

044300 STONE MASONRY

PART 1 GENERAL

1.01 SUMMARY

A. Section includes the following applications of stone masonry:

1. Standard Specification for Quartz-Based Dimension Stone (ASTM C 616). This material is commonly referred to as “Llenroc” or “Bluestone” and is widely used in many applications on the Ithaca Campus.
 - a. The purpose of this specification is to define terms commonly used regarding the quartz based stone and establish minimum material requirements for the stone to be used on campus.

PART 2 PRODUCTS

2.01 QUARTZ-BASED STONE

A. Quartz-Based Stone: Comply with ASTM C 616

1. Definitions: ASTM C119- Quartz-Based Dimension Stone Group – Classification of Local Enfield and Ithaca sandstone (Classification II Quartzitic Sandstone).
 - a. (Commercial Definition) Quartzitic Sandstone (II) – sandstone containing at least 90% free silica (Quartz grains plus siliceous cement), which has a strength of over 10,000psi.
 - b. (Scientific Definition) Quartzitic Sandstone (II) – sandstone containing at least 90% free silica (Quartz grains plus siliceous cement), which may fracture around or through the constituent grains.
 - c. Silt Stone – a fine grained, noncarbonated clastic rock composed mostly of detrital quartz and clay materials in which the particles have an approximate size range from 0.06 to 0.005mm. Silt stone may be designated fine-grain sandstone, and is texturally transitional between sandstone and shale.
2. Definitions - Cornell University Terms (Cornell University; Geological Sciences):
 - a. Llenroc (Regional Term) – (Cornell spelled backwards) Llenroc can be distinguished from Enfield and Ithaca sandstone by its orientation, and is utilized on many of the newer buildings on campus. Llenroc is used as a veneer, not as a load bearing element. Llenroc is installed at 90° to its original sedimentary bedding plane.

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- 1) *This form of installation is not a preferred method for use of the Quartz based stone. The vertical orientation of the stones bedding plane leads to premature deterioration of stone, allowing moisture and vegetation to enter the thin laminations in the sandstone/siltstone causing layers of stone to delaminate and fall from the façade.*
- b. Bluestone - (Does not refer to color). It is a term used to describe the full range of sedimentary sandstone in New York and Pennsylvania. (New York Quarries, Inc.)
 - 1) Portage Bluestone; Geological name for a type Quartzitic Sandstone (II).
 - a) Colors: Blue, brown, lilac, green, mousy grey, grey, chocolate, salt & pepper, etc. These are general color references used by different quarries. Each quarry has irregularities within their beds or quarry blocks, providing varying colors and material properties within the stone. Some stones may be all one color, or may vary.
 - b) Portage Bluestone: also referred to as; New York Bluestone – Portage type from New York; Pennsylvania Bluestone – Portage type from Pennsylvania.
 - 2) Alcove Bluestone (Geologically known as Hamilton Sandstone) – has a very distinct dark blue/grey, “Gun Metal Grey” color.
 - a) ASTM Physical test results resemble Quartzite III as identified in ASTM C-616 Physical Requirements (Table I).
- c. Finishes (ASTM C119):
 - 1) Natural Cleft – (1/8” or more in surface variation); an irregularly textured low-relief surface, produced by splitting stone along its bedding plane, stratification, or rift.
 - 2) Split Face - a slightly convex or concave surface, produced by hydraulic stone splitters with straight or toothed blades or by driving wedges into a stone with natural cleavage surface.
 - 3) Rock Face (rock-pitched) – a split surface that has been dressed by machine or by hand to produce a convex bold projection along the face of the stone. This finish provides a bolder, more massive appearance than split face.

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- a) *Rock Face finishes have led to premature failure of Quartzite II Sandstone that was installed as Llenroc. The dressed convex shape exposes additional bedding planes to moisture and freeze thaw cycles that lead to failure of the stone. Rock face finish is only allowed in a traditional installation of the sandstone with the bedding planes oriented horizontally.*
 - 4) Thermalized (or Flamed) – a rough textured surface produced by brief exposure to a high temperature flame resulting in exfoliation of the stone surface.
 - 5) Bush-Hammered (Honed) – a uniformly textured surface with small evenly spaced pits produced by a hand or pneumatic hammer and carbide-tipped head having numerous points.
3. Minimum Physical Requirements: ASTM C-616
- a. ASTM C-97: Absorption and Bulk Specific Gravity (Absorption by Weight, max %):
 - 1) II Quartzite Sandstone 3%
 - 2) III Quartzite 1%
 - b. ASTM C-97: Absorption and Bulk Specific Gravity (Density, Min lb/ft³)
 - 1) II Quartzite Sandstone 150
 - 2) III Quartzite 160
 - c. ASTM C-170: Compressive Strength Perpendicular to the Grain (min, psi)
 - 1) II Quartzite Sandstone 10000
 - 2) III Quartzite 20000
 - d. ASTM C-241: Abrasion Resistance (min, H_a)
 - 1) II Quartzite Sandstone 8
 - 2) III Quartzite 8

2.02 GRANITE

- A. Cornell has located a granite with a similar visual appearance to Llenroc: Adirondack Granite, Adirondack Natural Stone, Whitehall, New York. In special cases where durability is preferred, Llenroc appearance is desired, and new work is not adjacent to existing stone masonry, this granite may be used as a substitution for Llenroc.

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PART 3 – EXECUTION

3.01 BELOW-GRADE STONE INSTALLATION

- A. Bluestone and other porous sedimentary stone shall not be used below grade or in contact with the ground.
- B. Provide granite or cast stone for below-grade installations.

3.02 TYPICAL STONE INSTALLATION (VERTICAL)

- A. Bluestone and sedimentary stone shall be placed with bedding planes horizontal.
- B. Where proposed masonry work is not adjacent to existing Llenroc masonry and when coordinated with University Architect, granite with similar appearance to Llenroc/bluestone may be substituted for bluestone (see Section 2.02). Provide ash-lar pattern to match existing stone layout as needed.

3.03 MASONRY CLEANING

- A. Masonry cleaning has been performed on campus with varying degrees of success. The design team should contact Cornell Facilities Engineering for institutional knowledge, reports, and test results about masonry cleaning for specific buildings to include in the proposed project.
- B. If historic or instructional knowledge is not available for the specific building, the design team shall perform cleaning mockups during the design phase starting with least aggressive process (water) to more aggressive treatments (chemical, then sand blasting). Cornell trades are available to support cleaning mockup activities so design team can determine most appropriate cleaning procedure.
- C. The potential residue material from a cleaning mockup should be discussed with Cornell Environmental Health & Safety to determine whether it should be treated as hazardous waste material or if additional precautions & protections are required.

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