

## 2012 IRC Pier Construction

### **R404.1.9 Isolated masonry piers.**

Isolated masonry piers shall be constructed in accordance with this section and the general masonry construction requirements of [Section R606](#). Hollow masonry piers shall have a minimum nominal thickness of 8 inches (203 mm), with a nominal height not exceeding four times the nominal thickness and a nominal length not exceeding three times the nominal thickness. Where hollow masonry units are solidly filled with concrete or grout, piers shall be permitted to have a nominal height not exceeding ten times the nominal thickness. Footings for isolated masonry piers shall be sized in accordance with [Section R403.1.1](#).

#### **R404.1.9.1 Pier cap.**

Hollow masonry piers shall be capped with 4 inches (102 mm) of solid masonry or concrete, a masonry cap block, or shall have cavities of the top course filled with concrete or grout. Where required, termite protection for the pier cap shall be provided in accordance with [Section R318](#).

#### **R404.1.9.2 Masonry piers supporting floor girders.**

Masonry piers supporting wood girders sized in accordance with Tables R502.5(1) and R502.5(2) shall be permitted in accordance with this section. Piers supporting girders for interior bearing walls shall have a minimum nominal dimension of 12 inches (305 mm) and a maximum height of 10 feet (3048 mm) from top of footing to bottom of sill plate or girder. Piers supporting girders for exterior bearing walls shall have a minimum nominal dimension of 12 inches (305 mm) and a maximum height of 4 feet (1220 mm) from top of footing to bottom of sill plate or girder. Girders and sill plates shall be anchored to the pier or footing in accordance with [Section R403.1.6](#) or Figure R404.1.5(1). Floor girder bearing shall be in accordance with [Section R502.6](#).

#### **R404.1.9.3 Masonry piers supporting braced wall panels.**

Masonry piers supporting *braced wall panels* shall be designed in accordance with accepted engineering practice.

#### **R404.1.9.4 Seismic design of masonry piers.**

Masonry piers in all *dwelling*s located in Seismic Design Category D<sub>0</sub>, D<sub>1</sub> or D<sub>2</sub>, and townhouses in Seismic Design Category C, shall be designed in accordance with accepted engineering practice.

#### **R404.1.9.5 Masonry piers in flood hazard areas.**

Masonry piers for *dwelling*s in flood hazard areas shall be designed in accordance with [Section R322](#).

### **R404.1.3 Design required.**

Concrete or masonry foundation walls shall be designed in accordance with accepted engineering practice when either of the following conditions exists:

1. Walls are subject to hydrostatic pressure from groundwater.
2. Walls supporting more than 48 inches (1219 mm) of unbalanced backfill that do not have permanent lateral support at the top or bottom.

### **R606.6 Piers.**

The unsupported height of masonry piers shall not exceed ten times their least dimension. When structural clay tile or hollow concrete masonry units are used for isolated piers to support beams and girders, the cellular spaces shall be filled solidly with concrete or Type M or S mortar, except that unfilled hollow piers may be used if their unsupported height is not more than four times their least dimension. Where hollow masonry units are solidly filled with concrete or Type M, S or N mortar, the allowable compressive stress shall be permitted to be increased as provided in Table R606.5.

#### **R606.6.1 Pier cap.**

Hollow piers shall be capped with 4 inches (102 mm) of *solid masonry* or concrete, a masonry cap block, or shall have cavities of the top course filled with concrete or grout.

## *Cornell University Pier Definition and Application*

[CFR](#) › [Title 24](#) › [Subtitle B](#) › [Chapter XX](#) › [Part 3285](#) › [Subpart D](#) › [Section 3285.303](#)

## 24 CFR 3285.303 - Piers.

§ 3285.303 Piers.

**(a) General.** The piers used must be capable of transmitting the vertical live and dead loads to the footings or foundation.

**(b) Acceptable piers—materials specification.**

**(1)** Piers are permitted to be concrete blocks; pressure-treated wood with a water borne preservative, in accordance with AWWPA Standard U1-04 (incorporated by reference, see § [3285.4](#)) for Use Category 4B ground contact applications; or adjustable metal or concrete piers.

**(2)** Manufactured piers must be listed or labeled for the required vertical load capacity, and, where required by design, for the appropriate horizontal load capacity.

**(c) Design requirements.**

**(1) Load-bearing capacity.** The load bearing capacity for each pier must be designed to include consideration for the dimensions of the home, the design dead and live loads, the spacing of the piers, and the way the piers are used to support the home.

**(2)** Center beam/mating wall support must be required for multi-section homes and designs must be consistent with Tables 2 and 3 to § 3285.303 and Figures A, B, and C to § 3285.310.

**(d) Pier loads.**

**(1)** Design support configurations for the pier loads, pier spacing, and roof live loads must be in accordance with Tables 1, 2, and 3 to § 3285.303 and the MHCSS. Other pier designs are permitted in accordance with the provisions of this subpart.

**(2)** Manufactured piers must be rated at least to the loads required to safely support the dead and live loads, as required by § 3285.301, and the installation instructions for those piers must be consistent with Tables 1, 2, and 3 to this section.

**Table 1 to § 3285.303 —Frame Blocking Only/Perimeter Support Not Required Except at Openings**

Pier spacing	Roof live load (psf)	Location	Load (lbs.)
4 ft. 0 in.	20	Frame	2,900
	30	Frame	3,300
	40	Frame	3,600
6 ft. 0 in.	20	Frame	4,200
	30	Frame	4,700
	40	Frame	5,200
8 ft. 0 in.	20	Frame	5,500
	30	Frame	6,200
	40	Frame	6,900
10 ft. 0 in.	20	Frame	6,800
	30	Frame	7,600
	40	Frame	8,500

Notes:

1. See Table to § 3285.312 for cast-in-place footing design by using the noted loads.
2. Table 1 is based on the following design assumptions: maximum 16 ft. nominal section width (15 ft. actual width), 12" eave, 10" I-beam size, 300 lbs. pier dead load, 10 psf roof dead load, 6 psf floor dead load, 35 plf wall dead load, and 10 plf chassis dead load.
3. Interpolation for other pier spacing is permitted.
4. The pier spacing and loads shown in the above table do not consider flood or seismic loads and are not intended for use in flood or seismic hazard areas. In those areas, the foundation support system is to be designed by a professional engineer or architect.
5. See Table to § 3285.312 for sizing of footings.

**Table 2 to § 3285.303 —Frame Plus Perimeter Blocking/Perimeter Blocking Required**

Maximum pier spacing	Roof live load (psf)	Location	Load (lbs.)
4 ft. 0 in.	20	Frame	1,400
		Perimeter	1,900
		Mating	3,200
4 ft. 0 in.	30	Frame	1,400
		Perimeter	2,300
		Mating	3,800
4 ft. 0 in.	40	Frame	1,400
		Perimeter	2,600

**Table 2 to § 3285.303 —Frame Plus Perimeter Blocking/Perimeter Blocking Required**

Maximum pier spacing	Roof live load(psf)	Location	Load (lbs.)
6 ft. 0 in.	20	Mating	4,400
		Frame	1,900
		Perimeter	2,700
6 ft. 0 in.	30	Mating	4,700
		Frame	1,900
		Perimeter	3,200
6 ft. 0 in.	40	Mating	5,600
		Frame	1,900
		Perimeter	3,700
8 ft. 0 in.	20	Mating	6,100
		Frame	2,400
		Perimeter	3,500
8 ft. 0 in.	30	Mating	7,300
		Frame	2,400
		Perimeter	4,200
8 ft. 0 in.	40	Mating	8,500
		Frame	2,900
		Perimeter	4,800
10 ft. 0 in.	20	Mating	7,600
		Frame	2,900
		Perimeter	4,300
10 ft. 0 in.	30	Mating	9,100
		Frame	2,900
		Perimeter	5,100
10 ft. 0 in.	40	Perimeter	6,000
		Mating	10,600

Notes:

1. See Table to § 3285.312 for cast-in-place footing design by using the noted loads.
2. Mating wall perimeter piers and footings only required under full height mating walls supporting roof loads. Refer to Figures A and B to § 3285.310.
3. Table 2 is based on the following design assumptions: maximum 16 ft. nominal section width (15 ft. actual width), 12" eave, 10" I-beam size, 300 lbs. pier dead load, 10 psf roof dead load, 6 psf floor dead load, 35 plf wall dead load, and 10 plf chassis dead load.
4. Interpolation for other pier spacing is permitted.
5. The pier spacing and loads shown in the above table do not consider flood or seismic loads and are not intended for use in flood or seismic hazard areas. In those areas, the foundation support system is to be designed by a professional engineer or architect.
6. See Table to § 3285.312 for sizing of footings.

**Table 3 to § 3285.303 —Ridge Beam Span Footing Capacity**  
**Mating wall opening (ft) Roof live load (psf) Pier and footing load (lbs.)**

5	20	1,200
	30	1,600

**Table 3 to § 3285.303 —Ridge Beam Span Footing Capacity**  
**Mating wall opening (ft) Roof live load (psf) Pier and footing load (lbs.)**

	40	1,900
	20	2,300
10	30	3,100
	40	3,800
	20	3,500
15	30	4,700
	40	5,800
	20	4,700
20	30	6,200
	40	7,500
	20	5,800
25	30	7,800
	40	9,700
	20	7,000
30	30	9,300
	40	11,600
	20	8,100
35	30	10,900
	40	13,600

Notes:

1. See Table to § 3285.312 for cast-in-place footing design by using the noted loads.
2. Table 3 is based on the following design assumptions: maximum 16 ft. nominal section width (15 ft. actual width), 10" I-beam size, 300 lbs. pier dead load, 10 psf roof dead load, 6 psf floor dead load, 35 plf wall dead load, and 10 plf chassis dead load.
3. Loads listed are maximum column loads for each section of the manufactured home.
4. Interpolation for maximum allowable pier and column loads is permitted for mate-line openings between those shown in the table.
5. The pier spacing and loads shown in the above table do not consider flood or seismic loads and are not intended for use in flood or seismic hazard areas. In those areas, the foundation support system must be designed by a professional engineer or registered architect.
6. See Table to § 3285.312 for sizing of footings.

› Title 24 › Subtitle B › Chapter XX › Part 3285 › Subpart D › Section 3285.304

## 24 CFR 3285.304 - Pier configuration.

§ 3285.304 Pier configuration.

**(a) Concrete blocks.** Installation instructions for concrete block piers must be developed in accordance with the following provisions and must be consistent with Figures A and B to § 3285.306.

**(1)** Load-bearing (not decorative) concrete blocks must have nominal dimensions of at least 8 inches × 8 inches × 16 inches;

**(2)** The concrete blocks must be stacked with their hollow cells aligned vertically; and

**(3)** When piers are constructed of blocks stacked side-by-side, each layer must be at right angles to the preceding one, as shown in Figure B to § 3285.306.

**(b) Caps.**

(1) Structural loads must be evenly distributed across capped-hollow block piers, as shown in Figures A and B to § 3285.306.

(2) Caps must be solid concrete or masonry at least 4 inches in nominal thickness, or hardboard lumber at least 2 inches nominal in thickness; or be corrosion-protected minimum one-half inch thick steel; or be of other listed materials.

(3) All caps must be of the same length and width as the piers on which they rest.

(4) When split caps are used on double-stacked blocks, the caps must be installed with the long dimension across the joint in the blocks below.

**(c) Gaps.** Any gaps that occur during installation between the bottom of the main chassis beam and foundation support system must be filled by:

(1) Nominal 4 inch × 6 inch × 1 inch shims to level the home and fill any gaps between the base of the main chassis beam and the top of the pier cap;

(2) Shims must be used in pairs, as shown in Figures A and B to § 3285.306, and must be driven in tightly so that they do not occupy more than one inch of vertical height; and

(3) Hardwood plates no thicker than 2 inches nominal in thickness or 2 inch or 4 inch nominal concrete block must be used to fill in any remaining vertical gaps.

**(d) Manufactured pier heights.** Manufactured pier heights must be selected so that the adjustable risers do not extend more than 2 inches when finally positioned.

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§ 3285.306 Design procedures for concrete block piers.

**(a) Frame piers less than 36 inches high.**

(1) Frame piers less than 36 inches high are permitted to be constructed of single, open, or closed-cell concrete blocks, 8 inches " 8 inches " 16 inches, when the design capacity of the block is not exceeded.

(2) The frame piers must be installed so that the long sides are at right angles to the supported I-beam, as shown in Figure A to this section.

(3) The concrete blocks must be stacked with their hollow cells aligned vertically and must be positioned at right angles to the footings.

(4) Horizontal offsets from the top to the bottom of the pier must not exceed one-half inch.

(5) Mortar is not required, unless specified in the installation instructions or required by a registered professional engineer or registered architect.

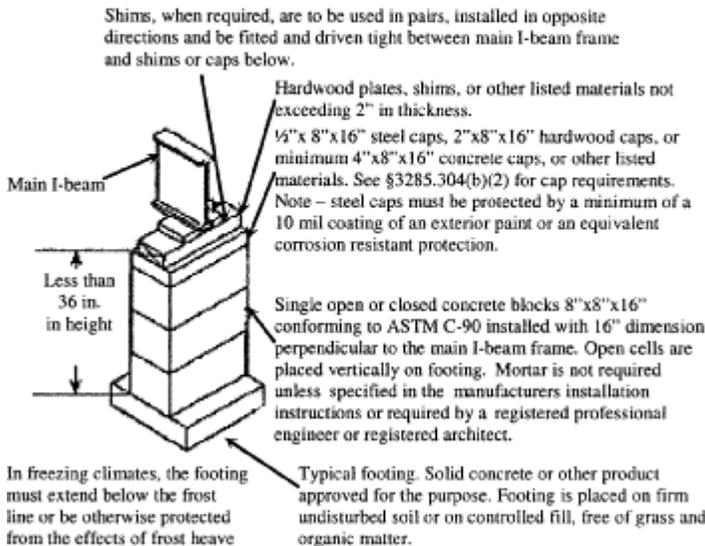
**(b) Frame piers 36 inches to 67 inches high and corner piers.**

(1) All frame piers between 36 inches and 67 inches high and all corner piers over three blocks high must be constructed out of double, interlocked concrete blocks, as shown in Figure B to this section, when the design capacity of the block is not exceeded. Mortar is not required for concrete block piers, unless otherwise specified in the installation instructions or required by a professional engineer or registered architect.

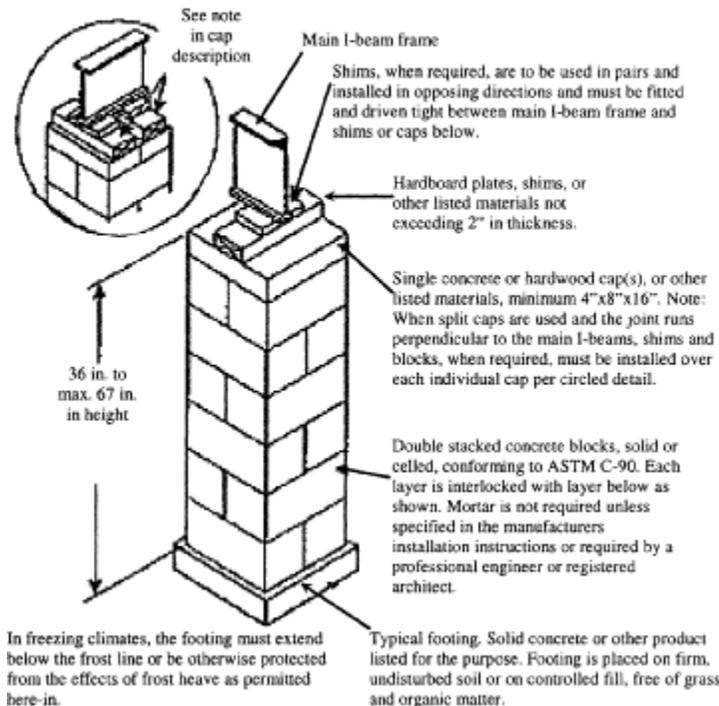
(2) Horizontal offsets from the top to the bottom of the pier must not exceed one inch.

**(c) All piers over 67 inches high.** Piers over 67 inches high must be designed by a registered professional engineer or registered architect, in accordance with acceptable engineering practice. Mortar is not required for concrete block piers, unless otherwise specified in the manufacturer installation instructions or by the design.

**Figure A to § 3285.306 Typical Footing and Pier Design, Single Concrete Block.**



**Figure B to 3285.306(b) Typical Footing and Pier Installation, Double Concrete Block.**



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[Visit ICC-ES Website](#)**SECTION R403 FOOTINGS****R403.1 General.**

All exterior walls shall be supported on continuous solid or fully grouted masonry or concrete footings, crushed stone footings, wood foundations, or other *approved* structural systems which shall be of sufficient design to accommodate all loads according to [Section R301](#) and to transmit the resulting loads to the soil within the limitations as determined from the character of the soil. Footings shall be supported on undisturbed natural soils or engineered fill. Concrete footing shall be designed and constructed in accordance with the provisions of [Section R403](#) or in accordance with ACI 332.

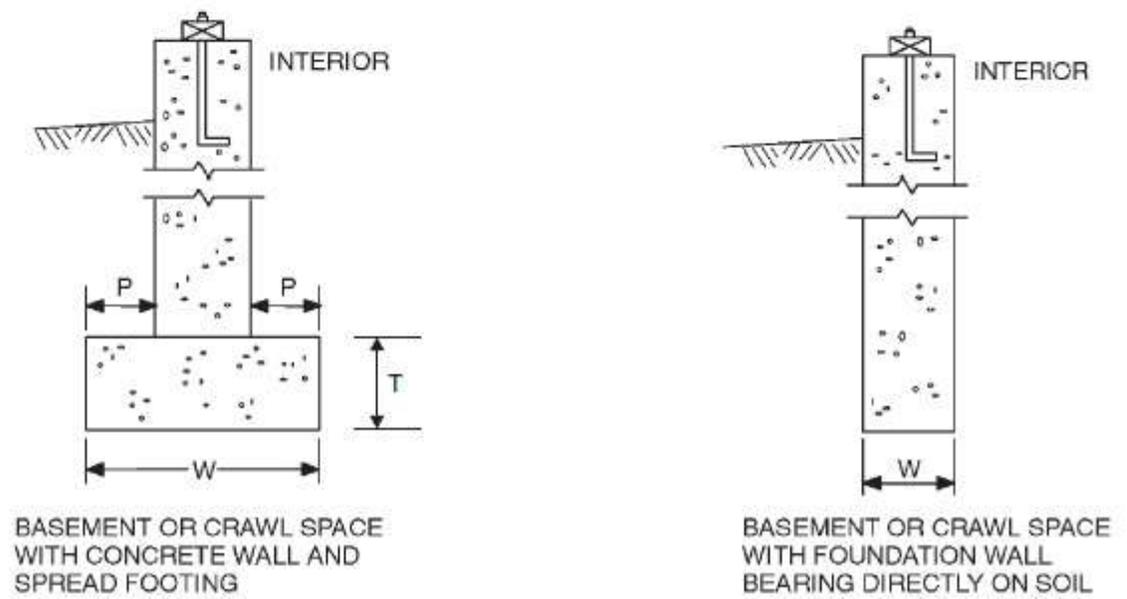
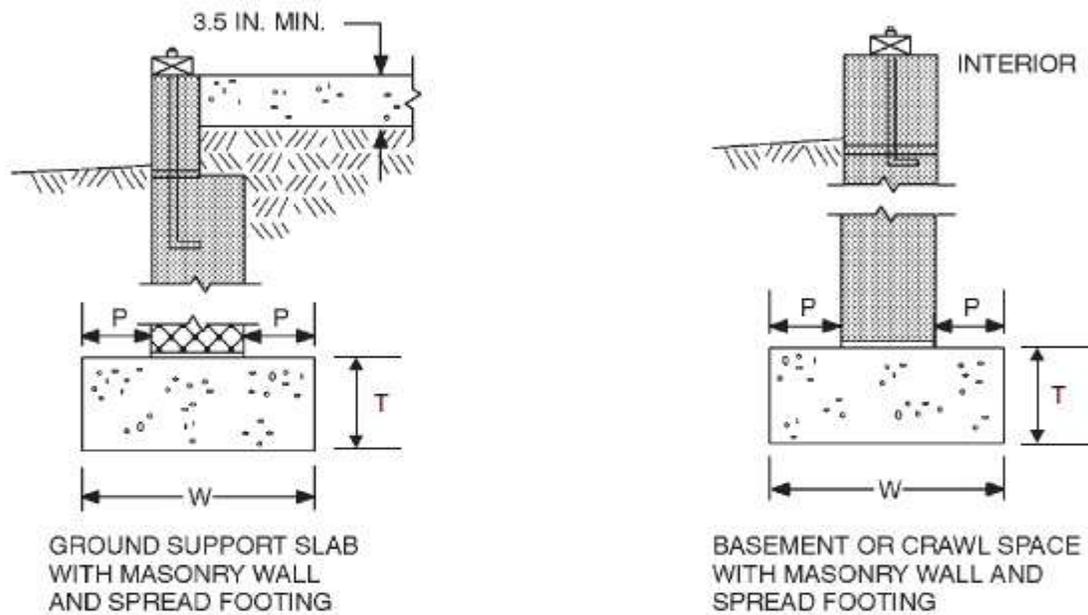
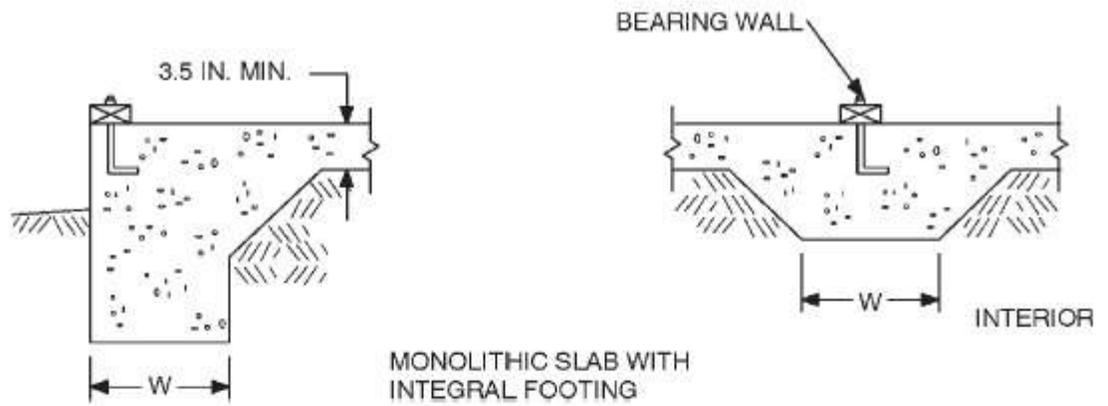
**TABLE R403.1 MINIMUM WIDTH OF CONCRETE, PRECAST OR MASONRY FOOTINGS (inches)<sup>a</sup>**

	LOAD-BEARING VALUE OF SOIL (psf)			
	1,500	2,000	3,000	≥ 4,000
<b>Conventional light-frame construction</b>				
1-story	12	12	12	12
2-story	15	12	12	12
3-story	23	17	12	12
<b>4-inch brick veneer over light frame or 8-inch hollow concrete masonry</b>				
1-story	12	12	12	12
2-story	21	16	12	12
3-story	32	24	16	12

<b>8-inch solid or fully grouted masonry</b>				
1-story	16	12	12	12
2-story	29	21	14	12
3-story	42	32	21	16

For SI: 1 inch = 25.4 mm, 1 pound per square foot = 0.0479 kPa.

a. Where minimum footing width is 12 inches, use of a single wythe of solid or fully grouted 12-inch nominal concrete masonry units is permitted.



For SI: 1 inch= 25.4mm.