



## Standard Specification for Precast Reinforced Concrete Crib Wall Members<sup>1</sup>

This standard is issued under the fixed designation C915; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

### 1. Scope

1.1 This specification covers open- and closed-face precast reinforced concrete crib walls intended to act as earth-retaining structures or as protection against stream encroachment.

NOTE 1—This specification is a manufacturing and purchase specification only, with examples and suggestions for usage. Successful performance of this product depends on the proper selection and assembling of members, proper foundation and bearing material, and consideration of backfill heights, backfill material, drainage, and other engineering and construction considerations. The purchaser of the crib wall members specified herein is cautioned that he must properly correlate the field requirements with the members selected and provide adequate inspection at the construction site.

1.2 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are for information only.

### 2. Referenced Documents

#### 2.1 ASTM Standards:<sup>2</sup>

A370 Test Methods and Definitions for Mechanical Testing of Steel Products

A615/A615M Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement

A616/A616M Specification for Rail-Steel Deformed and Plain Bars for Concrete Reinforcement (Withdrawn 1999)<sup>3</sup>

A617/A617M Specification for Axle-Steel Deformed and Plain Bars for Concrete Reinforcement (Withdrawn 1999)<sup>3</sup>

C31/C31M Practice for Making and Curing Concrete Test Specimens in the Field

C33 Specification for Concrete Aggregates

C39/C39M Test Method for Compressive Strength of Cylindrical Concrete Specimens

C42/C42M Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete

C94/C94M Specification for Ready-Mixed Concrete

C150 Specification for Portland Cement

C173/C173M Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method

C231 Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method

C260 Specification for Air-Entraining Admixtures for Concrete

C309 Specification for Liquid Membrane-Forming Compounds for Curing Concrete

C330 Specification for Lightweight Aggregates for Structural Concrete

C494/C494M Specification for Chemical Admixtures for Concrete

C595 Specification for Blended Hydraulic Cements

C618 Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete

### 3. Classification

3.1 Cribbing manufactured in accordance with this specification shall be of open- or closed-face design and shall conform to the standard designs shown in Figs. 1-4.

### 4. Ordering Information

4.1 Acceptability of the crib wall members in all cross sections and lengths produced in accordance with Section 6 shall be determined by the results of cylinder compression tests of the placed concrete and mill certificates for the reinforcing steel and cement. A written statement, signed by the manufacturer, shall verify that the cement, aggregate, admixtures, and reinforcing steel conform to the specifications for materials in Section 5 and that the preparation of equipment, mixing, conveying, placing, consolidating, and curing meet requirements of the applicable standard specifications. The concrete strength as determined by the cylinder compression tests shall be as specified in 6.3, and the test method shall conform to the requirements of Test Method C39/C39M. The manufacturer's statement shall also certify adherence to tolerance dimensions of Section 9.

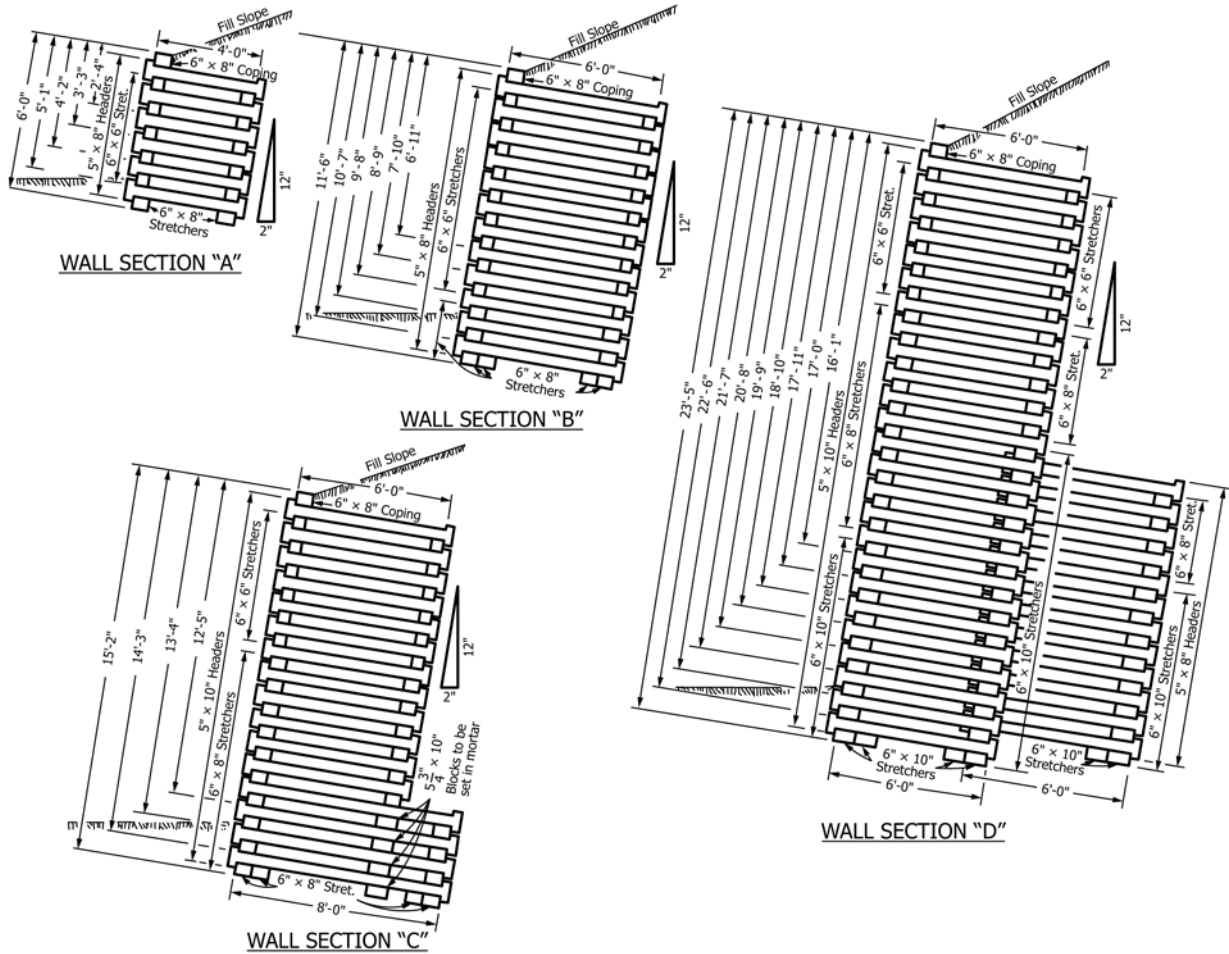
4.2 Acceptability of the concrete strength of completed cribbing produced in accordance with Section 6 may also be

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<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

<sup>3</sup> The last approved version of this historical standard is referenced on [www.astm.org](http://www.astm.org).



NOTE 1—Surface drainage should not be permitted to flow directly against the face of the cribbing.

NOTE 2—Walls should be separated into 96-ft sections by the provision of double rows of headers.

NOTE 3—In using these typical sections for designing walls of intermediate height, the drawing should be read from the top down until the desired height is reached. Base details are repeated for intermediate heights.

NOTE 4—In areas of aggressive environment, Type II cement or protective coatings, or both, may need to be used to avoid deterioration of the walls.

NOTE 5—Metric Conversion: 1 ft = 304.8 mm 1 in. = 25.4 mm 1 lb = 0.453592 kg 1 ft<sup>3</sup> = 0.028317 m<sup>3</sup>

FIG. 1 Open-Faced Concrete Crib Wall

determined by compressive tests of concrete cores in accordance with Test Method C42/C42M.

## 5. Materials

5.1 **Cement**—Portland cement shall conform to the requirements of Specification C150 or shall be portland blast-furnace slag cement or portland-pozzolan cement conforming to the requirements of Specification C595.

5.2 **Aggregates**—Aggregates shall conform to Specification C33 or C330. The nominal maximum size aggregate shall not be greater than 3/4 in. (19.0 mm).

5.3 **Admixtures**—Air-entraining admixtures shall conform to Specification C260. Chemical admixtures shall conform to Specification C494/C494M. Fly ash or other pozzolanic admixtures shall conform to the requirements of Specification C618.

5.4 **Water**—Water used for curing, washing aggregates, and mixing concrete shall be free of oils, organic materials, and

other substances that may be deleterious to concrete or steel; it should not contain concentrations of chlorides in excess of 1000 ppm or sulfates in excess of 1000 ppm.

5.4.1 If water of higher chloride content is used by reason of nonavailability of water of recommended quality, the manufacturer must obtain approval from the user.

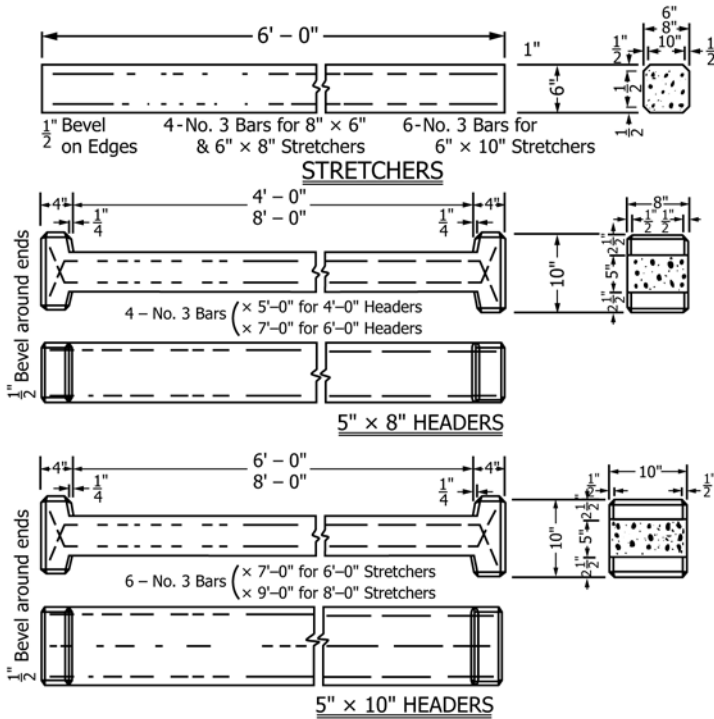
5.5 **Steel Reinforcement**—Steel reinforcement shall consist of bars conforming to Specifications A615/A615M, A616/A616M, or A617/A617M.

## 6. Design

6.1 Precast concrete crib wall members shall conform to details and dimensions prescribed in Figs. 1-4, subject to the provisions of this section and Section 10.

6.2 **Reinforcement**—Minimum reinforcement shall be as shown in Fig. 2 and Fig. 4 and shall be Grade 40 or 60.

6.3 **Concrete**—Concrete shall have a minimum design compressive strength of 4000 psi (28 MPa) in 28 days.



HEIGHT OF WALL	UNITS REQUIRED FOR OPEN FACED WALL 96' LONG								Wall Section
	HEADERS				STRETCHERS			BLK'S.	
	5"×8" × 4'-0"	5"×8" × 6'-0"	5"×10" × 6'-0"	5"×10" × 8'-0"	6"×6" × 6'-0"	6"×8" × 6'-0"	6"×10" × 6'-0"	5½"×10" × 10'	
2' – 4"	34				32	48			"A"
3' – 3"	51				64	48			
4' – 2"	68				96	48			
5' – 1"	85				128	48			
6' – 0"	102				160	48			
6' – 11"		119			192	80			"B"
7' – 10"		136			224	80			
8' – 9"		153			256	80			
9' – 8"		170			288	80			
10' – 7"		187			288	112			
11' – 6"		204			288	144			"C"
12' – 5"			204	17	192	272		17	
13' – 4"			204	34	192	304		34	
14' – 3"			204	51	192	336		51	
15' – 2"			204	68	192	368		68	
16' – 1"		68	289		192	304	176		"D"
17' – 0"		85	306		192	320	208		
17' – 11"		102	323		192	320	256		
18' – 10"		119	340		192	320	304		
19' – 9"		136	357		192	320	352		
20' – 8"		153	374		192	320	400		
21' – 7"		170	391		192	320	448		
22' – 6"		187	408		192	320	496		
23' – 5"		204	425		192	320	544		

NOTE 1—All reinforcing to be No. 3 bars placed 1 1/4 in. clear from surface of concrete.

NOTE 2—Bars to be held in position by chairs having noncorrosive tips.

NOTE 3—Blocks shall be set in cement-sand mortar (1 to 3).

NOTE 4—Backfilling should follow closely the erection of the successive tiers of units, and the wall should not be erected higher than 3 ft above the backfilled portion at any time.

NOTE 5—Gravel, crushed stone, or other granular material meeting the users' specifications may be used as backfill material. Rock may also be used, but care should be used to avoid damaging or dislodging the crib units. Clay or material having a large percentage of clay is not to be used.

NOTE 6—Cribbing should be placed on a foundation of firm bearing material. This foundation should be at least 3 ft below the surface of the ground, beyond all danger of frost, unless on solid rock. If the stretchers are located directly above rock, a cushion of sand or gravel not less than 6 in. thick should be provided.

NOTE 7—All headers are placed at 6 ft 0 in. center to center.

NOTE 8—Details of steps are similar to those shown on Fig. 4.

FIG. 2 Open-Faced Concrete Crib Wall

6.4 *Concrete Cover*—The minimum concrete cover over the reinforcement shall be 1 1/4 in. (32 mm).

6.5 *Air Entrainment*—Unless otherwise specified by the purchaser, all concrete shall have an air content of  $6\frac{1}{2} \pm 1\frac{1}{2}$  % as measured by Test Method C173/C173M or C231.

## 7. Manufacture

7.1 *Certification*—At the request of the purchaser, the manufacturer shall, prior to the actual delivery of the crib wall members, furnish a statement to the purchaser giving the source and type of cement, the sources and specific gravities of the aggregates, the concrete mix proportions, type, amount, and name of admixture (if any), and mill certificates for the reinforcing steel used in the manufacture.

7.2 *Mixture*—The aggregates shall be sized, graded, proportioned, and thoroughly mixed with proportions of cement and water as will produce a concrete mixture of a quality

such that the crib wall members will conform to the test and design requirements of this specification.

7.3 *Placing*—Concrete shall be placed in the forms as nearly as possible in its final position. Special care should be taken to fill all parts of the forms, and to place concrete under and around all reinforcing steel. Reinforcement shall be adequately secured so as to remain in the proper position during the placing of the concrete. Tie wires, if used to fasten the reinforcing steel, shall be bent down to provide the maximum protective cover of concrete over the wires.

7.4 *Curing*—Crib wall members shall be cured by one of the following methods or combination thereof. They shall be cured so that the concrete will develop the required compressive strength.

7.4.1 *Accelerated Curing*—The crib wall members may be cured with either steam or radiant heat in a moist atmosphere.



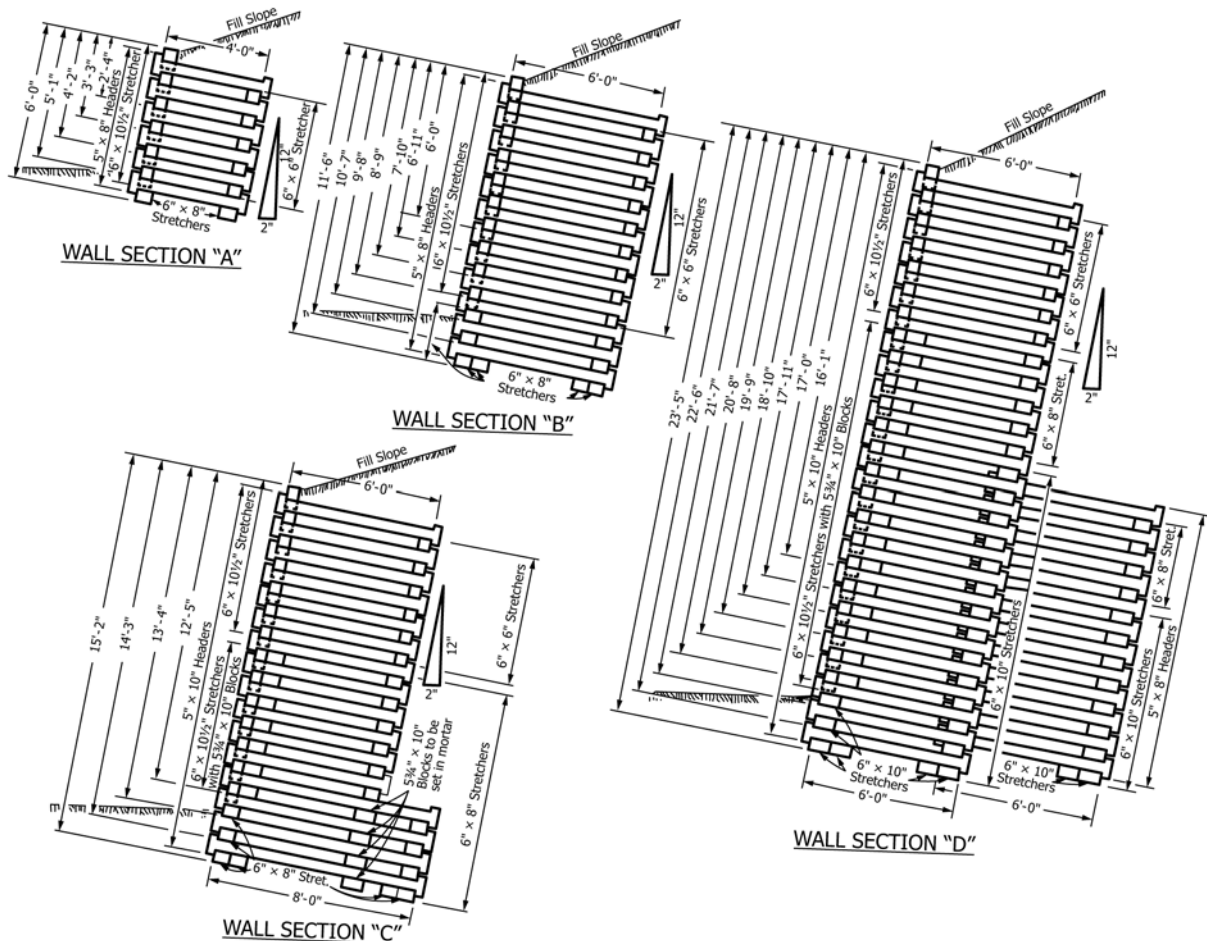


FIG. 3 Closed-Face Concrete Crib Wall

7.4.2 *Water Curing*—Crib wall members may be water-cured by covering with water-saturated material or by a system of perforated pipes, mechanical sprinklers, porous hose, or by any other approved method that will keep the members moist.

7.4.3 *Membrane Curing*—A curing membrane conforming to the requirements of Specification C309 may be applied and should be left intact until strength requirements are met. The concrete at the time of application shall be within 10°F (6°C) of the atmospheric temperature. All surfaces shall be kept moist prior to the application of the compounds and shall be damp when the compound is applied.

7.4.4 *Curing Options*—Other methods of curing may be used if approved by the purchaser.

7.5 *Reinforcement*—Steel reinforcement shall conform to the requirements set forth in this specification and shall be placed in position in the form within specified tolerances. The minimum reinforcement shall be No. 3 bars placed symmetrically about the principal axis.

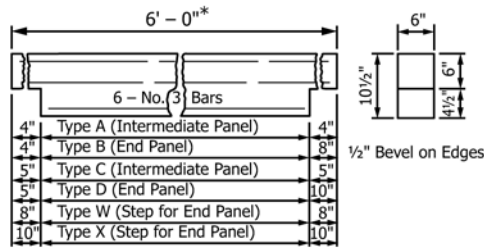
7.6 *Forms*—Forms shall be rigid and sufficiently strong to support the weight of the concrete without deformation or deflection within specified tolerances. Seepage of water from the form should be minimized. All forms shall be so constructed that they can be removed without damaging the concrete. All exposed concrete edges shall be beveled.

7.6.1 *Cleaning and Oiling*—Forms shall be cleaned before each use. New forms shall be free of paint or other protective coatings that might cling to the surface of the members. Forms shall have a suitable release agent applied as necessary to aid in breaking the bond between the form wall and the concrete.

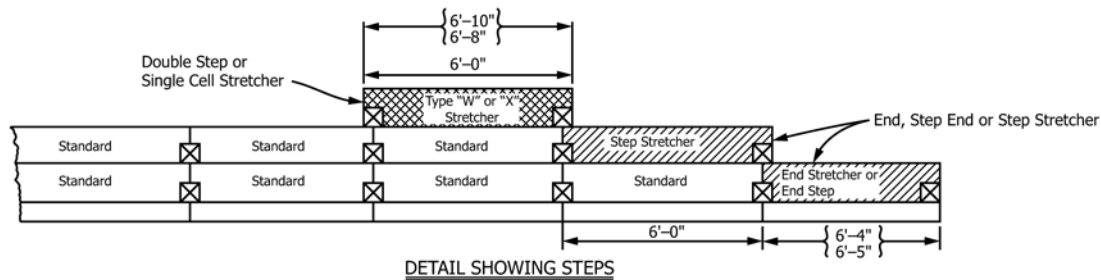
7.7 *Concrete Finish*—Concrete finishing shall be at the option of the manufacturer and shall produce a finish comparable to a steel form finish.

## 8. Physical Requirements

8.1 *Compression Tests*—Compression tests for satisfying the design concrete strength shall be made on standard concrete cylinders. Test specimens shall be identified with crib wall members. Two cylinders will be required for each 10 yd<sup>3</sup> (8 m<sup>3</sup>) with a minimum of two cylinders for each day of production and shall be made at random from different batches. Cylinders shall be made in accordance with Practice C31/C31M, cured in a similar manner to the product, and tested in accordance with Test Method C39/C39M. The average compressive strength of all cylinders tested for any one day's production shall be equal to or greater than the design strength. In no case shall any cylinder tested fall below 80 % of the design strength.



HEIGHT OF WALL	UNITS REQUIRED FOR CLOSED FACE WALL 96' LONG								Wall Section
	HEADERS				STRETCHERS			BLK'S.	
	5"×8" × 4'-0"	5"×8" × 6'-0"	5"×10" × 6'-0"	5"×10" × 8'-0"	6"×6" × 6'-0"	6"×8" × 6'-0"	6"×10" × 6'-0"	5½"×10" × 10"	
2' – 4"	34				16	32	32		"A"
3' – 3"	51				32	32	48		
4' – 2"	68				48	32	64		
5' – 1"	85				64	32	80		
6' – 0"	102				80	32	96		
6' – 11"					96	64	112		"B"
7' – 10"		119			112	64	128		
8' – 9"		136			128	64	144		
9' – 8"		153			144	64	160		
10' – 7"		170			144	96	160		
11' – 6"		187			144	128	160		
12' – 5"		204			160	160	208	119	"C"
13' – 4"			204	17	96	176	224	153	
14' – 3"			204	34	96	208	224	170	
15' – 2"			204	51	96	240	224	187	
16' – 1"		68	289		96	128	176	272	
17' – 0"		85	306		96	144	192	288	
17' – 11"		102	323		96	144	224	304	"D"
18' – 10"		119	340		96	144	256	320	
19' – 9"		136	357		96	144	288	336	
20' – 8"		153	374		96	144	320	352	
21' – 7"		170	391		96	144	352	368	
22' – 6"		187	408		96	144	400	368	
23' – 5"		204	425		96	144	448	368	



\* Where changes of height occur, units of 6'-4", 6'-5", 6'-8" or 6'-10" are required depending on header size.

NOTE 1—For general notes and details not shown refer to open-faced details.

FIG. 4 Closed-Face Concrete Crib Wall

## 9. Tolerances and Permissible Variations

9.1 *Cross Section*—The cross section of the member shall not be out of square more than 1/8 in. (3 mm).

9.2 *Horizontal Alignment*—The longitudinal straightness of the four faces shall not deviate from a straight line parallel to the centerline of the member more than 1/4 in. (6 mm).

9.3 *Dimensions*—The finished dimensions of the member shall not deviate more than 1/4 in. (6 mm) from the nominal design dimensions.

9.4 *Tolerance of Reinforcement*—Cover over reinforcement shall not be less than 1 1/4 in. (32 mm) nor greater than 1 1/2 in. (38 mm).

## 10. Inspection and Rejection

10.1 *Inspection*—The quality of materials, the process of manufacture, and the finished crib wall members shall be subject to inspection and approval by the inspector employed by the purchaser, if the purchaser so desires. If the manufacturer is required to obtain the services of an independent testing laboratory, the cost shall be borne by the purchaser. The

manufacturer shall afford the inspector all reasonable access, without charge, for making necessary checks of the production facilities and for performing any tests the purchaser may direct his inspector to conduct. All tests and inspection shall be so conducted as not to interfere unnecessarily with the manufacture and delivery of the member. The manufacturer shall have raw members out of the forms available for inspection.

10.2 *Repair*—The manufacturer shall not apply any cosmetic treatment to the members without written approval by the purchaser. Sections may be repaired, if necessary, because of occasional imperfections in manufacture or damage during handling, but only after authorization by the purchaser. They will be acceptable if, in the opinion of the purchaser, the repairs are sound, properly finished, and cured. The repaired sections shall conform to the requirements of this specification.

10.3 *Rejection*—Members shall be subject to rejection on account of failure to conform to any of the specification requirements. Individual members may also be rejected because of any of the following reasons:

10.3.1 Defects that indicate incorrect proportioning, mixing, and molding.



10.3.2 Surface defects that indicate honeycombed or open texture.

10.3.3 Damaged or cracked areas where such damage would cause the member not to perform as designed.

10.3.4 Fractures or cracks passing through the section or any continuous structural crack extending for a length of 12 in. (305 mm) or more, regardless of position in the section.

## **11. Marking**

11.1 The following information shall be clearly marked on each member:

11.1.1 The date of manufacture of the member, and

11.1.2 The concrete lot number from which the member was manufactured.

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