

SECTION 04200 CONCRETE UNIT MASONRY

Notes: This guide specification is intended for concrete unit masonry, specifically concrete block.

Some editing may be required to suit specific project requirements.

This Section includes the terms "General Contractor", "Owner" and "Owner's Representative" - edit these term as necessary to correspond to the individuals listed in the General Conditions of the Contract.

PART 1 GENERAL

1.01 SUMMARY

A. Description:

1. The work covered by this section includes the supply of concrete unit masonry.

B. Definitions:

1. Admixture: Substance other than prescribed materials such as water, aggregate and cementitious materials added to concrete to improve one or more chemical or physical properties.
2. Ashlar: A masonry unit that is half the height of a standard unit.
3. Block (also concrete block): A solid or hollow unit larger than a brick sized unit.
8. Bond Beam unit: a U or W-shaped masonry unit, placed with the open side up to accommodate horizontal reinforcing and grout to form a continuous beam. Also known as a channel or lintel block.
5. Bull-nose units: a masonry unit with one or more rounded corners to soften corners. When there are two rounded corners on the same face of the block, it is referred to as a pilaster bullnose. When there are two rounded corners on the same end of the block, it is referred to as a double bullnose.
3. Concrete Masonry Unit: Hollow or solid masonry unit, manufactured using low frequency, high amplitude vibration to consolidate concrete of stiff or extremely dry consistency.
4. Efflorescence: A deposit of encrustation of soluble salts (generally white), that may form on the surface of the masonry unit when moisture moves through the masonry materials and evaporates on the surface.
5. Fire Resistance: A rating assigned to walls indicating the length of time a wall performs as a barrier to the passage of flames, hot gases and heat when subjected to a standardized fire and hose stream test.
6. Hollow masonry unit: A unit whose cross-sectional area in any plane parallel to the bearing surface is less than 75% of its gross cross-sectional area measured in the same plane.
4. Knock out units: a masonry unit with knockout webs which can be removed to accommodate vertical bond beam.
7. Lightweight concrete masonry units: A unit whose oven-dry density is less than 1,680 kilograms/cubic metre (105 pounds / cubic foot).
9. Pigment: A compatible, color fast, chemically stable admixture that gives a cementitious matrix its colouring.
10. Pilaster block: Concrete block used in the construction of pilasters (a bonded or keyed column of masonry built as part of a wall) or columns.
11. Ribbed Block: A block with projected ribs (with either a rectangular or circular profile) on the face for aesthetic purposes. Also called fluted.
12. Scored block: A block with groves on the face for aesthetic purposes.

13. Semi solid masonry unit: A unit whose cross-sectional area in every plane parallel to the bearing surface is at least 75 percent, but less than 100 percent, of its gross cross-sectional area measured in the same plane.
14. Solid masonry unit: A unit whose cross-sectional area in every plane parallel to the bearing surface is 100 percent or more of its gross cross-sectional area measured in the same plane.
15. Split block (split face block): A concrete masonry unit with one or more faces purposely fractured to produce a rough texture for aesthetic purposes. Also called rock-faced block.

C. Related Sections:

1. Section 04050 – Masonry Procedures
2. Section 04100 – Mortar and Grout for Masonry

1.02 REFERENCE STANDARDS

A. Canadian Standards Association (CSA)

1. CSA A165.1-04, Concrete Block Masonry Units
2. CSA A179-94, Mortar and Grout for Unit Masonry
3. CSA A370-94, Connectors for Masonry
4. CSA A371-94, Masonry Construction of Buildings

B. National Research Council Canada

1. National Building Code of Canada, 2005

C. Underwriters' Laboratories of Canada (ULC)

1. CAN/ULC-S101-2004 (under development), Standard Methods of Fire Endurance Tests of Building Construction and Materials

D. American Society for Testing and Materials (ASTM):

1. ASTM C90-01, Standard Specifications for Loadbearing Concrete Masonry Units
2. ASTM C129-01, Standard Specification for Non-loadbearing Concrete Masonry Units
3. ASTM C 140-03, Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units
4. ASTM C331-04, Standard Specifications for Lightweight Aggregates for Concrete Masonry Units
4. ASTM C 979, Standard Specification for Pigments for Integrally Colored Concrete.
5. ASTM E 524, Standard Test Method for Water Penetration and Leakage through Masonry

E. Ontario Concrete Block Association (OCBA):

1. OCBA Metric Technical Manual, Last Updated April 2005.

1.03 MATERIAL SUBMITTALS

- A. The General Contractor shall submit the following items for approval in accordance with the Conditions of the Contract and the Division 1 Submittal Procedures Section.
1. Manufacturer Certification – Certification from the OCBA showing that the manufacturer is a member in good standing and has successfully completed all requirements of the Association's Quality Assurance Program for the given calendar year, and is granted a license to produce QP2000 Series Concrete Masonry Products.
 2. Material Certification - Product Compliance Certificates in accordance with the OCBA QP2000 standards program showing that the products meet the requirements of the OCBA.
 3. Samples – Two representative samples of each unit masonry type, face finish and colour. Ensure that the samples indicate the range of colour variation expected in the finished installation.

4. Supporting documentation - Manufacturer's catalog, product data, installation instructions, and material safety data sheets for the specified materials and products.
 5. Manufacturer's Warranty
- B. Accepted samples become the standard of acceptance for the work.

1.04 REGULATORY REQUIREMENTS

- A. Regulatory Requirements and Approvals: [Specify applicable licensing, bonding or other requirements of regulatory agencies].

1.06 MEASUREMENT FOR PAYMENT

- A. Payment for the supply of the unit masonry will be based on a per unit price.

PART 2 PRODUCTS

2.01 STANDARD CONCRETE MASONRY UNITS

- A. Standard concrete masonry units as manufactured by Brown's Concrete Products Limited to CAN3-A165.1, of the following nature.
1. Classification: (H/SS/SF)/(10/15/20/30)/(A/B/C/D/N)/(M/O) except as modified by fire resistance rating requirements specified below.

There is an attachment at the back of this specification that provides detail on the above classification system.

2. Size: OCBA Metric Modular
 3. Density: Regular / Lightweight
 4. Fire Resistance Rating: 2 hour
 5. Colour: colour, or as shown on the Design Drawings.
 6. Colour Pigment Material Standard: Comply with ASTM C 979.
- B. Specialty shapes shall be from the same manufacturer to avoid potential problems with different colours, sizes, quality and texture, and manufactured to the same specifications.
- C. Manufacturer will undertake all the necessary steps when trying to colour match (either for second orders or to existing installations), however colour matching cannot be guaranteed.
- D. For special orders, General Contractor to provide order quantities. Manufacturer shall not be held responsible for product over or under ordering.
- E. Where a water-repellent admixture is specified, the admixture shall be DRY-BLOCK® Block Admixture as manufactured by W.R. Grace and Co being an integral liquid polymeric admixture that is mixed with concrete during the production of concrete masonry units.
1. The unit masonry manufacturer shall follow the recommendations of DRY BLOCK® manufacturer in terms of addition rate and mixing.
 2. The unit masonry shall be capable of achieving a Class E Rating for water permeance when evaluated using ASTM E 514 with the test extended to 72 hours, using the rating criteria specified in ASTM E 514.
 3. The block manufacturer shall supply, with the blocks, DRY-BLOCK® Mortar Admixture for use by the mason contractor during installation of the concrete masonry units as outlined in Section 04050. The Admixture shall be added to the mortar outlined in Section 04100.

2.02 ARCHITECTURAL CONCRETE MASONRY UNITS

- A. Architectural concrete masonry units as manufactured by Brown's Concrete Products Limited to CAN3-A165.1, of the following nature.
1. Classification: (H/SS/SF)/(10/15/20/30)/(A/B/C/D/N)/(M/O) except as modified by fire resistance rating requirements specified below.
 2. Size: OCBA Metric Modular

3. Type: Solid face split / two rib split / three rib split / four ribbed / four ribbed split / six ribbed split / split ledge / single scored / three scored
 4. Colour: colour, or as shown on the Design Drawings.
 5. Colour Pigment Material Standard: Comply with ASTM C 979.
- B. Manufacturer will undertake all the necessary steps when trying to colour match (either for second orders or to existing installations); however, colour matching cannot be guaranteed.
 - C. For special orders, General Contractor to provide order quantities. Manufacturer shall not be held responsible for product over or under ordering.
 - D. Where a water-repellent admixture is specified, the admixture shall be DRY-BLOCK® Block Admixture as manufactured by W.R. Grace and Co being an integral liquid polymeric admixture that is mixed with concrete during the production of concrete masonry units.
 1. The unit masonry manufacturer shall follow the recommendations of DRY BLOCK® manufacturer in terms of addition rate and mixing.
 2. The unit masonry shall be capable of achieving a Class E Rating for water permeance when evaluated using ASTM E 514 with the test extended to 72 hours, using the rating criteria specified in ASTM E 514.
 3. The block manufacturer shall supply, with the blocks, DRY-BLOCK® Mortar Admixture for use by the mason contractor during installation of the concrete masonry units as outlined in Section 04050. The Admixture shall be added to the mortar outlined in Section 04100.

PART 3 EXECUTION

3.01 DELIVERY, ON-SITE HANDLING & STORAGE

- A. General:
 1. Comply with Division 1 Product Requirement Section.
 2. Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.
- B. Delivery:
 1. Coordinate delivery and installation schedule to minimize interference with normal use of buildings, roads and structures adjacent to project.
 2. Where pallets are not required for lifting of the product cubes with a forklift, General Contractor to notify manufacturer at the time of order if pallets are required.
 3. Unload materials at job site in the location designated by the General Contractor and in such a manner that no damage occurs to the product or the site
- C. On-site Handling and Storage:
 1. Unit masonry to remain on pallets on which they were delivered, or on wood supports that keep the material a minimum of 75 mm above the ground, until installed.
 2. Store materials in a manner to prevent deterioration or damage due to moisture, temperature changes, contamination, breaking, chipping or other causes.
 3. If being stored for a long time, cover with a polyethylene sheet or other plastic cover.
 4. Storage areas to be kept free from mud, dirt, and other foreign materials.
 5. Do not use salt to melt ice which may have formed during storage.

3.02 INSTALLATION

- A. The Installation of the Concrete Masonry Units is to be conducted in accordance with Section 04050.

3.03 CLEANING

- A. Once the installation is completed, remove traces of efflorescence, mortar and other stains, which may affect the appearance of the masonry work.
- B. Recommended products for cleaning include:
 1. Sure Klean 600 Detergent by ProSoCo Ltd

2. Diedrich 202V Vana-Stop by Diedrich Technologies Inc.
- C. Consult with the cleaner manufacturer prior to use to determine the proper proportions for diluting these products with water.

3.04 FIELD QUALITY CONTROL

- A. The General Contractor shall check all materials delivered to the site to ensure that the correct materials have been received and are in good condition prior to signing off on the manufacturer's packing slip.
 1. Minor cracks incidental to the usual methods of manufacture, or minor chipping resulting from customary methods of handling and delivery, shall not be considered defects.
 2. Minor efflorescence on the outside face of the masonry unit shall not be considered a defect.
- B. All damaged units not reported as damaged at the time of delivery are presumed to have been damaged after delivery and shall be the responsibility of the General Contractor to make good.
- C. Over the course of the project, the General Contractor is to inspect the materials to ensure they meet the requirements of the specifications. Any deficiencies are to be brought to the immediate attention of the manufacturer. The manufacturer cannot be held responsible for deficiencies in products, or resulting problems with the project, once the products are installed.

3.05 PROTECTION

- A. It is the responsibility of the General Contractor to protect the materials and work during and after installation.

END OF SECTION

SUMMARY OF THE FOUR PHYSICAL PROPERTIES LISTED IN A165.1

The four(4) basic physical properties of concrete masonry units are described by A165.1. Each of these physical properties, identified as important for satisfactory structural performance is described by a “facet”. This has come to be commonly known in Canada as the “Four(4) Facet System”.

The **first facet** indicates the solid content of the unit:

1. **H** Indicates a hollow unit, i.e.. a unit having a net cross sectional area less than 75% solid in any horizontal plane.
2. **SS** Indicates a semi solid unit having a minimum net cross sectional area of 75% solid in all horizontal planes, but less than 100% solid.
3. **SF** Indicates a solid coreless unit. This is a new classification. It was introduced to remove any misunderstanding of what is meant by a “solid” unit. By definition, a solid unit is permitted to be up to 25% void. Thus, in the rare cases where a full solid unit is required, a selection of “Sc” needs to be made and so indicated by the specified.

The **second facet** indicates the minimum compressive strength based on the net area of the cross-section. The compressive strength is calculated as the average of three(3) units while no unit can be less than 85% of that specified. Where Engineering Analysis is used, the Masonry Design Standard (S304.1) requires a five(5) unit test for preselection, however uses three(3) units (and a minimum 80% individual unit strength) for quality control purposes. The four strength levels identified parallel those used in the Masonry Design Standard in order to facilitate the design process.

In Canada, 15 Mpa has been adopted as the standard strength. The higher strength levels, although not stock items, are readily available on request. (It should be noted that a 30 Mpa strength level can only be achieved using normal weight aggregates, in other words with a concrete density greater than 2000 kg/m³, designated by “A”.)

The **third facet** identifies specific concrete densities along with related absorption characteristics. The primary purpose of this facet is a measure of elimination of excess pore area in the manufactured material and thus a measure of quality.

The terms standard (or heavy) weight, semi-lightweight and full lightweight are derived from the density of the aggregate used in manufacture. In western Canada, the aggregates used range from gravel in each region; to expanded clay, available in Winnipeg and Edmonton; expanded shale, available in Calgary; and pumice available in British Columbia.

The selection of the aggregate or weight class of the unit is of consequence and should be given full consideration by the specifying authority. Each aggregate or weight class has particular features. The final selection can have a direct bearing on weight, absorption, texture, colour, sealing, sound transmission, fire rating, thermal value and in some instances, compressive strength.

In the identification system, the density of the standard (or heavy) weight units using sand and gravel aggregate is covered by the “A” category, over 2000 kg/m³. Semi lightweight units, using 50% sand and 50% lightweight aggregate, say expanded clay, is covered by the “B” category.

This facet, in 1995, introduced a new density category, 1700 - 1800 kg/m³. The purpose of this change was to allow for a slightly higher density lightweight aggregate, such as expanded clay or shale, while still maintaining the popular close texture of the original “C” designation. The “D” category, with a density of less than 1700 kg/m³, also includes lightweight units where the aggregate is also expanded clay or shale.

The title, “Maximum Water Absorption” is sometimes misunderstood as a measure of resistance to water penetration which is not the case. Maximum permissible absorption measures the volume of all pores in the material or the differential in unit weight between saturated and oven dry conditions. As expected, lower density aggregates

containing a larger volume of pores permit a higher absorption factor than the higher density aggregates given the same compaction.

The **fourth facet** provides data to enable the designer to limit shrinkage and control wall cracking.

The maximum moisture content permitted depends on the units' shrinkage and humidity conditions at the point of use. Units having lower shrinkage properties are permitted a higher moisture content than higher shrinkage units. In addition, a higher moisture content is permitted for units used in drier conditions, ie. relative humidity under 75%.

The shrinkage represents the difference between fully soaked and oven dry conditions. Neither extreme is commonly met and when combined with the limitations on moisture content, actual deformation due to moisture (addition or loss) can be expected in the region of 0.02% (2mm in 10 metres or 3/32 inches in 33 feet).

Where moisture controlled units (type M) are required and specified, protection from rain or other moisture sources should be provided for both units and walls under construction so that moisture content remains unaffected.

Type "O" units may be used where drying shrinkage is not a major consideration, e.g.. interior partitions, inner wythe of a cavity wall. When used in exposed application, increased joint reinforcing and closer spacing of movement joints is advisable.