



October 18, 2005  
Supersedes April 19, 2005

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## CONCRETE MODULAR BLOCKS

### **GENERAL**

Use of segmental and/or modular blocks on Iowa DOT projects and other Federally-/State-funded projects requires an approved source and all required testing and certification showing compliance with Iowa DOT requirements. Source approval shall be on the basis of an approved mix design and Quality Control Program.

Each manufacturing facility shall provide the District Materials Engineer with a copy of their Quality Control Plan and Procedures, including testing rates, materials sources and mix designs. Each manufacturing facility shall also supply test reports and documentation to verify compliance with the specified requirements.

Acceptance of blocks shall be on the basis of certification from approved producers (prior to letting and/or bidding on Iowa's project work). Approved sources are listed in IM 445.04, Appendix A.

### **MATERIALS**

All aggregates, cement, mineral and liquid chemical admixtures shall be from an approved source and shall comply with the Iowa DOT Standard Specification requirements.

### **COMPRESSIVE STRENGTH REQUIREMENTS**

Concrete segmental units and cap blocks shall conform to the requirements of ASTM C1372, except that they shall have a minimum 28-day compressive strength of 5500 psi (40 MPa) for any one individual unit and 6000 psi (43 MPa) for the average of three units. The 24-hour water absorption rate shall not exceed 10%.

### **WATER ABSORPTION REQUIREMENTS**

Maximum water absorption shall meet the requirements of ASTM C1372.

### **SAMPLING & TESTING**

- A. Specimens shall be representative of the whole lot of units. **NOTE:** The term "lot" refers to any number of concrete masonry units of any configuration or dimension manufactured by the producer using the same materials, concrete mix design, manufacturing process and curing method.

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- B. The minimum required sampling rate for mix design approval is as follows:
1. One sample per mix design per product type (block type) per year.
  2. Sample size shall be a minimum of eight whole units per mix design. **NOTE:** Wall units and cap units are considered separate block types.
- C. Weigh units for moisture content tests immediately after sampling and record the weight as  $W_r$  (received weight).
- D. A minimum of three full-size units shall be measured for width, height and length and minimum thickness face shells and webs. Use average measurement to determine the minimum face shell thickness.
- Overall dimensions for width, height and length shall not differ by more than  $\pm 1/8$  inch ( $\pm 3.2$  mm) from the specified minimum dimensions.
- E. Compression Testing – Test specimens shall be coupons cut from a face shell of each unit and sawed to remove any face shell projections. The coupon size shall have a height to thickness ratio of 2 to 1 before capping and length to thickness ratio of 4 to 1. Compressive testing of full-size units shall not be acceptable.
- F. Freeze-thaw durability testing shall be required and shall be as described in ASTM C1372 and shall be performed in accordance with the requirements of ASTM C1262.

The tested wall units shall be with **either** of the following:

1. Testing in water. The weight loss of each of five test specimens at the conclusion of 100 cycles shall not exceed 1% of its initial weight.

**OR**

The weight loss of each of four of the five test specimens at the conclusion of 150 cycles shall not exceed 1.5% of its initial weight.

2. Testing in 3% saline solution shall be a minimum of the following:
  - a. The weight loss of each of five test specimens at the conclusion of 40 cycles shall not exceed 1% of its initial weight

**OR**

- b. The weight loss of four out of five test specimens at the conclusion of 50 cycles shall not exceed 1.5% of its initial weight with the maximum allowable weight loss for the fifth specimen to not exceed 10%.

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3. ASTM C1262 freeze-thaw test results shall be recorded and reported in 10-cycle intervals. **NOTE:** Freeze-thaw durability shall be the responsibility of the producer and shall be representative of an approved mix design. An independent/certified/accredited laboratory shall perform the required testing.

All units shall be sound and free of cracks or other defects that would interfere with the proper placing, physical appearance and/or impair the strength or long-range performance of the units.

- G. A minimum of three units shall be samples and tested per project for comprehensive strength and absorption. These units will be sampled at the producer's plant and will be used for quality control. Failure to meet the specified requirements may result in the rejection of that lot of units.

**LEVELING PAD** - Manufacturer recommendation

**NOTE 1:** If granular material is recommended for the leveling pad, then it shall be backfill material meeting the requirements of Section 4132 of the Standard Specifications. Thickness will be as per design requirement or minimum of 10-12 inches.

**NOTE 2:** If unreinforced concrete is recommended for the leveling pad, it shall be Class C Concrete meeting the requirements of IM 529 and Section 2403 of the Standard Specifications.

**CONCRETE UNIT FILL** - If required (by plans) fill the concrete units in place with porous backfill meeting the requirements of Section 4133 of the Standard Specifications.

**SUBDRAINS** - shall be a minimum of 4 inches (100 mm) in diameter and shall meet the requirements of Article 4143.01B of the Standard Specifications.

**OUTLET & RODENT GUARD** - Shall meet the requirements of Standard Road Plan RF-19E, Type A.

**ACCEPTANCE & USE**

- A. All block manufacturers shall comply with the Iowa DOT Specification requirements and shall submit test results supporting compliance with the requirements of this IM. Upon satisfactory review and verification of the test results, the system design, fabrication facility and personnel qualification, the product and the manufacturing facility will be placed on the approved list.
- B. A certificate of compliance attached to each pallet of blocks shall accompany all blocks shipped and/or submitted for use on Iowa DOT and/or Federal-Aid projects.

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- C. **NOTE:** Each block manufacturer shall have a special identification mark on each block and cap in a manner approved by the District Materials Engineer to distinguish State-approved blocks from commercial blocks.
- D. The approved markings scheme will be included in IM 445.04, Appendix A and in the certification documents.

### **CERTIFICATION DOCUMENTS**

The producer of certified concrete segmental and modular blocks shall furnish on each shipment day a certified bill of materials or invoice, which identifies the county, project number, contractor's name and the number of blocks. The certification of compliance shall be signed by a designated or responsible company representative and shall be stated as follows:

The materials itemized in this shipment are certified to be in compliance with the applicable ASTM and the Iowa Department of Transportation Plans and Specifications.

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Authorized Signature & Date

One copy of the above-described documents shall be forwarded to the Project Engineer on the day the item(s) are delivered to the project and one copy shall be sent to the respective District Materials Engineer.