

**SECTION 32 17 15
GRANITE CURBS, BOLLARDS, AND BARRICADES**

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 - GENERAL

1.01 SUMMARY

- A. Section Includes:

SPECIFIER: Select applicable units from subparagraphs below.

01. Granite curbs.
02. Granite bollards.
03. Granite barricades.
04. Installation materials.
05. Miscellaneous materials.

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 installation of anchor bolts cast in concrete.

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 REFERENCES 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 C114-11b, Standard Test Methods for Chemical Analysis of Hydraulic Cement
 02. ASTM C11911, Standard Terminology Relating to Dimension Stone
 03. ASTM C144-11, Standard Specification for Aggregate for Masonry Mortar
 04. ASTM C150-11, Standard Specification for Portland Cement
 05. ASTM C17009, Standard Test Method for Compressive Strength of Dimension Stone
 06. ASTM C20706(2011), Standard Specification for Hydrated Lime for Masonry Purposes
 07. ASTM C270-10, Standard Specification for Mortar for Unit Masonry
 08. ASTM C61511, Standard Specification for Granite Dimension Stone
 09. ASTM C88009, Standard Test Method for Flexural Strength of Dimension Stone
 10. ASTM C1107-11, Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Non-shrink)
- 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

1.05 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.
 - a. Include dimensions and profiles of granite units.
 - b. Show fabrication and installation details for granite components.
 - c. Show widths, details, and locations of expansion, contraction, control, and isolation joints in substrates and finished granite surfaces.
 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 selected.
 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:

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

01. 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.
 02. 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.
 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.

1.06 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.
- C. Fabricator Qualifications: Shop that employs skilled workers who have completed granite fabrication similar in material, design, and extent to that indicated for this Project, and whose work has resulted in installations with a record of successful in-service performance.
- D. Installer Qualifications: Experienced stone setters skilled in installing granite components similar in material, design, and extent to that indicated for this Project, and whose work has resulted in installations with a record of successful in-service performance.

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

- E. Mock-up: Provide a full-size mock-up of the granite installation in the approved colors and finishes, installed 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. Color Consistency: Color range shall not exceed range of color established by samples.
03. Joints: Include grouted joints, control and expansion joints, and sealant, in types, colors, and profiles specified or shown.
04. Included typical components and anchors.
05. When approved, the mock-up will become the standard for the Project.

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

06. **[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.]**

1.07 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 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. Ventilate under covers to prevent condensation.
 04. Lift granite with wide-belt slings; do not use wire rope or ropes that might cause damage. Move granite, if required, using dollies with cushioned wood supports.
 05. Properly store cementitious materials on elevated platforms, under cover, and in dry location.
 06. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
 07. Store polymer additives in unopened containers and protected from freezing.

1.08 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 Source Examination: Make quarried blocks available for examination by Architect.

2.02 GRANITE MATERIAL

- A. Granite: ASTM C615; match Architects's samples.

2.03 CURBS

SPECIFIER: Indicate applicable characteristics in subparagraphs below; add information as necessary to meet Project requirements.

- A. Granite Curbs:
 01. Granite Variety: **[Insert granite variety].**
 02. Finish: **[Polished] [Sawn] [Thermal] [Other].**
 03. Size:
 - a. Length: **[24 inches to 48 inches (610 mm to 1220 mm)] [Other].**
 - b. Width: **[6 inches (152 mm)] [8 inches (203 mm)] [Other].**
 - c. Height: **[12 inches (305 mm)] [18 inches (457 mm)] [Other].**
 - d. **[Custom size(s); refer to Drawings].**
 03. **[Size and Shape: Refer to Drawings.]**

2.04 BOLLARDS

SPECIFIER: Indicate applicable characteristics in subparagraphs below; add information as necessary to meet Project requirements.

- A. Granite Bollards:
 - 01. Granite Variety: **[Insert granite variety]**.
 - 02. Finish: **[Antique] [Brushed] [Honed] [Polished] [Sandblasted] [Split face] [Thermal] [Water jet] [Other]**.
 - 03. Size and Shape: Refer to Drawings.

2.05 BARRICADES

SPECIFIER: Indicate applicable characteristics in subparagraphs below; add information as necessary to meet Project requirements.

- A. Granite Barricades:
 - 01. Granite Variety: **[Insert granite variety]**.
 - 02. Finish: **[Antique] [Brushed] [Honed] [Polished] [Sandblasted] [Split face] [Thermal] [Water jet] [Other]**.
 - 03. Size and Shape: Refer to Drawings.

2.06 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. Thin-Set Mortar: Latex-Portland Cement Mortar, ANSI A118.4. 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.
- I. Water: Potable.

2.07 GROUT

- A. Non-shrink, Nonmetallic Grout: ASTM C1107; recommended in writing by grout manufacturer, for exterior applications.

SPECIFIER: Select one of 2 subparagraphs below; indicate actual color(s) if known.

01. Color: Selected by the Architect from manufacturer's **[standard colors] [full range of colors]**.
01. Color: **[Match granite] [Match Architect's samples]**.

2.08 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.

2.09 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. Fabricate granite in sizes and shapes required to comply with requirements indicated, including details on Drawings and final shop drawings.
- E. Finish exposed faces and edges of stone (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.
- F. Dress joints straight and at 90-degree angle to face. Shape beds to fit supports.
- G. Anchor Provisions: Cut and drill sink provisions and holes in stone for anchors, fasteners, supports, and lifting devices as indicated or needed to set stone in place.
01. Allow room for expansion of the anchoring devices where necessary.

SPECIFIER: Select desired joint width in paragraph below.

- H. Joint Width: Cut granite to produce uniform joints **[3/8 inch (10 mm)] [other] [as shown on Drawings]**.
- I. Provide reveals, reglets, openings, and similar features as required to accommodate adjacent work.
- J. Fabricate molded work, including washes and drips, to produce uniform stone shapes, with precisely formed arises slightly eased, and matching profile at joints between units.
- K. Inspect granite at 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.
- L. Fabrication Tolerances:
01. Granite thickness 2 inches or less: Plus or minus 1/16 inch (1.5 mm) of the nominal thickness.
 02. Granite thicknesses greater than 2 inches: Plus or minus 1/8 inch (3 mm) of the nominal thickness.
 03. Overall face size: Plus or minus 1/8 inch (3 mm) in both height and width.
 04. Out of square: Plus or minus 1/8 (3 mm) difference of diagonals.

2.10 GRANITE GRAPHICS AND INSCRIPTIONS

- A. Carve and cut graphics and inscriptions in accordance with final shop drawings. Use skilled stone carvers experienced in the successful performance of work similar to that indicated.

SPECIFIER: Select one of the following paragraphs below for graphics and inscriptions incorporation; consult granite supplier for recommendations.

- B. Abrasively etch graphics and inscriptions in accordance with final shop drawings.
- C. Laser etch graphics and inscriptions in accordance with final shop drawings.

2.11 MIXING MORTARS AND GROUTS

- A. General: Mix mortars and grouts to comply with referenced Standards and mortar and grout manufacturers' written instructions.
 - 01. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.
 - 02. Do not use admixtures.
 - 03. Calcium chloride is NOT allowed.
 - 04. Combine mortar materials and mix thoroughly. Discard mortar when it has reached initial set.

SPECIFIER: If paving is set with colored mortar products, adjust setting mortar in subparagraph below to reflect the use of color.

- B. Portland Cement-Lime Setting Mortar: Comply with ASTM C270 Type M, 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.
- E. Packaged Grout Mix: Proportion and mix grout ingredients according to grout manufacturer's written instructions.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine surfaces indicated to receive granite components and conditions under which components will be installed, for compliance with requirements for installation.
 - 01. Review requirements for correct and level finished grade, mounting surfaces and other conditions affecting performance.
 - 02. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION - GENERAL

- A. Comply with manufacturer's written installation instructions. Complete field assembly where required.
- B. Install granite components level, plumb, true and located where indicated on Drawings.
- C. Cleaning: Clean granite components after setting and grouting is complete, so that surfaces are free of foreign matter.
 - 01. Remove grout residue from exposed surfaces as soon as possible. Clean grout smears and haze from granite using granite producer's and grout manufacturer's written instructions, but no sooner than 10 days after installation. Use only cleaners recommended by granite producer and grout manufacturer and only after determining that cleaners are safe to use by testing on samples of granite and other surfaces to be cleaned. Flush surfaces with clean water before and after cleaning.

3.03 ADJUSTING

- A. After completing installation of granite curbs, bollards, and barricades, inspect components.
- B. Remove granite curbs, bollards, and barricades, and related work with the following defects, and replace with new units, unless otherwise specified herein:
 - 01. Broken, chipped, permanently stained, and otherwise damaged components.
 - 02. Granite components not complying with other requirements indicated.
- C. Patching: Minor patching in small areas may be acceptable if the repair does not distract from the overall appearance of the finished Project.
 - 01. Repair granite using methods recommended by granite producer.
 - 02. The Architect will make final decision on acceptance of patched granite, at their discretion.

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)