



Designation: C1623 – 17a

Standard Specification for Manufactured Concrete Masonry Lintels¹

This standard is issued under the fixed designation C1623; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope*

1.1 This specification covers concrete masonry lintels (beams) that are solid in cross-section, are reinforced for flexure, and are made from hydraulic cement, water, and mineral aggregates with or without the inclusion of other materials. These lintels are suitable for both loadbearing and nonloadbearing applications.

NOTE 1—This specification covers only concrete masonry lintels containing reinforcement. Due to building code imposed limitations on the design of masonry lintels, all lintels must contain reinforcement. Concrete masonry lintels are not typically manufactured using shear reinforcement (stirrups or other vertical reinforcement). Therefore, this standard does not address issues related to such. For further guidance, refer to *Building Code Requirements for Masonry Structures*, TMS 402. Prestressed concrete lintels are not covered by this standard.

1.2 Lintels are manufactured using a no-slump concrete mix to provide a surface texture similar to that of concrete masonry. This specification applies to both machine-made and hand-tamped concrete masonry lintels intended for use in concrete masonry applications.

1.3 Concrete masonry lintels covered by this specification are made from lightweight or normal weight aggregates, or both.

1.4 This specification does not address the design or analysis of lintel capacity. Structural evaluations must be performed separately. The strength of a lintel is a function of factors including, but not limited to, the characteristics of the materials used in manufacturing (concrete materials and reinforcement), the amount and location of reinforcement, and the manufacturing and curing procedures. For design and analysis methods, refer to *Building Code Requirements for Masonry Structures*, TMS 402.

1.5 This specification does not cover U-shaped lintels or those of other cross-sections that are not 100 % solid.

1.6 This specification does not cover lintels of grouted concrete masonry lintels, or precast or cast-in-place lintels of slump concrete.

¹ This specification is under the jurisdiction of ASTM Committee C15 on Manufactured Masonry Units and is the direct responsibility of Subcommittee C15.03 on Concrete Masonry Units and Related Units.

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1.7 The text of this standard references notes and footnotes that provide explanatory material. These notes and footnotes (excluding those in tables and figures) shall not be considered as requirements of the standard.

1.8 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.9 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 ASTM Standards:²

- A615/A615M Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
- A706/A706M Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement
- A996/A996M Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement
- C33 Specification for Concrete Aggregates
- C140 Test Methods for Sampling and Testing Concrete Masonry Units and Related Units
- C150 Specification for Portland Cement
- C331 Specification for Lightweight Aggregates for Concrete Masonry Units
- C595 Specification for Blended Hydraulic Cements
- C618 Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
- C979 Specification for Pigments for Integrally Colored Concrete
- C989 Specification for Slag Cement for Use in Concrete and Mortars
- C1157 Performance Specification for Hydraulic Cement
- C1232 Terminology for Masonry

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

*A Summary of Changes section appears at the end of this standard

C1240 Specification for Silica Fume Used in Cementitious Mixtures

C1262 Test Method for Evaluating the Freeze-Thaw Durability of Dry-Cast Segmental Retaining Wall Units and Related Concrete Units

2.2 *Other Standards*:³

TMS 402 Building Code Requirements for Masonry Structures

TMS 602 Specification for Masonry Structures

3. Terminology

3.1 Terminology defined in Terminology **C1232** shall apply for this specification.

4. Material

4.1 *Cementitious Materials*—Materials shall conform to the following applicable specifications:

4.1.1 *Portland Cement*—Specification **C150**.

4.1.2 *Modified Portland Cement*—Portland cement conforming to Specification **C150**, modified as follows:

(1) *Limestone*—If calcium carbonate is added to the cement, the CaCO₃ content shall be not less than 85 %.

(2) *Limitation on Insoluble Residue*—1.5 %.

(3) *Limitation on Air Content of Mortar*—Volume percent, 22 % max.

(4) *Limitation on Loss on Ignition*—7 %.

4.1.3 *Blended Hydraulic Cements*—Specification **C595**

4.1.4 *Hydraulic Cement*—Specification **C1157**.

4.1.5 *Pozzolans*—Specification **C618**.

4.1.6 *Ground Granulated Blast Furnace Slag*—Specification **C989**.

4.1.7 *Silica Fume*—Specification **C1240**.

4.2 *Aggregates*—Aggregates shall conform to the following specifications, except that grading requirements shall not necessarily apply:

4.2.1 *Normal Weight Aggregates*—Specification **C33**.

4.2.2 *Lightweight Aggregates*—Specification **C331**.

4.3 *Pigments for Integrally Colored Concrete*—Specification **C979**.

4.4 *Steel Reinforcement*—Steel reinforcement shall consist of deformed bars conforming to Specifications **A615/A615M**, **A706/A706M**, or **A996/A996M**.

4.5 *Other Constituents*—Air-entraining agents, integral water repellents, and other constituents shall be previously established as suitable for use in concrete masonry lintels and shall conform to applicable ASTM standards or shall be shown by test or experience not to be detrimental to the durability of the concrete masonry lintels or any material customarily used in masonry construction.

5. Physical Requirements

5.1 At the time of delivery to the purchaser, the concrete within the lintel shall conform to the requirements prescribed in **Table 1**.

5.1.1 When higher compressive strengths than those listed in **Table 1** are specified, the tested average net area compressive strength of three specimens shall equal or exceed the specified compressive strength, and the tested individual specimen net area compressive strength of all three units shall exceed 90 % of the specified compressive strength.

NOTE 2—When particular features are desired such as surface textures for appearance or bond, finish, color, or particular properties such as specific reinforcing schedules, flexural strength, weight per unit length, higher compressive strength, or fire resistance, these features are specified separately by the purchaser. Consult suppliers as to the availability of lintels having the desired features.

5.2 All lintels shall be sound and free of cracks or other defects that interfere with proper placement unless defects are considered to be not detrimental to structural capacity of the lintel before or after defects are repaired using practices satisfactory to the engineer.

NOTE 3—The purchaser is the public body or authority, association, corporation, partnership, or individual entering into a contract or agreement to purchase or install, or both, concrete masonry lintels. The time of delivery to the purchaser is FOB plant when the purchaser or the purchaser's agent transports the concrete masonry lintels, or at the time unloaded at the worksite if the manufacturer or the manufacturer's agent transports the concrete masonry lintels.

NOTE 4—When these lintels are used in above-grade applications as part of a vertical, free-draining assemblage, the physical requirements in this specification have been shown to result in durable products. In applications where the lintels are frequently exposed to deicing chemicals or saturated conditions in conjunction with freezing and thawing temperatures, testing should be considered to evaluate freezing and thawing resistance using ASTM **C1262**.

6. Permissible Variations in Dimensions

6.1 Overall dimensions for width, and height shall differ by not more than $\pm \frac{1}{8}$ in. (3.2 mm) from the specified standard dimensions. Overall dimension for length shall differ by not more than 0.5 % from the specified length.

TABLE 1 Strength, Absorption, and Density Classification Requirements^A

Density Classification	Oven-Dry Density of Concrete, lb/ft ³ (kg/m ³)	Maximum Water Absorption, lb/ft ³ (kg/m ³)		Minimum Net Area Compressive Strength, psi (MPa)	
	Average of 3 Specimens ^B	Average of 3 Specimens ^B	Individual Specimen ^B	Average of 3 Specimens ^B	Individual Specimen ^B
Lightweight	Less than 105 (1680)	18 (288)	20 (320)	2500 (17.2)	2250 (15.5)
Medium Weight	105 to less than 125 (1680–2000)	15 (240)	17 (272)	2500 (17.2)	2250 (15.5)
Normal Weight	125 (2000) or more	13 (208)	15 (240)	2500 (17.2)	2250 (15.5)

^A Consult manufacturers for available densities.

^B Refer to section 9.2.1 for specimen requirements.

6.2 Warpage

6.2.1 The longitudinal straightness of each of the four faces shall not deviate from a straight line more than ¼ in. (6 mm) over 10 ft (3.05 m). Measure deviations with lintel resting on flat, horizontal surface.

6.2.2 The cross-section of the lintel shall not deviate from square more than ⅛ in. (3 mm) over 8 in. (203 mm) in height.

7. Requirements for Reinforcement

7.1 Reinforcement and its placement shall comply with Building Code Requirements for Masonry Structures, TMS 402 and Specification for Masonry Structures, TMS 602 with the following exceptions. See **Appendix X1** for further guidance.

7.1.1 Actual vertical depth of longitudinal reinforcement shall be within 0.5 in. (12.7 mm) of the specified depth.

7.1.2 End of reinforcing bars shall be terminated not more than 3 in. (76 mm) from the end of the lintel.

NOTE 5—Lintels are sometimes manufactured with reinforcing bars extending past the end of the lintel. Consult applicable codes to determine if such bars need to be embedded in grout or otherwise connected to the structure or protected.

7.2 Manufacturer shall maintain records of mill certifications for reinforcement and shall make such records available on request by the purchaser.

8. Finish and Appearance

8.1 Where lintels are to be used in exposed wall construction, the face or faces that are to be exposed shall not show chips or cracks, not otherwise permitted, or other imperfections when viewed from a distance of not less than 20 ft (6.1 m) under diffused lighting.

8.2 The purchaser shall specify the color and texture of lintels. The finished surfaces that will be exposed in place shall conform to an approved sample consisting of not less than four lintels, representing the range of texture and color permitted on the project.

9. Sampling and Testing

9.1 The purchaser or authorized representative shall be accorded proper facilities to inspect and sample the lintels at the place of manufacture from the lots ready for delivery.

9.2 Sample and test lintels for compression and absorption in accordance with Test Methods **C140** with the following deviations.

9.2.1 Compression tests shall be performed on three specimens, each measuring nominally 4 in. (100 mm) in width, 8 in. (200 mm) in length and 8 in. (200 mm) in height. The aspect ratio of each test specimen (measured height divided by measured width) shall be 2.0 ± 0.1 . The height of the specimen shall be in the same orientation as the height of the lintel. One specimen shall be saw-cut from each of three lintels with or without horizontal reinforcing bars within the specimen.

NOTE 6—Because concrete masonry lintels contain reinforcing steel it is often impractical to obtain compression specimens that do not contain

reinforcement. Saw-cuts that are made perpendicular to the length of the reinforcement do not typically damage the integrity of the compression specimen being removed if the blade is sharp and in good working order. Horizontal reinforcing bars that are oriented perpendicular to the direction of compression loading do not significantly affect the tested strength of the specimen.

9.2.2 Absorption tests shall be performed on three specimens, each having greater than 200 in³ (3280 cm³) in volume. One specimen shall be saw-cut from each of three lintels. The specimen shall be cut such that it does not contain reinforcing bars.

NOTE 7—A specimen measuring nominally 4 in. (100 mm) in width, 8 in. (200 mm) in length and 8 in. (200 mm) in height is typically easy to obtain and meets the volume requirements for absorption specimens.

9.2.3 When saw-cutting of compression and absorption specimens exposes reinforcement, document and report the following:

9.2.3.1 Number of bars and a sketch or description of their location.

9.2.3.2 Size (diameter) of each bar.

9.2.3.3 Vertical location of each bar, measured from top of lintel to center of bar, in. (mm).

9.2.3.4 Horizontal location of each bar, measured from each face of the lintel to the center of bar, in. (mm).

10. Compliance

10.1 If a sample fails to conform to the specified requirements, the manufacturer shall be permitted to remove lintels from the shipment. A new sample shall be selected by the purchaser from remaining lintels from the shipment with a similar configuration and dimension and tested at the expense of the manufacturer. If the second sample meets the specified requirements, the remaining portion of the shipment represented by the sample meets the specified requirements. If the second sample fails to meet the specified requirements, the remaining portion of the shipment represented by the sample fails to meet the specified requirements.

NOTE 8—Unless otherwise specified in the purchase order or project contract documents, the cost of tests is typically borne as follows: (1) if the results of the tests show that the lintels do not conform to the requirements of this specification, the cost is typically borne by the seller; (2) if the results of the tests show that the lintels conform to the specification requirements, the cost is typically borne by the purchaser.

11. Product Marking

11.1 If the lintel or its reinforcement is not symmetrical with respect to both the vertical and horizontal axes, lintels shall be marked such that the top of the lintel and its respective faces can be clearly identified to ensure that the lintel is placed correctly.

11.2 Lintels shall be clearly labeled so that its reinforcement schedule can be determined directly from the label or cross-referenced from the manufacturer's documentation.

12. Keywords

12.1 absorption; compressive strength; concrete masonry lintel; lintel; loadbearing; reinforced

APPENDIX

(Nonmandatory Information)

X1. REINFORCEMENT PLACEMENT REQUIREMENTS

X1.1 Scope

X1.1.1 This appendix provides information on the bar placement requirements in the Building Code Requirements for Masonry Structures (TMS 402) and Specification for Masonry Structures (TMS 602) as they relate to manufactured concrete masonry lintels. This is provided for information only. Users should consult the applicable version of those standards when manufacturing lintels. The information provided in this appendix is based on the 2016 versions of TMS 402 and 602.

X1.2 Requirements

X1.2.1 *Cover*—The required cover distance for reinforcement (solid thickness of masonry from the edge of the reinforcing bar to the face of the masonry) is shown in **Table X1.1**. Reinforcement in manufactured masonry lintels must comply with these requirements.

X1.2.2 *Vertical Depth*—Within TMS 402/602, the tolerance for placement of reinforcement in flexural elements depends on the distance from the centerline of the reinforcing bars to the opposite face of masonry (d). The tolerance varies depending on the actual d distance. Since the d distance is not always known by the lintel manufacturer, ASTM C1623 requires the

TABLE X1.1 TMS 402/602 Cover Requirements

Bar Size	Masonry Exposed to Earth or Weather	Masonry Not Exposed to Earth or Weather
Larger than No. 5 (M#16)	2 in. (50.8 mm)	1.5 in. (38.1 mm)
No. 5 (M#16) and smaller	1.5 in. (38.1 mm)	1.5 in. (38.1 mm)

smallest tolerance allowed in TMS 402/602. For manufactured masonry lintels, actual reinforcement vertical depth must be within 0.5 in. (12.7 mm) from the specified vertical depth.

X1.2.3 *Horizontal Placement*—The horizontal placement of reinforcement (along the width of the lintel) must be within 2 in. (50 mm) of the specified location. In no case should the reinforcement be placed closer to the face of the lintel than the allowable cover (See Table X1.1). When multiple bars are used in the same lintel, see section X1.2.4 for additional requirements.

X1.2.4 *Distance Between Parallel Bars*—TMS 402/602 contains requirements for separation between parallel reinforcing bars. The minimum clear distance between parallel bars must be the nominal bar size or 1 in. (25.4 mm), whichever is greater.

SUMMARY OF CHANGES

Committee C15 has identified the location of selected changes to this standard since the last issue (C1623 – 17) that may impact the use of this standard. (August 1, 2017)

(1) Modified **X1.1.1** to reference the specific versions of TMS 402 and 602 for which the information in the appendix is based.

Committee C15 has identified the location of selected changes to this standard since the last issue (C1623 – 16) that may impact the use of this standard. (January 1, 2017)

(1) Modified Section **7** to remove conflicts with building code related to reinforcement placement.

(2) Added **Appendix X1** to provide guidance on code requirements for reinforcement spacing.

Committee C15 has identified the location of selected changes to this standard since the last issue (C1623 – 11) that may impact the use of this standard. (December 15, 2016)

(1) Updated references to TMS 402 and TMS 602.

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