings for size and location]** .
- 02. Include back-up construction, flashing, anchors, mortar and sealant, in types, colors, and profiles specified or shown.
- 03. When approved, the mock-up will become the standard for the Project.

SPECIFIER: Select removal or incorporation of mock-up in subparagraph below.

04. [Remove mock-up(s) at Substantial Completion or when requested by the Architect.] [Approved mock-up(s) may become part of completed Work if undisturbed at time of Substantial Completion.]

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store and handle materials to prevent deterioration or damage.

- 01. Carefully pack and load granite for shipment using reasonable care and customary precautions against damage in transit. Do not use material for blocking or packing, which may cause staining or discoloration.
- 02. Stack granite on timber or platforms at least 4 inches (107 mm) above the ground. Use care to prevent staining or discoloration during storage.
- 03. If storage is to be for a prolonged period, use polyethylene or other suitable plastic film placed between wood blocking and finished surfaces of completely dry stone.

- B. Properly store cementitious materials. Do not use damp cementitious materials.
- C. Store installation accessories, including metal items, to prevent corrosion and contamination.

1.09 FIELD CONDITIONS

- A. Cold-Weather Requirements: Comply with ACI 530.1/ASCE 6/TMS 602.
- B. Hot-Weather Requirements: Comply with ACI 530.1 ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.01 GRANITE SOURCE

- A. Varieties and Source: Subject to compliance with requirements, provide granite from the following source:
 - 01. Granite Source: Dakota Granite Company; 1(605) 432-5580.
- B. Substitutions: Suppliers seeking approval of their products are required to comply with the Owner's Instructions to Bidders.
- C. Granite Supply Examination: Make quarried blocks available for examination by Architect prior to fabrication.

2.02 GRANITE MATERIAL

- A. General:
 - 01. Granite: ASTM C615; match Architect's samples.

SPECIFIER: Indicate individual Types in paragraph below, including applicable characteristics; add paragraphs as necessary to meet Project requirements.

- B. Granite Type **[Insert Drawing Designation Type]:**
 - 01. Granite Variety: **[Insert granite variety]**.
 - 02. Location: Exterior masonry.
 - 03. Finish: **[Antique] [Brushed] [Honed] [Polished] [Sandblasted] [Split-face] [Thermal] [Water jet] [Other]**.
 - 04. Thicknesses:
 - a. Unless otherwise indicated, provide units with not less than the following thicknesses: **[3 inches (75 mm)] [4 inches (100 mm)] [6 inches (150 mm)] [8 inches (200 mm)]**.

2.03 MORTAR MATERIALS

- A. Portland Cement: ASTM C150, Type I or Type II, except Type III may be used for cold-weather construction.
 - 01. Provide natural color or white cement as required to produce mortar color indicated.

SPECIFIER: Retain subparagraph below if recommended by stone source to limit staining.

- 02. Low-Alkali Cement: Not more than 0.60 percent total alkali when tested according to ASTM C114.
- B. Hydrated Lime: ASTM C207.
- C. Portland Cement-Lime Mix: Packaged blend of portland cement complying with ASTM C150, Type I or III, and hydrated lime complying with ASTM C207; provide products by one of the following:
 - 01. Essroc, Italcementi Group
 - 02. Holcim (US) Inc.
 - 03. Lafarge North America
 - 04. Lehigh Cement Company
- D. Mortar Pigments: Natural and synthetic iron oxides with a record of satisfactory performance in mortar, and containing no carbon black; provide products by one of the following:
 - 01. Davis Colors
 - 02. Solomon Colors
- E. Colored Cement Product: Packaged blend made from portland cement and lime and mortar pigments, all complying with specified requirements, and containing no other ingredients.
 - 01. Formulate blend as required to produce color indicated or, if not indicated, as selected from manufacturer's standard colors.
 - 02. Do not exceed 10 percent of Portland cement by weight.
 - 03. Do not exceed 5 percent of masonry cement or mortar cement by weight.
 - 04. Mix mortar to match Architect's sample.
 - 05. Provide products by one of the following:
 - a. Holcim (US) Inc.
 - b. Lafarge North America
 - c. Lehigh Cement Company
- F. Aggregate: ASTM C144.
- G. Latex Additive: Acrylic-resin water emulsion recommended by additive manufacturer for use with field-mixed Portland cement mortar bed; provide products by one of the following:
 - 01. Bonsal
 - 02. Bostik Findley, Inc.
 - 03. C-Cure
 - 04. Custom Building Products

05. DAP, Inc.
 06. Laticrete International, Inc.
 07. MAPEI Corp.
 08. TEC Specialty Construction Brands; H. B. Fuller Company.
- H. Water: Potable.

2.04 ANCHORS AND FASTENERS

- A. Hot-Dip Galvanized-Steel Wire: ASTM A82, with ASTM A153, Class B2.
- B. Stainless Steel Wire: ASTM A580, Type 304.
- C. Hot-Dip Galvanized Steel Sheet: ASTM A1008, cold-rolled, carbon-steel sheet hot-dip galvanized after fabrication to comply with ASTM A153, Class B2.
- D. Stainless Steel Sheet: ASTM A240, Type 304.
- E. Stone Anchors: Anchors designed to engage kerfs or holes in granite trim and holes for anchor bolts for fastening to substrates or framing.
 01. Anchor Materials:
 - a. Stainless steel, ASTM A666, Type 304.
 - b. Extruded aluminum, ASTM B221; not less than strength and durability properties of Alloy 6063.
 02. Dowels and Pins Material: Stainless steel, ASTM A276, Type 304.
- F. Post-Installed Anchor Bolts: Provide the following for installation into concrete and masonry:
 01. Expansion anchors.
 02. Stainless Steel Bolts: ASTM F593, Alloy Group 1 or 2.
 03. Stainless Steel Nuts: ASTM F594, Alloy Group 1 or 2.
 04. Anchor Material: ASTM A666 or ASTM A276, Type 304 or 316.
 05. Capacity:

SPECIFIER: VERIFY load capacities with Structural Engineer of Record.

- a. Concrete: Sustain load equal to 4 times the required loads.
- b. Masonry: Sustain load equal to 6 times the required loads.
- c. Test: ASTM E488.

2.05 VENEER ANCHORS

SPECIFIER: Indicate acceptable manufacturer(s), and specific anchors with name(s) and number(s) in paragraph below.

- A. Products: **[Insert manufacturer and product].**

SPECIFIER: Select anchor material in paragraph below.

- B. Wire Veneer Anchors: Wire ties formed from W1.7 or 0.148 inch (3.8 mm), **[hot-dip galvanized] [stainless]** steel wire.
- C. Two-part Veneer Anchors: Wire tie section and a metal anchor section.
 01. Structural Performance Characteristics: Capable of withstanding a 100 lb (45 kg) load in both tension and compression without deforming or developing play in excess of 0.05 inch (1 mm).
- D. Coated, Steel Drill Screws for Steel Studs: ASTM C954 with hex washer head and neoprene washer, No. 10, with organic polymer coating.
- E. Stainless Steel Drill Screws for Steel Studs: 300 Series stainless steel, complying with ASTM C954 with hex washer head and neoprene washer, 3/16 inch (5 mm) diameter by 1-1/2 inch (13 mm) length, and with organic coating.

2.06 EMBEDDED FLASHING MATERIALS

SPECIFIER: Select Division 07 or Section 07 62 00 in paragraph below; adjust actual Section number and name as necessary.

- A. Metal Flashing: Provide metal flashing complying with SMACNA's "Architectural Sheet Metal Manual" and **[Division 07 Section "Sheet Metal Flashing and Trim"] [Section 07 62 00 - Sheet Metal Flashing and Trim]** and as follows:
 01. Stainless Steel: ASTM A240, Type 304, 0.016 inch (0.4 mm) thick.
 02. Metal Drip Edges: Extend at least 3 inches (76 mm) into wall and 1/2 inch (13 mm) out from wall, with outer edge bent down 30 degrees and hemmed.
 03. Metal Flashing Terminations: Fabricate from stainless steel.
- B. Flexible Flashing: For concealed flashing; use one of the following:

01. Rubberized-Asphalt flashing: Composite flashing consisting of rubberized-asphalt compound, bonded to high-density, cross-laminated polyethylene film to produce an overall thickness of not less than 0.040 inch (1 mm).
02. EPDM Flashing: Sheet flashing product made from ethylene-propylene-diene terpolymer, complying with ASTM D4637, 0.040 inch (1 mm) thick.

SPECIFIER: Select Division 07 or Section 07 62 00 in paragraph below; adjust actual Section number and name as necessary.

- C. Solder and Sealant for Sheet Metal Flashings: As specified in **[Division 07 Section "Sheet Metal Flashing and Trim"] [Section 07 62 00 - Sheet Metal Flashing and Trim]**.
- D. Adhesives, Primers, and Seam Tapes for Flexible Flashings: Flashing manufacturer's recommended products.

2.07 MISCELLANEOUS ACCESSORIES

SPECIFIER: Select filler material in paragraph below.

- A. Compressible Filler: ASTM D1056, Grade 2A1; compressible up to 35 percent; width and thickness indicated; and formulated from **[Neoprene] [PVC] [Urethane]**.
- B. Weep Hole/Vent Products: Round plastic tubing, medium-density polyethylene, 3/8 inch (10 mm) o.d., by thickness of stone masonry.
- C. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.
 01. Strips, full-depth of cavity and 10 inches (254 mm) wide, with dovetail shaped notches 7 inches (178 mm) deep that prevent mesh from being clogged with mortar droppings.

2.08 CAVITY-WALL INSULATION

SPECIFIER: Select Type IV or Type X in paragraph below; compressive strength of Type IV exceeds Type X, but may not be necessary, unless higher lateral compression potential is expected; the R-value is identical.

- A. Extruded Polystyrene Board Insulation: ASTM C578, **[Type IV] [Type X]**, closedcell product extruded with an integral skin.

2.09 JOINT SEALANTS

SPECIFIER: Ensure that selected sealant will not stain granite, through stain testing performed by the sealant manufacturer on the actual granite specified.

- A. Joint Fillers and Sealants: Provide materials complying with requirements specified in **[Division 07 Section "Joint Sealants"] [Section 07 92 00 - Joint Sealants]**.
 01. Colors: Provide colors of exposed sealants to match colors of grout in granite adjoining sealed joints, unless otherwise specified.

2.10 MISCELLANEOUS MATERIALS

- A. Cleaner: A neutral cleaner capable of removing soil and residue without harming granite and grout surfaces, specifically approved for materials and installations indicated by granite producer and grout manufacturer.

2.11 MORTAR MIXES AND MIXING

- A. Pre-blended, Dry Mortar Mix: Furnish dry mortar ingredients in the form of a pre-blended mix.
 01. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- B. Mortar for Stone Masonry: Comply with ASTM C270 Type S, Proportion Specification.
- C. Latex-Modified Portland Cement Setting Mortar: Proportion and mix portland cement, aggregate, and latex additive to comply with latex-additive manufacturer's written instructions.
- D. Pigmented Mortar: Use colored cement product or select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products.
 01. Do not exceed 10 percent of Portland cement by weight.
 02. Do not exceed 5 percent of masonry cement or mortar cement by weight.
 03. Mix mortar to match Architect's sample.

2.12 GRANITE FABRICATION

- A. Fabricate granite to comply with requirements indicated and with NBGQA's "Specifications for Architectural Granite".
- B. Select granite for intended use to prevent fabricated units from containing cracks, seams, and starts that could impair structural integrity or function.
- C. Cut granite from one block or contiguous, matched blocks in which natural markings occur.

- D. Cut granite to produce pieces of thickness, size, and shape indicated, and to comply with fabrication and construction tolerances recommended by applicable granite association.
 - 01. Clean sawed backs of granite to remove rust stains and iron particles.
 - 02. Dress joints (bed and vertical) straight and at a 90-degree angle to face.
- E. Fabricate granite units in sizes and shapes required to comply with requirements indicated, including details on Drawings and final shop drawings.
- F. Fabricate granite to maintain minimum clearance of 1 inch (25 mm) between backs of granite units and surfaces behind granite.
- G. Shape granite for type of masonry (pattern) as follows:

SPECIFIER: Select one of the patterns specified in subparagraphs 1 through 3 below, as applicable for Project.

- 01. Sawed-bed, ashlar with uniform course heights and uniform lengths as indicated on Drawings.
- 02. Sawed-bed, ashlar with uniform course heights as indicated on Drawings, and with random lengths.
- 03. Sawed-bed, ashlar with random course heights and random lengths (interrupted coursed).
- H. Finish exposed faces and edges of granite (except sawn reveals), to comply with requirements indicated for finish and to match approved samples and mock-ups.
 - 01. Exposed Ends: Finish exposed ends to match exposed face, unless otherwise indicated.
 - 02. Arises: Remove the sharp edge from arises to slightly blunt edge and to reduce chipping of the finished edge.
- I. Anchor Provisions: Cut and drill sinkages and holes in granite for anchors, fasteners, supports, and lifting devices as indicated or needed to set granite in place.
 - 01. Allow room for expansion of the anchoring devices where necessary.

SPECIFIER: Select desired joint width in paragraph below.

- J. Joint Width: Cut granite to produce uniform joints **[3/8 inch (10 mm)] [other] [as shown on Drawings]**.
- K. Provide chases, reveals, reglets, openings, and similar features as required to accommodate adjacent work.
- L. Fabricate molded work, including washes and drips, to produce uniform granite shapes, with precisely formed arises slightly eased, and matching profile at joints between units.
- M. Grade and mark granite to achieve uniform appearance when installed.
- N. Fabrication Tolerances:
 - 01. Granite thickness 2 inches (51 mm) or less: Plus or minus 1/16 inch (1.5 mm) of the nominal thickness.
 - 02. Granite thicknesses greater than 2 inches (51 mm): Plus or minus 1/8 inch (3 mm) of the nominal thickness.
 - 03. Overall face size: Plus or minus 1/16 inch (1.5 mm) in both height and width.
 - 04. Out of square: Plus or minus 1/8 inch (3 mm) difference of diagonals.
- O. Inspect granite at quarry and fabrication plant for compliance with requirements for appearance, material, and fabrication, prior to delivery to the Project site. Replace defective units which do not comply before shipment.

2.13 SOURCE QUALITY CONTROL

SPECIFIER: Select testing to be performed under separate contract by Owner's testing laboratory or testing to be performed under this Contract in paragraph below.

- A. Stone Testing: **[The Owner will engage] [Engage]** an independent testing laboratory to perform source quality control testing. Tests will be conducted on specimens randomly selected under the direction of the testing laboratory, and on each type and variety of granite, for compliance with the physical properties specified. Tests will be representative and typical of the granite proposed for the Project.
 - 01. Test results will be reported in writing by the testing laboratory, to the Owner, Architect, and the Contractor.
 - 02. The independent testing laboratory shall perform the following testing:
 - a. Absorption and Specific Gravity: ASTM C97.
 - b. Modulus of Rupture: ASTM C99.
 - c. Compressive Strength: ASTM C170.
 - d. Flexural Strength: ASTM C880.
 - 1) Frequency of Flexural Strength Testing: Test specimens for every 20,000 sq. ft., but not less than 2 sets for each granite type and finish.
- B. Anchor Assembly Testing:
 - 01. Manufacturer: Provide anchorage assembly manufacturer's test reports verifying required strengths of anchorage assemblies.

02. Owner: Owner will engage an independent testing laboratory to perform anchor assembly engineering and testing.
 - a. Anchorage Testing: Comply with requirements of ASTM C1242 and ASTM C1354 for testing anchors.
- C. Furnish test specimens from materials intended for incorporation into the Work. Furnish one set of test specimens for each required test.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine surfaces indicated to receive granite units and conditions under which units will be installed, with installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
 01. Examine substrate to verify that dovetail slots, inserts, reinforcement, veneer anchors, flashing, and other items installed in substrates and required for or extending into granite masonry are correctly installed.

SPECIFIER: Select building wrap, air barrier, or other product as specific to Project in subparagraph below.

02. Examine wall framing, sheathing, and **[building wrap] [air barrier] [insert other product]** to verify that stud locations are suitable for spacing of veneer anchors.
03. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION PREPARATION

SPECIFIER: Select building wrap, air barrier, or other product as specific to Project in paragraph below.

- A. Accurately mark stud center lines on face of **[building wrap] [air barrier] [insert other product]** before beginning stone installation over steel framing.
- B. Clean dirty or stained granite surfaces by removing soil, stains, and foreign materials before setting. Clean granite by thoroughly scrubbing with nonmetallic fiber brushes and then drenching with clear water. Use only mild cleaning compounds that contain no caustic or harsh materials or abrasives.

3.03 SETTING GRANITE - GENERAL PREPARATION

- A. Perform necessary field cutting and trimming as granite is set.
 01. Use power saws to cut granite that is fabricated with saw-cut surfaces. Cut lines straight and true, with edges eased slightly to prevent snipping.
 02. Use hammer and chisel to split granite that is fabricated with split surfaces. Make edges straight and true, matching similar surfaces that were shop- and quarry-fabricated.
 03. Pitch face at field-split edges as needed to match stone that are not field-split.
- B. Sort granite before it is placed in wall to remove units that do not comply with requirements relating to aesthetic effects, physical properties, or fabrication, or that are otherwise unsuitable for intended use.
- C. Arrange granite with color and size variations uniformly dispersed for an evenly blended appearance.
- D. Set granite to comply with requirements shown on Drawings. Install supports, fasteners, and other attachments indicated or necessary to secure granite masonry in place. Set granite accurately in locations indicated with edges and faces aligned according to established relationships and indicated tolerances.
- E. Maintain uniform joint widths. Minor variations are required to maintain bond alignment.
 01. At narrowest points, joints not less than: 1/4 inch (6 mm).
 02. At widest points, joints not more than: 1/2 inch (13 mm).
- F. Provide sealant joints of widths and at locations indicated.
 01. Keep sealant joints free of mortar and other rigid materials.
- G. Install expansion strips in sealant joints at locations indicated.

SPECIFIER: Add weep holes if applicable in paragraph below.

- H. Install embedded flashing **[and weep holes]**.
 01. At concrete backing:

SPECIFIER: Select flashing detail in subparagraph below based on Drawing details.

- a. Extend flashing through granite masonry, turned up a minimum of **[4 inches (102 mm)] [6 inches (152 mm)] [8 inches (203 mm)] [12 inches (306 mm)]**, and insert in reglet.
02. At multi-wythe masonry walls, including cavity walls:

SPECIFIER: Select flashing detail in subparagraph below based on Drawing details.

- a. Extend flashing through granite masonry, turned up a minimum of **[4 inches (102 mm)] [8 inches (203 mm)] [12 inches (306 mm)] [16 inches (406 mm)]**, and into or through inner wythe.
03. At stud-framed walls:

SPECIFIER: Select flashing detail in subparagraph below based on Drawing details.

- a. Extend flashing through granite masonry and up the face of sheathing at least **[8 inches (203 mm)] [12 inches (306 mm)] [16 inches (406 mm)]** behind **[building wrap] [air barrier] [insert other product]**.
04. At lintels and shelf angles, extend flashing full length of angles but not less than 6 inches (152 mm) into masonry at each end.
05. At sills, extend flashing not less than 4 inches (102 mm) at ends.
06. At ends of head and sill flashing turn up not less than 2 inches (51 mm) to form end dams.
07. Interlock end joints of ribbed sheet metal flashing by overlapping ribs not less than 1 1/2 inches (38 mm) or as recommended by flashing manufacturer, and seal lap with elastomeric sealant.
08. Install metal drip edges with ribbed sheet metal flashing by interlocking hemmed edges to form hooked seam. Seal seam with elastomeric sealant.
09. Extend sheet metal flashing 1/2 inch (13 mm) beyond face of masonry at exterior and turn flashing down to form a drip.
- I. Flexible Flashing with Metal Drip Edge:
01. 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.
- J. Place weep holes and vents in joints where moisture may accumulate, including at base of cavity walls, above shelf angles, and at flashing.
01. Space weep holes 24 inches (610 mm) maximum o.c.
 02. Space weep holes formed from plastic tubing or wicking material 16 inches (406 mm) o.c.
 03. Trim wicking material used in weep holes flush with outside face of wall after mortar has set.
 04. Place cavity drainage material in cavities.

3.04 CONSTRUCTION TOLERANCES

- A. For external corners, expansion joints, control joints, and other conspicuous lines, do not exceed 1/4 inch in 20 feet (6 mm in 6 m), or 1/2 inch in 40 feet (13 mm in 12 m) or more.
- B. Variation from Plumb:
01. Vertical Lines and Surfaces of Walls not to exceed:
 - a. 1/4 inch in 10 feet (6 mm in 3 m).
 - b. 3/8 inch in 20 feet (10 mm in 6 m).
 - c. 1/2 inch in 40 feet (13 mm in 12 m) or more.
 02. External corners, expansion joints, and other conspicuous lines not to exceed:
 - a. 1/8 inch in 10 feet (3 mm in 3 m).
 - b. 1/4 inch in 20 feet (6 mm in 6 m) or more.
- C. Variation from Level:
01. Bed joints of lintels, sills, water tables, parapets, horizontal bands, horizontal grooves, and other conspicuous lines, not to exceed:
 - a. 1/4 inch in 20 feet (6 mm in 6 m).
 - b. 1/2 inch in 40 feet (13 mm in 12 m) or more.
- D. Variation of Linear Building Line:
01. Positions shown in plan not to exceed:
 - a. 1/2 inch in 20 feet (12 mm in 6 m).
 - b. 3/4 inch in 40 feet (19 mm in 12 m) or more.
- E. Measure variation from level, plumb, and position shown in Drawings as variation of the average plane of the face of each unit from level, plumb, or dimensioned plane.
- F. Variation in Mortar-Joint Thickness: Do not vary from joint size range indicated.

3.05 GRANITE INSTALLATION

- A. Anchor granite masonry to concrete and unit masonry with veneer anchors.
- B. Anchor granite masonry to framing with screw-attached veneer anchors.

- C. Embed veneer anchors in mortar joints of granite masonry.
- D. Space anchors not more than 16 inches (406 mm) o.c. vertically and 24 inches (610 mm) o.c. horizontally. Install additional anchors within 12 inches (305 mm) of openings, joints, and perimeter of wall.
- E. Anchor granite trim with granite trim anchors. Provide compressible filler in ends of dowel holes and bottoms of kerfs. Fill remainder of anchor holes and kerfs with mortar.
- F. Set granite in full bed of mortar with full head joints. Build anchors into mortar joints as granite is set.
- G. Provide 2-inch (51 mm) cavity between granite masonry and backup construction unless otherwise shown. Keep cavity free of mortar droppings and debris. Minimize mortar protrusions into cavity.
- H. Rake out joints for pointing with mortar to uniform depths.
- I. Rake out mortar from sealant-filled joints to uniform depths of not less than 1/2 inch (13 mm), with square bottoms and clean sides.
 - 01. Set following granite units with head joints filled with sealants:
 - a. Cornices.
 - b. Copings.
 - c. Belt and other projecting courses.
- J. In-Progress Cleaning: Clean granite as work progresses. Remove mortar fins and smears before tooling joints.
- K. Protect granite during installation as follows:
 - 01. Prevent staining of granite from mortar, grout, sealants, and other sources. Immediately remove such materials without damaging granite.
 - 02. Protect base of walls using coverings spread on ground and over wall surface.
 - 03. Protect sills, ledges, and other projections from mortar.
 - 04. At the end of each day's work, cover top of walls with nonstaining waterproof covering. Protect partially finished work when not being worked on.

3.06 POINTING

- A. Remove dust and mortar particles from granite joints. Where setting mortar was removed to depths greater than surrounding areas, apply pointing mortar.
- B. Place and compact pointing mortar in layers not more than 3/8 inch (10 mm) deep.
- C. Tool joints when pointing mortar is thumbprint hard to produce the following joint profile:
 - 01. Joint Profile: Concave.

3.07 SEALING JOINTS

SPECIFIER: Select Division 07 or Section 07 92 00 in paragraph below; adjust actual Section number and name as necessary.

- A. General: Prepare joints and install joint fillers and sealants of type and at locations indicated to comply with applicable requirements in **[Division 07 Section "Joint Sealants"] [Section 07 92 00 - Joint Sealants]**.

3.08 ADJUSTING

- A. Remove granite units and related work with the following defects, and replace with new units to match adjacent units, unless otherwise specified herein:
 - 01. Broken, chipped, stained, and otherwise damaged granite. Granite may be repaired if methods and results are approved by Architect.
 - 02. Defective joints, including misaligned joints.
 - 03. Granite units and joints not matching approved samples and mock-ups.
 - 04. Granite units not complying with other requirements indicated.
- B. Replace in a manner that results in exterior granite masonry which matches approved samples and mock-ups, complies with other requirements, and shows no evidence of replacement.
 - 01. The Architect will make final decision on acceptance, at their discretion.

3.09 CLEANING

- A. General: Clean granite units in accordance with recommended guidelines in NBGQA's "Specifications for Architectural Granite".
- B. Final Cleaning: Clean granite using clean water and soft rags or stiff-bristle fiber brushes. Do not use wire brushes, acid-type cleaning agents, cleaning compounds with caustic or harsh fillers, or other materials or methods that could damage granite. After cleaning, rinse with clean water.
- C. When cleaning is completed, remove temporary protection.

END OF SECTION

NOTE: The following metric conversions shall apply where English measurements are indicated in the text:

1/64 inch	(0.40 mm)
1/32 inch	(0.80 mm)
1/16 inch	(1.5 mm)
1/8 inch	(3 mm)
3/16 inch	(5 mm)
1/4 inch	(6 mm)
5/16 inch	(8 mm)
3/8 inch	(10 mm)
1/2 inch	(13 mm)
5/8 inch	(16 mm)
3/4 inch	(19 mm)
13/16 inch	(20 mm)
1 inch	(25 mm)
13/16 inches	(30 mm)
11/4 inches	(32 mm)
11/2 inches	(38 mm)
15/8 inches	(41 mm)
2 inches	(51 mm)
3 inches	(76 mm)
4 inches	(102 mm)
6 inches	(152 mm)
7 inches	(178 mm)
8 inches	(203 mm)
10 inches	(254 mm)
12 inches	(305 mm)
16 inches	(406 mm)
18 inches	(457 mm)
24 inches	(610 mm)(0.6 m)
48 inches	(1220 mm)(1.2 m)
8 feet	(2440 mm)(2.4 m)
10 feet	(3 m)
20 feet	(6 m)
40 feet	(12 m)