



STRONGHOLD INSULATED CONCRETE FORM (ICF) STRUCTURAL GUIDELINE (USA)

Date	January 27, 2021
File No.	0068-2-5
For	Stronghold Insulation Systems, Inc.
Address	P.O. Box 351, Pelican Rapids, MN 56572

Subject

Stronghold Insulated Concrete Form (ICF) System

Scope of Stronghold ICF Structural guide

This guideline is for building with Stronghold Insulated Concrete Forms (ICF) to comply with the Structural requirements of the 2018 and 2015 International Building Code (IBC) and International Residential Code (IRC).

The reinforcing tables prepared are intended to be used as guidance for i) Preparing prescriptive installations in compliance with the IRC, and, ii) Estimating reinforcing for construction where professional design is required in accordance with the IBC.

Tables for equitable foundation wall sizes are separated in to two groupings of Seismic Design Categories: 1) A-C, and 2) D (D₀, D₁, D₂). There are different reinforcing details for these groupings and care must be made to use the correct table corresponding to the project site details.

Stronghold ICF forms and this structural guide are for the forming of concrete walls only. All other structural elements and non-structural elements of the building interacting with the stay-in-place forms and concrete walls are not provided by Stronghold ICF and must comply with Code.

This prescriptive engineering guide shall be used as a reference only. It is not to be used as a specification or drawing detail as design documents for any construction project. It is the user's responsibility to ensure the information provided meets local building code requirements and construction practices. Structural designers using this guide must prepare project-specific calculations and drawings corresponding to the actual building design conditions. Stronghold ICF and BOCA Engineering assume no responsibility for misinterpretation or misuse of this guide.

Compliance Statement: The concrete wall structural details when installed per the conditions as specified in this report meet 2018 and 2015 International Building Code (IBC) and International Residential Code (IRC) and ACI 318-14.

This report has been prepared and reviewed on behalf of Boca Engineering Co. by:

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2021-01-27

Date



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Stronghold ICF Description

Stronghold ICF are permanent concrete forms for preparing above or below grade concrete walls, consisting of two panels of expanded polystyrene (EPS) foam plastic joined by thermoplastic cross ties, leaving an open cavity for placing reinforcing and concrete. Foam plastic panels are 1.45 pcf nominal density, 2.75-in thick, and the concrete wall thickness is 4, 6, 8, 10 or 12 inches. Stronghold stay-in-place concrete forms conform to ASTM E2634 *Standard Specification for ICF*, as referenced in IRC R404.1.3.3.6.1, IRC R 608.4.4 and IBC 1903.4.

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Design Parameters for Using Stronghold ICF Wall Reinforcing Tables

GENERAL

The building dimensions, weight of materials, occupancy loading and climatic loading must be within the limitations of IRC Section 301. (Additional limitations apply for concrete walls-above-grade as outlined subsequently in this guide)

Weight of concrete in Stronghold ICF walls estimated as 150 lbs/ft³.

FOUNDATION WALLS BELOW GRADE

Below-grade walls are not subjected to hydrostatic pressure or surcharges from adjacent buildings or heavy equipment.

Foundation walls shall be laterally supported at the top and bottom as required by IRC R404.1.3.2 by methods satisfactory to the Code as acceptable to the building authority.

Foundation walls are to support light framed walls over, or, concrete walls within the limitations of IRC R608.2 and this guide. When supporting above-grade concrete walls, the foundation wall thickness and vertical reinforcing spacing must be equal to or greater than the walls above.



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In Seismic Design Category D₀, D₁, D₂, reinforcing bars must comply with ASTM A706 with yield strength 60,000 psi and may not be substituted with lesser strength bars.

Foundations for Townhouse buildings in Seismic Design Category C must comply with the Seismic design provisions of Seismic Design Category D₀, D₁, D₂.

ABOVE GRADE WALLS

Above-grade concrete walls must fall within the building dimensions and loading conditions of IRC R608.2, where:

- i) Building height does not exceed 35 ft or two stories, plan dimensions do not exceed 60 ft, floor spans no greater than 32 ft and roof spans no greater than 40 ft.
- ii) Maximum Design loads (service-level, non-factored):

MAXIMUM DESIGN LOADS		
	DEAD (PSF)	LIVE (PSF)
ROOF/CEILING	15	80 (snow + live)
FLOOR/CEILING	10	40
ATTIC	(CEILING D.L.)	20
ROOF PROJECTIONS	2 FT MAX, 8 PSF DEAD LOAD	
WIND	EXPOSURE CATEGORY B: V _{ult} Up to 160 mph	
	EXPOSURE CATEGORY C: V _{ult} Up to 136 mph	
	EXPOSURE CATEGORY D: V _{ult} Up to 127 mph	
	RISK CATEGORY: II	
SEISMIC	DESIGN CATEGORY A, B, or C	
	EXCEPTION: TOWNHOUSES LIMITED TO DESIGN CATEGORY A or B	

Walls are constructed in accordance with the drawings in this guide, based on IRC Figures 608.6(1)-(4).

Walls must be laterally supported on the top and bottom by a floor or roof framing system or slab on grade, by methods acceptable per IRC 608.6.1.

The minimum reinforcing and solid wall lengths are installed according to the tables in this guide, for the applicable referenced building dimension and loading conditions.

Solid wall length tables in this guide, based on IRC Tables 608.7(1A)-(1C), have been simplified to show commonly encountered design conditions. The IRC tables provide for numerous other options depending on variations of building heights, dimensions, and climatic loading, and, provide allowance for applying reduction factors for certain conditions and reinforcing substitutions. The IRC Tables may be used as an alternate approach to using the tables in this guide.

At all exterior wall corners, solid wall segments are required each way, minimum length of two (2) FT.

Solid wall segment lengths must be a minimum of two (2) FT, and no more than two segments of less than four (4) feet may be used to calculate the total summed length.

The length of solid wall total is taken as the summation of all qualifying solid wall segments along the projected straight line of a sidewall or end wall as shown in diagram 0068-015 of this guide.

The maximum clear span of any opening is 18 FT.



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LINTELS IN WALL OPENINGS

Reinforced lintels are required in openings greater than 2 FT in width in all load-bearing and non-load-bearing Stronghold ICF walls.

The figures and tables in this guide for lintel reinforcing of load-bearing walls are based on IRC Figures 608.8(1)-(2) and IRC Tables 608.8(1)-(5), simplified to commonly encountered design conditions and optimized for the Stronghold ICF system.

The lintel tables in this guide apply to uniformly loaded spans up to 18 FT. For lintels supporting concentrated loads such as from beams or girders, spans exceeding 18 FT, or loading conditions other than as stated, IRC 608.8.2 requires lintels designed per ACI 318.

WALL PREPARATION INFORMATION, TABLES AND FIGURES

FOR USE IN DESIGN AND CONSTRUCTION BEGIN NEXT PAGE



Preparation of Stronghold ICF Foundation Walls

Concrete materials and preparation must comply with IRC R404.1.3.3.

Steel reinforcing must comply with IRC R404.1.3.3.7.1.

Footings in unity with Stronghold ICF walls are to comply with IRC R403.

Backfill drainage is to be prepared as per IRC R405.

Waterproofing and damproofing is to be prepared as per IRC R406.

Walls interrupted by openings are to be additionally reinforced in accordance with IRC R404.1.3.3.7.3 with extra vertical bars of the same dimension placed within 12-inches of each side of the opening.

Lintels in openings of the stem of foundation walls protruding above-grade are to be prepared in accordance with IRC R608.8 and the Lintel tables and figures within this guide.

Lap splices in horizontal and vertical reinforcing bars are to comply with IRC R404.1.3.3.7.5. The minimum overlap of #4 bars is 30-inches and #5 bars is 38-inches. The maximum gap between #4 or #5 60ksi splice bars is 6-inches. Refer to Code for overlap and maximum gap of other bar types.

Construction joints are made according to IRC R404.1.3.3.7.8. In plain concrete walls and 6-inch concrete walls with reinforcing at 48-inch o/c, joints are to be located at points of lateral support and have #4 bars spaced at 24-inch o/c extending a minimum of 12-inches embedment on each side of the joint. In reinforced foundations walls (other than 6-inch walls reinforced at 48-inch o/c), construction joints are to be located in the middle third of the unsupported span or prepared as those for plain concrete walls.

All further details as required by IRC R404 applicable to the design are to be followed.

Notes to Stronghold ICF Foundation Wall Tables 1-6

1. Soil pressures are approximated in accordance with soil classes of the Unified Soil Classification system as per ASTM D2487-17 and Foundations and Earth Structures, NAVFAC DM-7.2 (1986), where table values are only applicable to those actual pressures shown.
2. Table values are based on a reinforcing yield strength of 60,000 psi. Substitution with 40,000 psi and/or bars of other sizes in Seismic categories A-C is permitted using IRC Section R404.1.3.3.7.6 and Table R404.1.2(9).
3. NR indicates that reinforcing is not required by the IRC.
4. A dashline – indicates that the application is not recommended at that corresponding thickness, height, and bar size.
5. Boxes marked DESIGN indicate that the IRC requires the application to be designed in accordance with the IBC.
6. Allowable deflection is $L/240$, where L is the unsupported height of the foundation wall.
7. Interpolation is not permitted.
8. Where walls will retain 4 feet or more of unbalanced backfill, they shall be laterally supported at the top and bottom before backfilling.
9. Vertical reinforcement is to be placed with 1.25-inches cover from the inside face of the wall, with an acceptable tolerance of 10% of the wall thickness in either direction but in no case less than 3/4-inch from the inside face.
10. Concrete is to have a minimum specified 28-day compressive strength shown in the table notes.

FOUNDATION WALL REINFORCING TABLES AND DIAGRAMS BEGIN NEXT PAGE



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TABLE 1: STRONGHOLD ICF MINIMUM REINFORCEMENT FOR 6" & 8" FOUNDATION WALLS IN SEISMIC DESIGN CATEGORIES A-C

MAXIMUM WALL HEIGHT (feet)	MAXIMUM UNBALANCED BACKFILL HEIGHT (feet)	MINIMUM VERTICAL REINFORCEMENT BAR SIZE AND SPACING (inches)												MINIMUM HORIZONTAL BAR SIZE AND SPACING
		Soil Classes and design lateral soil pressure (psf per foot depth)												
		GW, GP, SW, SP				GM, GC, SM, SM-SC and ML				SC, ML-CL and Inorganic				
		30 psf				45 psf				60 psf				
		Minimum nominal wall thickness (inches)												
		6"		8"		6"		8"		6"		8"		All soil classes and wall thicknesses
		#4	#5	#4	#5	#4	#5	#4	#5	#4	#5	#4	#5	
7'	4'	48"	48"	NR	NR	48"	48"	NR	NR	48"	48"	NR	NR	#4 @ 32" o/c
	5'	48"	48"	NR	NR	48"	48"	NR	NR	32"	48"	NR	NR	#4 @ 32" o/c
	6'	48"	48"	NR	NR	24"	42"	NR	NR	16"	32"	32"	48"	#4 @ 32" o/c
	7'	32"	48"	NR	NR	16"	32"	32"	48"	16"	24"	24"	32"	#4 @ 32" o/c
8'	4'	48"	48"	NR	NR	48"	48"	NR	NR	48"	48"	NR	NR	#4 @ 32" o/c
	5'	48"	48"	NR	NR	40"	48"	NR	NR	24"	40"	NR	NR	#4 @ 32" o/c
	6'	40"	48"	NR	NR	24"	40"	NR	NR	16"	24"	24"	40"	#4 @ 32" o/c
	7'	24"	40"	NR	NR	16"	24"	24"	40"	16"	24"	16"	32"	#4 @ 32" o/c
9'	8'	16"	32"	32"	48"	16"	24"	16"	32"	8"	16"	16"	24"	#4 @ 32" o/c
	4'	48"	48"	NR	NR	48"	48"	NR	NR	48"	48"	NR	NR	#4 @ 32" o/c
	5'	48"	48"	NR	NR	32"	48"	NR	NR	24"	40"	NR	NR	#4 @ 32" o/c
	6'	32"	48"	NR	NR	24"	32"	NR	NR	16"	24"	16"	24"	#4 @ 32" o/c
	7'	24"	32"	NR	NR	16"	24"	24"	40"	16"	24"	16"	24"	#4 @ 32" o/c
10'	8'	16"	24"	24"	40"	16"	24"	16"	24"	8"	16"	16"	16"	#4 @ 32" o/c
	9'	16"	24"	24"	32"	8"	16"	16"	24"	8"	8"	8"	16"	#4 @ 32" o/c
	4'	48"	48"	NR	NR	48"	48"	NR	NR	48"	48"	NR	NR	#4 @ 32" o/c
	5'	48"	48"	NR	NR	32"	48"	NR	NR	24"	40"	NR	NR	#4 @ 32" o/c
	6'	32"	48"	NR	NR	16"	32"	NR	NR	16"	24"	24"	32"	#4 @ 32" o/c
	7'	24"	32"	NR	NR	16"	24"	24"	32"	16"	24"	16"	24"	#4 @ 32" o/c
	8'	16"	24"	24"	40"	16"	24"	16"	24"	8"	16"	8"	16"	#4 @ 32" o/c
10'	8"	16"	16"	24"	DESIGN	DESIGN	8"	16"	DESIGN	DESIGN	8"	16"	#4 @ 32" o/c	
11'	4'	48"	48"	48"	48"	48"	48"	48"	48"	48"	48"	48"	48"	#4 @ 32" o/c
	6'	24"	24"	48"	48"	24"	24"	32"	48"	16"	24"	24"	40"	#4 @ 24" o/c
	8'	16"	24"	24"	24"	8"	16"	16"	24"	8"	8"	8"	16"	#4 @ 16" o/c
	10'	-	16"	16"	24"	-	8"	8"	16"	-	8"	8"	8"	#4 @ 16" o/c
	11'	-	8"	-	16"	-	8"	-	8"	-	-	-	8"	#4 @ 16" o/c
12'	4'	48"	48"	48"	48"	48"	48"	48"	48"	48"	48"	48"	48"	#4 @ 32" o/c
	6'	24"	24"	48"	48"	24"	24"	24"	24"	16"	24"	24"	24"	#4 @ 24" o/c
	8'	16"	24"	24"	24"	8"	16"	16"	24"	8"	8"	8"	16"	#4 @ 16" o/c
	10'	-	16"	16"	24"	-	8"	8"	16"	-	-	8"	8"	#4 @ 16" o/c
	12'	-	8"	-	16"	-	8"	-	8"	-	-	-	8"	#4 @ 16" o/c

SHADED AREA HEIGHTS OVER 10 FT BEYOND IRC LIMITS REQUIRE ENGINEERED DESIGN. REINFORCING SCHEDULE FOR ESTIMATING PURPOSES ONLY.

- 1) Table is based on IRC Table 404.1.2(8). The reinforcing bar size and spacing has been optimized for the Stronghold ICF system, and meets or exceeds the reinforcing specified in the IRC table.
- 2) This table is applicable only for foundation walls that support light-frame walls (wood or light-gauge steel) or concrete walls in Seismic categories A - C.
- 3) Table is to be used in conjunction with "Stronghold ICF Structural Guideline" and drawings 0068-(1)-(4) prepared by BOCA Engineering Co which contains materials specifications, building conditions, design limitations and installation details.
- 4) #5 @ 48" boxes highlighted where #4 @ 48" for same wall thickness is acceptable.
- 5) The over 10' wall height cells have been prepared in accordance with design calculations per ACI 318-14, following minimum reinforcing area and spacing rules optimized for the Stronghold ICF system, using loading conditions as provided in the table. Where vertical reinforcing bar spacing is recommended at more than 24" o/c, walls are structurally modeled as plain concrete and reinforcing is provided for serviceability improvements.
- 6) Where building design conditions for above-grade light-frame walls fall outside of the IRC limitations presented in this guide and foundation design by ACI 318-14 is being pursued, use Table 5 of this guide.
- 7) Minimum concrete 28-day compressive strength of 2500 psi; reinforcing steel bar yield strength of 60,000 psi.



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TABLE 2: STRONGHOLD ICF MINIMUM REINFORCEMENT FOR 10" & 12" FOUNDATION WALLS IN SEISMIC DESIGN CATEGORIES A-C

MAXIMUM WALL HEIGHT (feet)	MAXIMUM UNBALANCED BACKFILL HEIGHT (feet)	MINIMUM VERTICAL REINFORCEMENT BAR SIZE AND SPACING (inches)												MINIMUM HORIZONTAL BAR SIZE AND SPACING
		Soil Classes and design lateral soil pressure (psf per foot depth)												
		GW, GP, SW, SP				GM, GC, SM, SM-SC and ML				SC, ML-CL and Inorganic				
		30 psf				45 psf				60 psf				
		Minimum nominal wall thickness (inches)												All soil classes and wall thicknesses
10"		12"		10"		12"		10"		12"				
#4 #5		#4 #5		#4 #5		#4 #5		#4 #5		#4 #5				
8'	4'	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	#4 @ 32" o/c
	5'	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	#4 @ 32" o/c
	6'	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	#4 @ 32" o/c
	7'	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	#4 @ 32" o/c
	8'	NR	NR	NR	NR	NR	NR	NR	NR	16"	32"	NR	NR	#4 @ 32" o/c
9'	4'	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	#4 @ 32" o/c
	5'	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	#4 @ 32" o/c
	6'	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	#4 @ 32" o/c
	7'	NR	NR	NR	NR	NR	NR	NR	NR	24"	40"	NR	NR	#4 @ 32" o/c
	8'	NR	NR	NR	NR	24"	40"	NR	NR	16"	24"	48"	48"	#4 @ 32" o/c
10'	9'	NR	NR	NR	NR	16"	32"	NR	NR	16"	24"	16"	24"	#4 @ 32" o/c
	4'	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	#4 @ 32" o/c
	5'	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	#4 @ 32" o/c
	6'	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	#4 @ 32" o/c
	7'	NR	NR	NR	NR	NR	NR	NR	NR	24"	32"	NR	NR	#4 @ 32" o/c
	8'	NR	NR	NR	NR	24"	32"	NR	NR	16"	24"	16"	32"	#4 @ 32" o/c
11'	9'	48"	48"	NR	NR	16"	24"	48"	48"	8"	16"	16"	24"	#4 @ 32" o/c
	10'	16"	32"	NR	NR	8"	16"	16"	24"	8"	16"	8"	16"	#4 @ 32" o/c
	6'	48"	48"	48"	48"	48"	48"	48"	48"	32"	48"	48"	48"	#4 @ 32" o/c
	8'	32"	48"	48"	48"	24"	40"	32"	48"	16"	24"	24"	32"	#4 @ 24" o/c
12'	10'	24"	32"	24"	40"	16"	24"	16"	24"	8"	16"	8"	16"	#4 @ 16" o/c
	11'	16"	24"	24"	32"	8"	16"	16"	24"	8"	8"	8"	16"	#4 @ 16" o/c
	6'	48"	48"	48"	48"	48"	48"	48"	48"	32"	48"	40"	48"	#4 @ 32" o/c
	8'	32"	48"	40"	48"	24"	32"	24"	40"	16"	24"	16"	32"	#4 @ 24" o/c
14'	10'	16"	32"	24"	40"	8"	24"	16"	24"	8"	16"	8"	16"	#4 @ 16" o/c
	12'	8"	16"	16"	24"	8"	8"	8"	16"	-	8"	8"	8"	#4 @ 16" o/c
	6'	48"	48"	48"	48"	40"	48"	48"	48"	32"	48"	40"	48"	#4 @ 24" o/c
	8'	32"	48"	40"	48"	16"	32"	24"	40"	16"	24"	16"	32"	#4 @ 16" o/c
	10'	16"	24"	24"	32"	8"	16"	16"	24"	8"	8"	8"	16"	#4 @ 16" o/c
14'	8"	16"	16"	24"	-	8"	8"	16"	-	8"	8"	8"	#4 @ 16" o/c	
14'	8"	8"	8"	16"	-	-	8"	8"	-	-	-	8"	#4 @ 16" o/c	

SHADED AREA HEIGHTS OVER 10 FT BEYOND IRC LIMITS REQUIRE ENGINEERED DESIGN. REINFORCING SCHEDULE FOR ESTIMATING PURPOSES ONLY.

- 1) Table is based on IRC Table 404.1.2(8). The reinforcing bar size and spacing has been optimized for the Stronghold ICF system, and meets or exceeds the reinforcing specified in the IRC table.
- 2) This table is applicable only for foundation walls that support light-frame walls (wood or light-gauge steel) or concrete walls in Seismic categories A - C.
- 3) Table is to be used in conjunction with "Stronghold ICF Structural Guideline" and drawings 0068-(1)-(4) prepared by BOCA Engineering Co which contains materials specifications, building conditions, design limitations and installation details.
- 4) #5 @ 48" boxes highlighted where #4 @ 48" for same wall thickness is acceptable.
- 5) The over 10' wall height cells have been prepared in accordance with design calculations per ACI 318-14, following minimum reinforcing area and spacing rules optimized for the Stronghold ICF system, using loading conditions as provided in the table. Where vertical reinforcing bar spacing is recommended at more than 24" o/c, walls are structurally modeled as plain concrete and reinforcing is provided for serviceability improvements.
- 6) Where building design conditions for above-grade light-frame walls fall outside of the IRC limitations presented in this guide and foundation design by ACI 318-14 is being pursued, use Table 6 of this guide.
- 7) Minimum concrete 28-day compressive strength of 2500 psi; reinforcing steel bar yield strength of 60,000 psi.



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**TABLE 3: STRONGHOLD ICF MINIMUM REINFORCEMENT FOR 6" & 8" FOUNDATION WALLS IN SEISMIC DESIGN CATEGORIES D₀, D₁, D₂****IRC APPLICATIONS SUPPORTING LIGHT-FRAME WALLS OVER**

MAXIMUM WALL HEIGHT (feet)	MAXIMUM UNBALANCED BACKFILL HEIGHT (feet)	MINIMUM VERTICAL REINFORCEMENT BAR SIZE AND SPACING (inches)												MINIMUM HORIZONTAL BAR SIZE AND SPACING	
		Soil Classes and design lateral soil pressure (psf per foot depth)													
		GW, GP, SW, SP				GM, GC, SM, SM-SC and ML				SC, ML-CL and Inorganic					
		30 psf				45 psf				60 psf					
		Minimum nominal wall thickness (inches)													
		6"		8"		6"		8"		6"		8"		All soil classes and wall thicknesses	
#4	#5	#4	#5	#4	#5	#4	#5	#4	#5	#4	#5	#4	#5		
6'	4'	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	#4 @ 24" o/c
	5'	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	#4 @ 24" o/c
	6'	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	#4 @ 24" o/c
7'	4'	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	#4 @ 24" o/c
	5'	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	#4 @ 24" o/c
	6'	24"	24"	24"	24"	24"	24"	24"	24"	24"	16"	24"	24"	24"	#4 @ 24" o/c
	7'	24"	24"	24"	24"	16"	24"	24"	24"	16"	24"	24"	24"	24"	#4 @ 24" o/c
8'	4'	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	#4 @ 24" o/c
	5'	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	#4 @ 24" o/c
	6'	24"	24"	24"	24"	24"	24"	24"	24"	16"	24"	24"	24"	24"	#4 @ 24" o/c
	7'	24"	24"	24"	24"	16"	24"	24"	24"	16"	24"	16"	24"	24"	#4 @ 24" o/c
	8'	16"	24"	24"	24"	16"	24"	16"	24"	8"	16"	16"	24"	24"	#4 @ 24" o/c
9'	4'	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	#4 @ 24" o/c
	5'	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	#4 @ 24" o/c
	6'	24"	24"	24"	24"	24"	24"	24"	24"	16"	24"	24"	24"	24"	#4 @ 24" o/c
	7'	24"	24"	24"	24"	16"	24"	24"	24"	16"	24"	16"	24"	24"	#4 @ 24" o/c
	8'	16"	24"	24"	24"	16"	24"	16"	24"	8"	16"	16"	16"	24"	#4 @ 24" o/c
	9'	16"	24"	24"	24"	8"	16"	16"	24"	8"	8"	8"	16"	24"	#4 @ 24" o/c
10'	4'	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	#4 @ 24" o/c
	5'	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	#4 @ 24" o/c
	6'	24"	24"	24"	24"	16"	24"	24"	24"	16"	24"	24"	24"	24"	#4 @ 24" o/c
	7'	24"	24"	24"	24"	16"	24"	24"	24"	16"	24"	16"	24"	24"	#4 @ 24" o/c
	8'	16"	24"	24"	24"	16"	24"	16"	24"	8"	16"	8"	16"	24"	#4 @ 24" o/c
	9'	16"	24"	16"	24"	8"	16"	8"	16"	DESIGN	DESIGN	8"	16"	24"	#4 @ 24" o/c
	10'	8"	16"	16"	24"	DESIGN	DESIGN	8"	16"	DESIGN	DESIGN	8"	16"	24"	#4 @ 24" o/c

- 1) Table is based on IRC Table 404.1.2(8). The reinforcing bar size and spacing has been optimized for the Stronghold ICF system, and meets or exceeds the reinforcing specified in the IRC table.
- 2) This table is applicable only for foundation walls with light-frame walls (wood or light-gauge steel) over, as per IRC R404.1.4.2. Use Table 5 of this guide for foundation walls that support above-grade concrete walls.
- 3) Table is to used in conjunction with "Stronghold ICF Structural Guideline" and drawings 0068-(1)-(4) prepared by BOCA Engineering Co which contains materials specifications, building conditions, design limitations and installation details.
- 4) #5 @ 24" boxes highlighted where #4 @ 24" for same wall thickness is acceptable.
- 5) Where building design conditions for above-grade light-frame walls fall outside of the IRC limitations presented in this guide and foundation design by ACI 318-14 is being pursued, use Table 5 of this guide.
- 6) Minimum concrete 28-day compressive strength of 3000 psi; reinforcing steel bar yield strength of 60,000 psi.



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TABLE 4: STRONGHOLD ICF MINIMUM REINFORCEMENT FOR 10" & 12" FOUNDATION WALLS IN SEISMIC DESIGN CATEGORIES D₀, D₁, D₂

IRC APPLICATIONS SUPPORTING LIGHT-FRAME WALLS OVER															
MAXIMUM WALL HEIGHT (feet)	MAXIMUM UNBALANCED BACKFILL HEIGHT (feet)	MINIMUM VERTICAL REINFORCEMENT BAR SIZE AND SPACING (inches)												MINIMUM HORIZONTAL BAR SIZE AND SPACING	
		Soil Classes and design lateral soil pressure (psf per foot depth)													
		GW, GP, SW, SP				GM, GC, SM, SM-SC and ML				SC, ML-CL and Inorganic					
		30 psf				45 psf				60 psf					
		Minimum nominal wall thickness (inches)												All soil classes and wall thicknesses	
10"		12"		10"		12"		10"		12"					
#4		#5		#4		#5		#4		#5		#4		#5	
6'	4'	24"	#5	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	#4 @ 24" o/c
	5'	24"	#5	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	#4 @ 24" o/c
	6'	24"	#5	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	#4 @ 24" o/c
7'	4'	24"	#5	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	#4 @ 24" o/c
	5'	24"	#5	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	#4 @ 24" o/c
	6'	24"	#5	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	#4 @ 24" o/c
	7'	24"	#5	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	#4 @ 24" o/c
8'	4'	24"	#5	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	#4 @ 24" o/c
	5'	24"	#5	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	#4 @ 24" o/c
	6'	24"	#5	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	#4 @ 24" o/c
	7'	24"	#5	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	#4 @ 24" o/c
	8'	24"	#5	24"	24"	24"	24"	24"	24"	24"	16"	24"	24"	24"	#4 @ 24" o/c
9'	4'	24"	#5	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	#4 @ 24" o/c
	5'	24"	#5	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	#4 @ 24" o/c
	6'	24"	#5	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	#4 @ 24" o/c
	7'	24"	#5	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	#4 @ 24" o/c
	8'	24"	#5	24"	24"	24"	24"	24"	24"	24"	16"	24"	24"	24"	#4 @ 24" o/c
	9'	24"	#5	24"	24"	24"	24"	16"	24"	24"	24"	16"	24"	16"	24"
10'	4'	24"	#5	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	#4 @ 24" o/c
	5'	24"	#5	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	#4 @ 24" o/c
	6'	24"	#5	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	#4 @ 24" o/c
	7'	24"	#5	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	#4 @ 24" o/c
	8'	24"	#5	24"	24"	24"	24"	24"	24"	24"	16"	24"	16"	24"	#4 @ 24" o/c
	9'	24"	#5	24"	24"	24"	24"	16"	24"	24"	8"	16"	16"	24"	#4 @ 24" o/c
	10'	16"	24"	24"	24"	8"	16"	16"	24"	8"	16"	8"	16"	16"	#4 @ 24" o/c

- 1) Table is based on IRC Table 404.1.2(8). The reinforcing bar size and spacing has been optimized for the Stronghold ICF system, and meets or exceeds the reinforcing specified in the IRC table.
- 2) This table is applicable only for foundation walls with light-frame walls (wood or light-gauge steel) over, as per IRC R404.1.4.2. Use Table 6 of this guide for foundation walls that support above-grade concrete walls in Seismic category D.
- 3) Table is to be used in conjunction with "Stronghold ICF Structural Guideline" and drawings 0068-(1)-(4) prepared by BOCA Engineering Co which contains materials specifications, building conditions, design limitations and installation details.
- 4) #5 @ 24" boxes highlighted where #4 @ 24" for same wall thickness is acceptable.
- 5) Where building design conditions for above-grade light-frame walls fall outside of the IRC limitations presented in this guide and foundation design by ACI 318-14 is being pursued, use Table 6 of this guide.
- 6) Minimum concrete 28-day compressive strength of 3000 psi; reinforcing steel bar yield strength of 60,000 psi.



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**TABLE 5: STRONGHOLD ICF MINIMUM REINFORCEMENT FOR 6" & 8" FOUNDATION WALLS IN SEISMIC DESIGN CATEGORY D
IRC AND IBC APPLICATIONS WITH DESIGN PER ACI 318-14, ALL ABOVE-GRADE WALL TYPES**

MAXIMUM WALL HEIGHT (feet)	MAXIMUM UNBALANCED BACKFILL HEIGHT (feet)	MINIMUM VERTICAL REINFORCEMENT BAR SIZE AND SPACING (inches)																		MINIMUM HORIZONTAL BAR SIZE AND SPACING
		Soil Classes and design lateral soil pressure (psf per foot depth)																		
		GW, GP, SW, SP						GM, GC, SM, SM-SC and ML						SC, ML-CL and Inorganic						
		30 psf						45 psf						60 psf						
		Minimum nominal wall thickness (inches)																		
6"			8"			6"			8"			6"			8"			All soil classes and wall thicknesses		
#4	#5	#6	#4	#5	#6	#4	#5	#6	#4	#5	#6	#4	#5	#6	#4	#5	#6			
7'	4'	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	#4 @ 24" o/c	
	5'	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	16"	16"	16"	24"	24"	#4 @ 24" o/c
	6'	24"	24"	24"	24"	24"	24"	16"	16"	16"	24"	24"	24"	16"	16"	16"	24"	24"	24"	#4 @ 24" o/c
	7'	8"	16"	16"	16"	16"	16"	8"	16"	16"	16"	16"	16"	16"	8"	8"	16"	8"	16"	#4 @ 16" o/c
8'	4'	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	#4 @ 24" o/c
	5'	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	16"	16"	16"	24"	24"	24"	#4 @ 24" o/c
	6'	24"	24"	24"	24"	24"	24"	16"	16"	16"	24"	24"	24"	16"	16"	16"	24"	24"	24"	#4 @ 24" o/c
	7'	8"	16"	16"	16"	16"	16"	8"	8"	16"	8"	16"	16"	-	8"	16"	8"	16"	16"	#4 @ 16" o/c
9'	4'	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	#4 @ 24" o/c
	5'	24"	24"	24"	24"	24"	24"	16"	16"	16"	24"	24"	24"	16"	16"	16"	24"	24"	24"	#4 @ 24" o/c
	6'	16"	16"	16"	24"	24"	24"	16"	16"	16"	24"	24"	24"	16"	16"	16"	24"	24"	24"	#4 @ 16" o/c
	7'	8"	8"	16"	8"	16"	16"	-	8"	16"	8"	16"	16"	-	8"	16"	8"	16"	16"	#4 @ 16" o/c
	8'	-	8"	8"	8"	16"	16"	-	8"	8"	8"	8"	16"	-	-	8"	-	8"	16"	#4 @ 16" o/c
10'	4'	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	#4 @ 24" o/c
	5'	24"	24"	24"	24"	24"	24"	16"	16"	16"	24"	24"	24"	16"	16"	16"	24"	24"	24"	#4 @ 24" o/c
	6'	16"	16"	16"	24"	24"	24"	16"	16"	16"	24"	24"	24"	16"	16"	16"	16"	16"	16"	#4 @ 16" o/c
	7'	-	8"	16"	8"	16"	16"	-	8"	16"	8"	16"	16"	-	8"	16"	8"	16"	16"	#4 @ 16" o/c
	8'	-	8"	8"	8"	8"	16"	-	-	8"	-	8"	16"	-	-	8"	-	8"	16"	#4 @ 16" o/c
	9'	-	-	8"	-	8"	16"	-	-	8"	-	8"	8"	-	-	-	-	8"	8"	#4 @ 16" o/c
11'	4'	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	#4 @ 24" o/c
	6'	16"	16"	16"	24"	24"	24"	16"	16"	16"	24"	24"	24"	16"	16"	16"	24"	24"	24"	#4 @ 16" o/c
	8'	-	-	8"	8"	8"	16"	-	-	8"	-	8"	16"	-	-	8"	-	8"	16"	#4 @ 16" o/c
	10'	-	-	-	-	-	8"	-	-	-	-	-	8"	-	-	-	-	-	8"	#4 @ 16" o/c
12'	4'	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	#4 @ 24" o/c
	6'	16"	16"	16"	24"	24"	24"	16"	16"	16"	16"	16"	16"	16"	16"	16"	16"	16"	16"	#4 @ 16" o/c
	8'	-	-	8"	-	8"	16"	-	-	8"	-	8"	16"	-	-	8"	-	8"	8"	#4 @ 16" o/c
	10'	-	-	-	-	-	8"	-	-	-	-	-	8"	-	-	-	-	-	-	#4 @ 16" o/c

FOR USE WHEN BUILDING DESIGN CONDITIONS ARE BEYOND IRC LIMITS AND REQUIRE ENGINEERED DESIGN. REINFORCING SCHEDULE FOR ESTIMATING PURPOSES ONLY.

- 1) This table has been prepared in accordance with design calculations per ACI 318-14, following minimum reinforcing area and spacing rules optimized for the Stronghold ICF system, using loading conditions as provided in the table and note 7.
- 2) Where vertical reinforcing bar spacing is recommended at 24" o/c, walls are structurally modeled as plain concrete and reinforcing is provided for serviceability improvements.
- 3) Boxes with "-" indicates reinforcement is not possible within the scope of this guide.
- 4) Table is to be used in conjunction with "Stronghold ICF Structural Guideline" and drawings 0068-(1)-(4) prepared by BOCA Engineering Co., which contains materials specifications, building conditions, design limitations and installation details.
- 5) Green highlighted boxes reflect the recommended most economical materials and labor option for a given loading and size condition.
- 6) Seismic loading conditions have not been considered for backfill heights of 6 feet and less in as per IBC Section 1807.2.2.
- 7) Where seismic loading conditions have been considered for backfill heights over 6 feet, the dynamic seismic lateral earth pressure load effect is an assumed horizontal resultant force equal to 36*H² lb/ft-width, which is added on to the at-rest backfill pressure; where H is equal to the height of unbalanced backfill in feet applied at a location equal to 0.5*H; where PGA = 0.6g, soil density = 120 pcf, and load factor 1.0E is applied to all soil lateral loads.
- 8) The maximum allowable site-specific peak ground acceleration (PGA) permitted for use of this table is equal to 0.6g.
- 9) A geotechnical investigation is required in Seismic Category D in accordance with IBC 1803.5.12 to determine the horizontal backfill seismic pressure to specify in design by IBC 1807.2.2 and ACI 318-14 Section 26.2(b). Where seismic loading condition does not fit into provided loading scenario per note 5 of this table, the actual values received from the investigation must be used to perform calculations per ACI 318-14 to determine the required reinforcing.
- 10) Minimum concrete 28-day compressive strength of 3000 psi; reinforcing steel bar yield strength of 60,000 psi.



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**TABLE 6: STRONGHOLD ICF MINIMUM REINFORCEMENT FOR 10" & 12" FOUNDATION WALLS IN SEISMIC DESIGN CATEGORY D
IRC AND IBC APPLICATIONS WITH DESIGN PER ACI 318-14, ALL ABOVE-GRADE WALL TYPES**

MAXIMUM WALL HEIGHT (feet)	MAXIMUM UNBALANCED BACKFILL HEIGHT (feet)	MINIMUM VERTICAL REINFORCEMENT BAR SIZE AND SPACING (inches)																		MINIMUM HORIZONTAL BAR SIZE AND SPACING
		Soil Classes and design lateral soil pressure (psf per foot depth)																		
		GW, GP, SW, SP						GM, GC, SM, SM-SC and ML						SC, ML-CL and Inorganic						
		30 psf						45 psf						60 psf						
		Minimum nominal wall thickness (inches)																		All soil classes and wall thicknesses
10"			12"			10"			12"			10"			12"					
		#4	#5	#6	#4	#5	#6	#4	#5	#6	#4	#5	#6	#4	#5	#6	#4	#5	#6	
7'	6'	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	#4 @ 24" o/c
	7'	16"	16"	16"	24"	24"	24"	16"	16"	16"	16"	16"	16"	16"	16"	16"	16"	16"	16"	#4 @ 16" o/c
8'	6'	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	#4 @ 24" o/c
	7'	16"	16"	16"	16"	16"	16"	16"	16"	16"	16"	16"	16"	8"	16"	16"	16"	16"	16"	#4 @ 16" o/c
	8'	16"	16"	16"	16"	16"	16"	8"	16"	16"	16"	16"	16"	8"	16"	16"	16"	16"	16"	#4 @ 16" o/c
9'	4'	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	#4 @ 24" o/c
	5'	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	#4 @ 24" o/c
	6'	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	#4 @ 24" o/c
	7'	16"	16"	16"	16"	16"	16"	16"	16"	16"	16"	16"	16"	16"	16"	16"	16"	16"	16"	#4 @ 16" o/c
	8'	8"	16"	16"	16"	16"	16"	8"	16"	16"	16"	16"	16"	16"	8"	16"	16"	8"	16"	#4 @ 16" o/c
	9'	8"	16"	16"	8"	16"	16"	8"	16"	16"	16"	8"	16"	16"	8"	16"	16"	8"	16"	#4 @ 16" o/c
10'	4'	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	#4 @ 24" o/c
	5'	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	#4 @ 24" o/c
	6'	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	#4 @ 24" o/c
	7'	16"	16"	16"	16"	16"	16"	16"	16"	16"	16"	16"	16"	16"	8"	16"	16"	16"	16"	#4 @ 16" o/c
	8'	8"	16"	16"	16"	16"	16"	8"	16"	16"	16"	8"	16"	16"	8"	16"	16"	8"	16"	#4 @ 16" o/c
	10'	-	8"	16"	8"	8"	16"	-	8"	16"	8"	16"	8"	16"	-	8"	16"	-	8"	#4 @ 16" o/c
11'	4'	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	#4 @ 24" o/c
	6'	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	#4 @ 24" o/c
	8'	8"	16"	16"	8"	16"	16"	8"	16"	16"	8"	16"	16"	8"	16"	16"	8"	16"	16"	#4 @ 16" o/c
	10'	-	8"	16"	8"	8"	16"	-	8"	8"	-	8"	16"	-	8"	8"	-	8"	16"	#4 @ 16" o/c
12'	4'	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	#4 @ 24" o/c
	6'	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	#4 @ 24" o/c
	8'	8"	16"	16"	8"	16"	16"	8"	16"	16"	8"	16"	16"	8"	16"	16"	8"	16"	16"	#4 @ 16" o/c
14'	10'	-	8"	8"	-	8"	16"	-	8"	8"	-	8"	16"	-	-	8"	-	8"	16"	#4 @ 16" o/c
	4'	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	#4 @ 24" o/c
	6'	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	24"	#4 @ 24" o/c
	8'	8"	8"	16"	8"	16"	16"	8"	8"	16"	8"	16"	16"	-	8"	16"	8"	16"	16"	#4 @ 16" o/c

FOR USE WHEN BUILDING DESIGN CONDITIONS ARE BEYOND IRC LIMITS AND REQUIRE ENGINEERED DESIGN. REINFORCING SCHEDULE FOR ESTIMATING PURPOSES ONLY

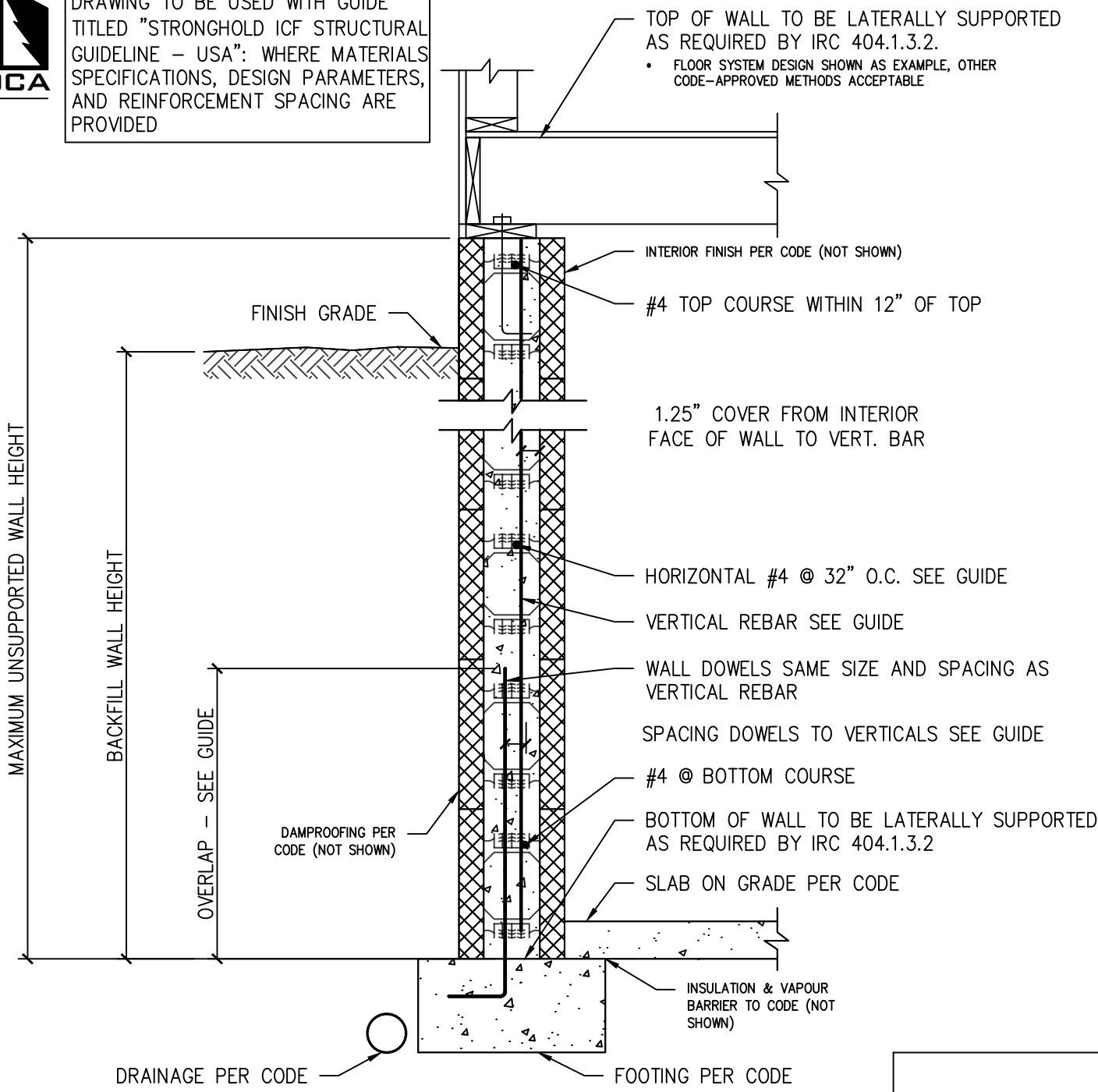
- 1) This table has been prepared in accordance with design calculations per ACI 318-14, following minimum reinforcing area and spacing rules optimized for the Stronghold ICF system, using loading conditions as provided in the table and note 7.
- 2) Where vertical reinforcing bar spacing is recommended at 24" o/c, walls are structurally modeled as plain concrete and reinforcing is provided for serviceability improvements.
- 3) Boxes with "-" indicates reinforcement is not possible within the scope of this guide.
- 4) Table is to be used in conjunction with "Stronghold ICF Structural Guideline" and drawings 0068-(1)-(4) prepared by BOCA Engineering Co., which contains materials specifications, building conditions, design limitations and installation details.
- 5) Green highlighted boxes reflect the recommended most economical materials and labor option for a given loading and size condition.
- 6) Seismic loading conditions have not been considered for backfill heights of 6 feet and less in as per IBC Section 1807.2.2.
- 7) Where seismic loading conditions have been considered for backfill heights over 6 feet, the dynamic seismic lateral earth pressure load effect is an assumed horizontal resultant force equal to 36*H² lb/ft-width, which is added on to the at-rest backfill pressure; where H is equal to the height of unbalanced backfill in feet applied at a location equal to 0.5*H; where PGA = 0.6g, soil density = 120 pcf, and load factor 1.0E is applied to all soil lateral loads.
- 8) The maximum allowable site-specific peak ground acceleration (PGA) permitted for use of this table is equal to 0.6g.
- 9) A geotechnical investigation is required in Seismic Category D in accordance with IBC 1803.5.12 to determine the horizontal backfill seismic pressure to specify in design by IBC 1807.2.2 and ACI 318-14 Section 26.2(b). Where seismic loading condition does not fit into provided loading scenario per note 5 of this table, the actual values received from the investigation must be used to perform calculations per ACI 318-14 to determine the required reinforcing.
- 10) Minimum concrete 28-day compressive strength of 3000 psi; reinforcing steel bar yield strength of 60,000 psi.



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**6" STRONGHOLD ICF
FOUNDATION WALL (TYP.)**
NOT-TO-SCALE

DRAWING FOR STRONGHOLD INSULATED CONCRETE FORMS STRUCTURAL GUIDE - NOT FOR USE AS CONSTRUCTION DESIGN DOCUMENTS



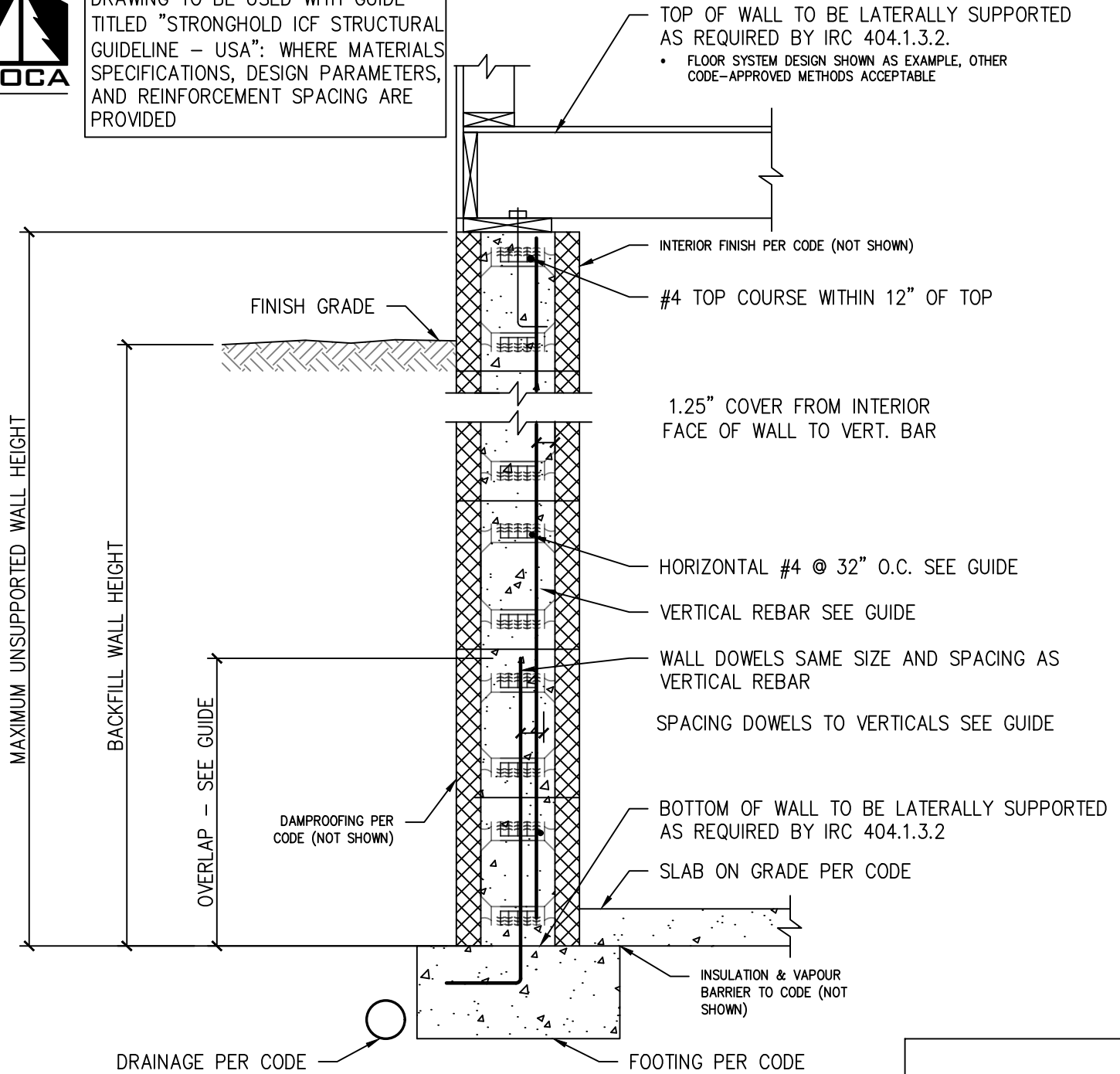
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1	2020/12/23	FOR PUBLICATION	CB
REV	DATE	ISSUE	APP
DRAWING NO. 0068-001		DES	CB
DATE DECEMBER 23, 2020		DRN	LI
		CHK	CB



DRAWING TO BE USED WITH GUIDE TITLED "STRONGHOLD ICF STRUCTURAL GUIDELINE - USA": WHERE MATERIALS SPECIFICATIONS, DESIGN PARAMETERS, AND REINFORCEMENT SPACING ARE PROVIDED



8" STRONGHOLD ICF
FOUNDATION WALL (TYP.)
 NOT-TO-SCALE



DRAWING FOR STRONGHOLD INSULATED CONCRETE FORMS STRUCTURAL GUIDE - NOT FOR USE AS CONSTRUCTION DESIGN DOCUMENTS

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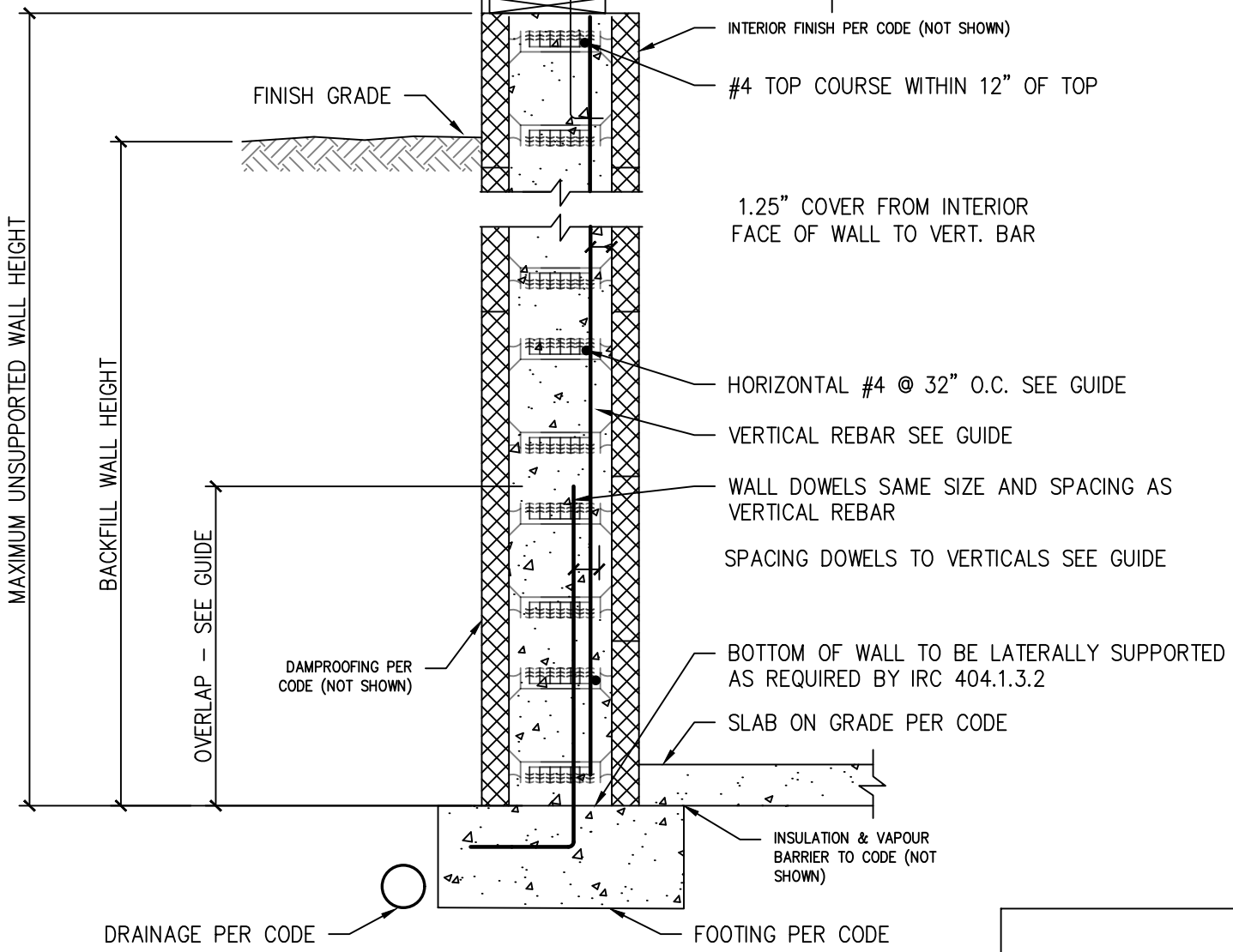
TITLE:
 STRONGHOLD ICF FOUNDATION WALL DETAIL

1	2020/12/23	FOR PUBLICATION	CB
REV	DATE	ISSUE	APP
DRAWING NO.		DES	CB
0068-002		DRN	LI
DATE		CHK	CB
DECEMBER 23, 2020			



DRAWING TO BE USED WITH GUIDE TITLED "STRONGHOLD ICF STRUCTURAL GUIDELINE - USA": WHERE MATERIALS SPECIFICATIONS, DESIGN PARAMETERS, AND REINFORCEMENT SPACING ARE PROVIDED

TOP OF WALL TO BE LATERALLY SUPPORTED AS REQUIRED BY IRC 404.1.3.2.
 • FLOOR SYSTEM DESIGN SHOWN AS EXAMPLE, OTHER CODE-APPROVED METHODS ACCEPTABLE



10" STRONGHOLD ICF
FOUNDATION WALL (TYP.)
 NOT-TO-SCALE

DRAWING FOR STRONGHOLD INSULATED CONCRETE FORMS STRUCTURAL GUIDE - NOT FOR USE AS CONSTRUCTION DESIGN DOCUMENTS

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PROJECT:
 STRONGHOLD INSULATED CONCRETE FORM (ICF) STRUCTURAL GUIDE

TITLE:
 STRONGHOLD ICF FOUNDATION WALL DETAIL

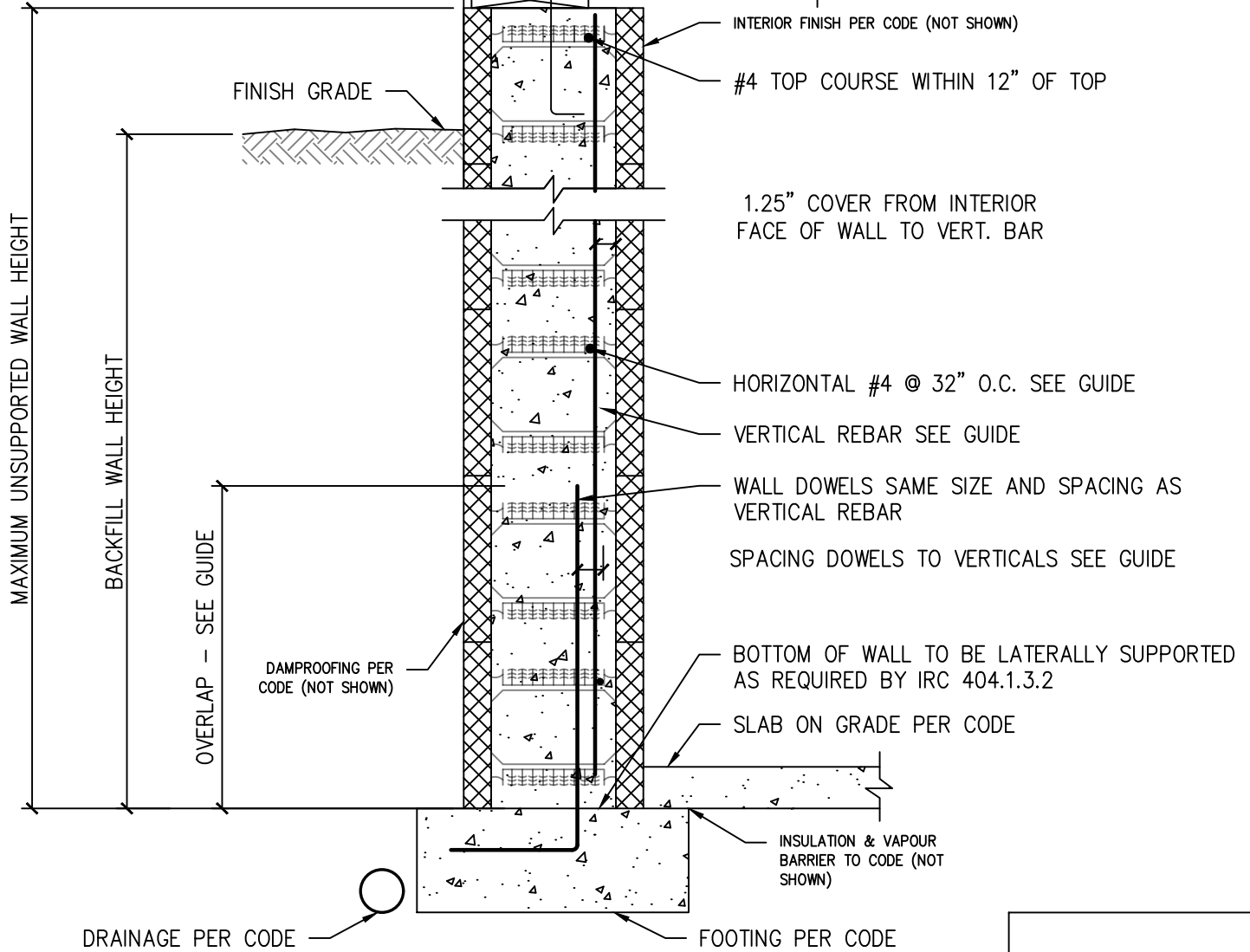
1	2020/12/23	FOR PUBLICATION	CB
REV	DATE	ISSUE	APP
DRAWING NO.		DES	CB
0068-003		DRN	LI
DATE		CHK	CB
DECEMBER 23, 2020			



DRAWING TO BE USED WITH GUIDE TITLED "STRONGHOLD ICF STRUCTURAL GUIDELINE - USA": WHERE MATERIALS SPECIFICATIONS, DESIGN PARAMETERS, AND REINFORCEMENT SPACING ARE PROVIDED

TOP OF WALL TO BE LATERALLY SUPPORTED AS REQUIRED BY IRC 404.1.3.2.

- FLOOR SYSTEM DESIGN SHOWN AS EXAMPLE, OTHER CODE-APPROVED METHODS ACCEPTABLE



**12" STRONGHOLD ICF
FOUNDATION WALL (TYP.)**
NOT-TO-SCALE

DRAWING FOR STRONGHOLD INSULATED CONCRETE FORMS STRUCTURAL GUIDE - NOT FOR USE AS CONSTRUCTION DESIGN DOCUMENTS



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CLIENT: STRONGHOLD INSULATION SYSTEMS INC.	PROJECT: STRONGHOLD INSULATED CONCRETE FORM (ICF) STRUCTURAL GUIDE	TITLE: STRONGHOLD ICF FOUNDATION WALL DETAIL
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1	2020/12/23	FOR PUBLICATION	CB
REV	DATE	ISSUE	APP
DRAWING NO. 0068-004		DES CB	
DATE DECEMBER 23, 2020		DRN LI	
		CHK CB	



Preparation of Stronghold ICF Above Grade Walls

Concrete materials and preparation must comply with IRC R608.5.1.

Steel reinforcing must comply with IRC R608.5.2.

The exterior is to be covered with a code-complying wall covering as per IRC 608.4.3.

Walls interrupted by openings are to be additionally reinforced in accordance with IRC R608.8.1.2 with extra vertical bars of the same dimension placed within 12-inches of each side, a # 4 horizontal bar not less than 12-inches from the bottom, and a lintel above.

Lintels of openings are to be prepared in accordance with IRC R608.8.2 and the Lintel tables and figures within this guide.

Development length and lap splices in horizontal and vertical reinforcing bars are to comply with IRC Table R608.5.4(1). The minimum development length of 60 ksi #4 bar is 23-inches, and of #5 bar is 28-inches. The minimum overlap of #4 bars is 30-inches and #5 bars is 38-inches. The maximum gap between #4 or #5 splice bars is 6-inches. Refer to Code for overlap and maximum gap of other bar types.

Construction joints are made according to IRC R608.5.5. In plain concrete walls and walls with reinforcing at 48-inch o/c, joints are to be located at points of lateral support and have #4 bars spaced at 24-inch o/c extending a minimum of 12-inches embedment on each side of the joint. In reinforced foundations walls (other than walls reinforced at 48-inch o/c), construction joints are to be located in the middle third of the unsupported span, or prepared as those for plain concrete walls.

Reinforcing shall be continuous through story breaks where there are concrete walls above or below. Lap splicing is permissible following the guidelines for lap splice development length.

Vertical bars at the ends of solid wall lengths, and adjacent to openings, shall be terminated at ends with a 90° hook in accordance with IRC 608.6.4.

All further details as required by IRC R608 applicable to the design are to be followed.

ABOVE GRADE WALL REINFORCING TABLES AND DIAGRAMS BEGIN NEXT PAGE



TABLE 7: STRONGHOLD ICF MINIMUM REINFORCEMENT FOR ABOVE GRADE WALLS IN SEISMIC DESIGN CATEGORIES A-C⁽¹⁾⁽²⁾⁽³⁾⁽⁴⁾⁽⁵⁾

MAXIMUM WIND SPEED (mph)			MAXIMUM UNSUPPORTED WALL HEIGHT PER STORY (feet)	MINIMUM NO. 4 (1/2") BAR VERTICAL REINFORCEMENT SPACING, (inches) ⁽⁶⁾⁽⁷⁾								MINIMUM HORIZ. BAR SIZE AND SPACING, (inches) ⁽⁹⁾		
				Minimum nominal wall thickness (inches)										
B	C	D		4"		6"		8"		10"				12" ⁽⁸⁾⁽⁹⁾
			Top ⁽⁷⁾	Side ⁽⁷⁾	Top ⁽⁷⁾	Side ⁽⁷⁾	Top ⁽⁷⁾	Side ⁽⁷⁾	Top ⁽⁷⁾	Side ⁽⁷⁾	Top ⁽⁷⁾	Side ⁽⁷⁾		
115			8'	48"	48"	48"	48"	48"	48"	48"	48"	48"	#4 @ 32" o/c	
			9'	48"	40"	48"	48"	48"	48"	48"	48"	24"	24"	#4 @ 32" o/c
			10'	40"	32"	48"	48"	48"	48"	48"	48"	24"	24"	#4 @ 32" o/c
120			8'	48"	40"	48"	48"	48"	48"	48"	48"	48"	#4 @ 32" o/c	
			9'	48"	32"	48"	48"	48"	48"	48"	48"	24"	24"	#4 @ 32" o/c
			10'	40"	32"	48"	48"	48"	48"	48"	48"	24"	24"	#4 @ 32" o/c
130	110		8'	48"	40"	48"	48"	48"	48"	48"	48"	48"	#4 @ 32" o/c	
			9'	40"	32"	48"	48"	48"	48"	48"	48"	24"	24"	#4 @ 32" o/c
			10'	32"	24"	48"	48"	48"	48"	48"	48"	24"	24"	#4 @ 32" o/c
140	119	110	8'	40"	32"	48"	48"	48"	48"	48"	48"	48"	#4 @ 32" o/c	
			9'	32"	32"	48"	48"	48"	48"	48"	48"	24"	24"	#4 @ 32" o/c
			10'	32"	24"	48"	48"	48"	48"	48"	48"	24"	24"	#4 @ 32" o/c
150	127	117	8'	40"	32"	48"	48"	48"	48"	48"	48"	48"	#4 @ 32" o/c	
			9'	32"	32"	48"	48"	48"	48"	48"	48"	24"	24"	#4 @ 32" o/c
			10'	24"	24"	48"	48"	48"	48"	48"	48"	24"	24"	#4 @ 32" o/c
160	136	125	8'	32"	32"	48"	48"	48"	48"	48"	48"	48"	#4 @ 32" o/c	
			9'	32"	24"	48"	48"	48"	48"	48"	48"	24"	24"	#4 @ 32" o/c
			10'	24"	16"	48"	48"	48"	48"	48"	48"	24"	24"	#4 @ 32" o/c

SHADED AREA THICKNESS OVER 10" BEYOND IRC LIMITS REQUIRE ENGINEERED DESIGN. REINFORCING SHOWN FOR ESTIMATING PURPOSES ONLY

- 1) Table is based on IRC Table R608.6(1).
- 2) Table is to used in conjunction with "Stronghold ICF Structural Guideline - USA" and drawings 0068-010 to 0068-016 prepared by BOCA Engineering Co which contains materials specifications, building conditions, design limitations and installation details.
- 3) Table is based on ASCE 7-16 28.5 Wind Loads: Main Wind Force Resisting System using a mean roof height of 35 feet, topographic factor, K_{zt}, equal to 1.0, and Risk Category II.
- 4) Table is based on concrete with a minimum specified compressive strength of 2,500 psi.
- 5) Interpolation is not permitted.
- 6) Table values are based on a reinforcing yield strength of 60,000 psi. Substitution with 40,000 psi and/or bars of other sizes is permitted using IRC Section R608.5.4.7 and Table R608.5.4(2).
- 7) "Top" loading means gravity loading from roof, floor or wall construction bearing on top the wall. "Side" loading means gravity load from floor construction which is transferred to the wall through a wood ledger or cold-formed steel track bolted to the side of the wall.
- 8) 12" wall reinforcing specified in table shall be placed in two layers parallel with wall faces to satisfy ACI 318-14 11.7.2.
- 9) 12" wall horizontal reinforcing shall be a double grid at 24" o/c spacing to satisfy ACI 318-14 11.7.2.



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TABLE 8: LENGTH OF SOLID WALL REQUIRED IN EACH EXTERIOR ENDWALL FOR WIND PERPENDICULAR TO RIDGE ONE STOREY OR TOP OF TWO STOREY

SIDEWALL LENGTH (feet) ⁽⁷⁾	ENDWALL LENGTH (feet) ⁽⁷⁾	ROOF SLOPE ⁽⁷⁾	LENGTH OF SOLID WALL REQUIRED IN ENDWALLS FOR WIND PERPENDICULAR TO RIDGE ⁽⁵⁾⁽⁶⁾															
			Minimum nominal wall thickness (inches)															
			4"			6"			8"			10"			12"			
			Basic Wind Speed (mph) Exposure															
			120B	140B	160B	120B	140B	160B	120B	140B	160B	120B	140B	160B	120B	140B	160B	
-	119C	136C	-	119C	136C	-	119C	136C	-	119C	136C	-	119C	136C				
-	110D	125D	-	110D	125D	-	110D	125D	-	110D	125D	-	110D	125D				
15	15	5:12	4'	4'	4'	4'	4'	4'	4'	4'	4'	4'	4'	4'	4'	4'	4'	
		12:12	4'	4'	4'	4'	4'	4'	4'	4'	4'	4'	4'	4'	4'	4'	4'	
	30	5:12	4'	4'	4'	4'	4'	4'	4'	4'	4'	4'	4'	4'	4'	4'	4'	
		12:12	4'	5'	6.5'	4'	4'	5'	4'	4'	5'	4'	4'	5'	4'	4'	5'	
	45	5:12	4'	4'	4'	4'	4'	4'	4'	4'	4'	4'	4'	4'	4'	4'	4'	
		12:12	5'	6.5'	8.5'	4'	5.5'	7'	4'	5'	7'	4'	5'	7'	4'	5'	6.5'	
	60	5:12	4'	4'	4.5'	4'	4'	4.5'	4'	4'	4.5'	4'	4'	4.5'	5'	5'	5'	
		12:12	6.5'	8.5'	11'	5'	6.5'	8.5'	5'	6.5'	8.5'	5'	6.5'	8.5'	5'	6.5'	8.5'	
	30	15	5:12	4'	4'	4.5'	4'	4'	4'	4'	4'	4'	4'	4'	4'	4'	4'	4'
			12:12	4'	5.5'	7'	4'	4.5'	6'	4'	4.5'	6'	4'	4.5'	6'	4'	4.5'	6'
		30	5:12	4'	4.5'	6'	4'	4.5'	5.5'	4'	4'	5.5'	4'	4'	5.5'	4'	4'	5.5'
			12:12	6'	8.5'	11'	5.5'	7.5'	9.5'	5.5'	7.5'	9.5'	5.5'	7.5'	9.5'	5.5'	7.5'	9.5'
45		5:12	4.5'	6'	7.5'	4'	5.5'	7'	4'	5.5'	7'	4.5'	5.5'	7'	5'	5.5'	7'	
		12:12	8.5'	11.5'	14.5'	7.5'	10'	13'	7.5'	10'	13'	7.5'	10'	13'	7.5'	10'	13'	
60		5:12	5'	7'	9'	5'	6.5'	8.5'	5'	6.5'	8.5'	5.5'	6.5'	8.5'	6.5'	6.5'	8.5'	
		12:12	10.5'	14.5'	18.5'	9.5'	13'	16.5'	9.5'	12.5'	16.5'	9.5'	12.5'	16.5'	9'	12.5'	16.5'	
60		15	5:12	5'	6.5'	8.5'	4.5'	6'	8'	4.5'	6'	7.5'	4.5'	6'	7.5'	5'	6'	7.5'
			12:12	7.5'	10'	13'	7'	9'	12'	6.5'	9'	12'	6.5'	9'	11.5'	6.5'	9'	11.5'
		30	5:12	6.5'	9'	11.5'	6'	8.5'	11'	6'	8'	10.5'	6'	8'	10.5'	6.5'	8'	10.5'
			12:12	11.5'	15.5'	20.5' ⁽⁸⁾	11'	14.5'	19' ⁽⁸⁾	10.5'	14.5'	19' ⁽⁸⁾	10.5'	14.5'	18.5' ⁽⁸⁾	10.5'	14.5'	18.5' ⁽⁸⁾
	45	5:12	8.5'	11.5'	14.5'	8'	10.5'	13.5'	7.5'	10.5'	13.5'	7.5'	10.5'	13.5'	8'	10.5'	13.5'	
		12:12	16'	21.5'	28'	14.5'	20'	26'	14.5'	19.5'	25.5'	14.5'	19.5'	25.5'	14.5'	19.5'	25.5'	
	60	5:12	10'	13.5'	18'	9.5'	13'	16.5'	9.5'	12.5'	16.5'	9.5'	12.5'	16.5'	9.5'	12.5'	16.5'	
		12:12	20'	27'	35.5'	18.5'	25.5'	33'	18.5'	25'	32.5'	18.5'	25'	32.5'	18'	25'	32.5'	

SHADED AREA THICKNESS OVER 10" BEYOND IRC LIMITS REQUIRE ENGINEERED DESIGN. REINFORCING SCHEDULE FOR ESTIMATING PURPOSES ONLY.

- 1) Table is based on IRC Table R608.7(1A).
- 2) Table is to used in conjunction with "Stronghold ICF Structural Guideline - USA" and drawings 0068-010 to 0068-016 prepared by BOCA Engineering Co which contains materials specifications, building conditions, design limitations and installation details.
- 3) Interpolation is not permitted.
- 4) Solid wall lengths shall not be reduced under any circumstances.
- 5) Minimum length of solid wall lengths included shall be greater than or equal to 24 inches in length, and not more than two solid wall lengths greater than or equal to 24 inches in length and less than 48 inches in length shall be included in the required total length of solid wall according to IRC R608.7.2.1.
- 6) Table shows minimum summation of solid wall length. Plans are permitted to exceed the minimum length.
- 7) Where actual sidewall, endwall and roof slope values fall between values provided in table, the next highest design value in the table shall be used.
- 8) Highlighted cells identify areas where length of solid wall required governs endwall and/or sidewall dimensions.



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TABLE 9: LENGTH OF SOLID WALL REQUIRED IN EACH EXTERIOR ENDWALL FOR WIND PERPENDICULAR TO RIDGE FIRST STORY OF TWO STORY

SIDEWALL LENGTH (feet) ⁽⁷⁾	ENDWALL LENGTH (feet) ⁽⁷⁾	ROOF SLOPE ⁽⁷⁾	LENGTH OF SOLID WALL REQUIRED IN ENDWALLS FOR WIND PERPENDICULAR TO RIDGE ⁽⁵⁾⁽⁶⁾														
			Minimum nominal wall thickness (inches)														
			4"			6"			8"			10"			12"		
			Basic Wind Speed (mph) Exposure														
			120B	140B	160B	120B	140B	160B	120B	140B	160B	120B	140B	160B	120B	140B	160B
			-	119C	136C	-	119C	136C	-	119C	136C	-	119C	136C	-	119C	136C
			-	110D	125D	-	110D	125D	-	110D	125D	-	110D	125D	-	110D	125D
15	15	5:12	4'	4'	5'	4'	4'	4.5'	4'	4'	4.5'	4.5'	4.5'	4.5'	5'	5'	5'
		12:12	4'	5'	7'	4'	4.5'	5.5'	4'	4'	5.5'	4.5'	4.5'	5.5'	5'	5'	5.5'
	30	5:12	4'	4.5'	5.5'	4.5'	4.5'	5'	5.5'	5.5'	5.5'	6.5'	6.5'	6.5'	7.5'	7.5'	7.5'
		12:12	5'	7'	9'	4.5'	5.5'	7.5'	5.5'	5.5'	7'	6.5'	6.5'	7'	7.5'	7.5'	7.5'
	45	5:12	4.5'	5'	6.5'	6'	6'	6'	7'	7'	7'	8.5'	8.5'	8.5'	10'	10'	10'
		12:12	6.5'	9'	11.5'	6'	7'	9'	7'	7'	9'	8.5'	8.5'	9'	10'	10'	10'
	60	5:12	6'	6'	7'	7.5'	7.5'	7.5'	9'	9'	9'	11'	11'	11'	12.5'	12.5'	12.5'
		12:12	8'	10.5'	13.5'	7.5'	8.5'	11'	9'	9'	10.5'	11'	11'	11'	12.5'	12.5'	12.5'
30	15	5:12	5.5'	7'	9.5'	5'	6.5'	8.5'	5.5'	6.5'	8.5'	6.5'	6.5'	8.5'	7.5'	7.5'	8.5'
		12:12	7'	9'	12'	6'	8.5'	11'	6'	8'	10.5'	6.5'	8'	10.5'	7.5'	8'	10.5'
	30	5:12	6.5'	8.5'	11'	6'	8'	10'	7.5'	8'	10'	9'	9'	10'	10.5'	10.5'	10.5'
		12:12	9'	12'	16' ⁽⁸⁾	8'	11'	14.5'	8'	11'	14'	9'	11'	14'	10.5'	11'	14'
	45	5:12	7'	9.5'	12.5'	8'	9'	11.5'	10'	10'	11.5'	11.5'	11.5'	11.5'	13.5'	13.5'	13.5'
		12:12	11'	15'	20'	10'	13.5'	18'	10'	13.5'	17.5'	11.5'	13.5'	17.5'	13.5'	13.5'	17.5'
	60	5:12	8.5'	11'	14'	10'	10'	13'	12'	12'	13'	14'	14'	14'	16.5'	16.5'	16.5'
		12:12	13.5'	18'	23.5'	12'	16.5'	21.5'	12'	16'	21'	14'	16'	21'	16.5'	16.5'	21'
60	15	5:12	10.5'	14'	-	10'	13'	-	9.5'	13'	-	11'	13'	-	12.5'	13'	-
		12:12	13'	-	-	12'	-	-	12'	-	-	12'	-	-	12.5'	-	-
	30	5:12	12.5'	16.5' ⁽⁸⁾	21.5' ⁽⁸⁾	11.5'	15.5' ⁽⁸⁾	20' ⁽⁸⁾	12'	15.5' ⁽⁸⁾	20' ⁽⁸⁾	14'	15'	20' ⁽⁸⁾	16.5' ⁽⁸⁾	16.5' ⁽⁸⁾	19.5' ⁽⁸⁾
		12:12	17' ⁽⁸⁾	23.5' ⁽⁸⁾	30.5' ⁽⁸⁾	16' ⁽⁸⁾	21.5' ⁽⁸⁾	28.5' ⁽⁸⁾	16' ⁽⁸⁾	21.5' ⁽⁸⁾	28' ⁽⁸⁾	15.5' ⁽⁸⁾	21.5' ⁽⁸⁾	28' ⁽⁸⁾	16.5' ⁽⁸⁾	21.5' ⁽⁸⁾	27.5' ⁽⁸⁾
	45	5:12	14'	19'	25'	13'	17.5'	23'	15'	17.5'	23'	17.5'	17.5'	22.5'	20'	20'	22.5'
		12:12	21.5'	29'	38' ⁽⁸⁾	20'	27'	35.5' ⁽⁸⁾	19.5'	27'	35' ⁽⁸⁾	19.5'	26.5'	34.5' ⁽⁸⁾	20'	26.5'	34.5' ⁽⁸⁾
	60	5:12	16'	21.5'	28'	15'	20'	26'	18'	19.5'	25.5'	21'	21'	25.5'	23.5'	23.5'	25.5'
		12:12	25.5'	35'	45.5' ⁽⁸⁾	24'	32.5'	42.5'	23.5'	32'	42'	23.5'	32'	41.5'	23.5'	32'	41.5'

SHADED AREA THICKNESS OVER 10" BEYOND IRC LIMITS REQUIRE ENGINEERED DESIGN. REINFORCING SCHEDULE FOR ESTIMATING PURPOSES ONLY.

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- 6) Table shows minimum summation of solid wall length. Plans are permitted to exceed the minimum length.
- 7) Where actual sidewall, endwall and roof slope values fall between values provided in table, the next highest design value in the table shall be used.
- 8) Highlighted cells identify areas where length of solid wall required governs endwall and/or sidewall dimensions.



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TABLE 10: LENGTH OF SOLID WALL REQUIRED IN EACH EXTERIOR SIDEWALL FOR WIND PARALLEL TO RIDGE

SIDEWALL LENGTH (feet) ⁽⁷⁾	ENDWALL LENGTH (feet) ⁽⁷⁾	ROOF SLOPE ⁽⁷⁾	LENGTH OF SOLID WALL REQUIRED IN SIDEWALLS FOR WIND PARALLEL TO RIDGE (feet) ⁽⁵⁾⁽⁶⁾															
			Minimum nominal wall thickness (inches)															
			4"			6"			8"			10"			12"			
			Basic Wind Speed (mph) Exposure															
			120B	140B	160B	120B	140B	160B	120B	140B	160B	120B	140B	160B	120B	140B	160B	
-	119C	136C	-	119C	136C	-	119C	136C	-	119C	136C	-	119C	136C				
-	110D	125D	-	110D	125D	-	110D	125D	-	110D	125D	-	110D	125D				
One story or top story of two story																		
< 30	15	5:12	4'	4'	4'	4'	4'	4'	4'	4'	4'	4'	4'	4'	4'	4'	4'	
		12:12	4'	4'	4'	4'	4'	4'	4'	4'	4'	4'	4'	4'	4'	4'	4'	
	30	5:12	4'	4'	4.5'	4'	4'	4'	4'	4'	4'	4'	4'	4'	4'	4'	4'	4'
		12:12	4'	5'	6.5'	4'	4.5'	6'	4'	4.5'	6'	4'	4.5'	6'	4'	4.5'	6'	6'
	45	5:12	4.5'	6'	7.5'	4'	5.5'	7'	4'	5.5'	7'	4.5'	5.5'	7'	5'	5.5'	7'	7'
		12:12	7'	9.5'	12.5'	6.5'	9'	11.5'	6.5'	9'	11.5'	6.5'	9'	11.5'	6.5'	9'	11.5'	11.5'
	60	5:12	6.5'	9'	11.5'	6'	8.5'	11'	6'	8'	10.5'	6'	8'	10.5'	6.5'	8'	10.5'	10.5'
		12:12	11.5'	15.5'	20.5'	11'	14.5'	19'	10.5'	14.5'	19'	10.5'	14.5'	18.5'	10.5'	14.5'	18.5'	18.5'
60	45	5:12	5'	6'	7.5'	5.5'	5.5'	7'	6.5'	6.5'	7'	7'	7'	7'	8'	8'	8'	
		12:12	7'	9.5'	12.5'	6.5'	9'	11.5'	6.5'	9'	11.5'	7'	9'	11.5'	8'	9'	11.5'	
	60	5:12	6.5'	9'	11.5'	7'	8.5'	11'	8'	8'	10.5'	8.5'	8.5'	10.5'	9.5'	9.5'	10.5'	
		12:12	11.5'	15.5'	20.5'	11'	14.5'	19'	10.5'	14.5'	19'	10.5'	14.5'	18.5'	10.5'	14.5'	18.5'	18.5'
First story of two story																		
< 30	15	5:12	4'	4'	4.5'	4.5'	4.5'	4.5'	5.5'	5.5'	5.5'	6.5'	6.5'	6.5'	7.5'	7.5'	7.5'	
		12:12	4'	4'	5'	4.5'	4.5'	4.5'	5.5'	5.5'	5.5'	6.5'	6.5'	6.5'	7.5'	7.5'	7.5'	
	30	5:12	5.5'	7'	9.5'	6'	6.5'	8.5'	7.5'	7.5'	8.5'	9'	9'	9'	10.5'	10.5'	10.5'	
		12:12	6.5'	9'	11.5'	6'	8.5'	11'	7.5'	8'	10.5'	9'	9'	10.5'	10.5'	10.5'	10.5'	
	45	5:12	8.5'	11.5'	15'	8'	11'	14'	10'	10.5'	14'	11.5'	11.5'	14'	13.5'	13.5'	14'	
		12:12	11.5'	15.5'	20'	10.5'	14.5'	18.5'	10.5'	14'	18.5'	11.5'	14'	18.5'	13.5'	14'	18.5'	
	60	5:12	12.5'	16.5'	21.5'	11.5'	15.5'	20'	12'	15.5'	20'	14'	15'	20'	16.5'	16.5'	19.5'	
		12:12	17'	23.5'	30.5'	16'	21.5'	28.5'	16'	21.5'	28'	15.5'	21.5'	28'	16.5'	21.5'	27.5'	
60	45	5:12	10.5'	11.5'	15'	12.5'	12.5'	14'	15'	15'	15'	17.5'	17.5'	17.5'	20'	20'	20'	
		12:12	11.5'	15.5'	20'	12.5'	14.5'	18.5'	15'	15'	18.5'	17.5'	17.5'	18.5'	20'	20'	20'	
	60	5:12	13'	16.5'	21.5'	15'	15.5'	20'	18'	18'	20'	21'	21'	21'	23.5'	23.5'	23.5'	
		12:12	17'	23.5'	30.5' ⁽⁸⁾	16'	21.5'	28.5'	18'	21.5'	28'	21'	21.5'	28'	23.5'	23.5'	27.5'	

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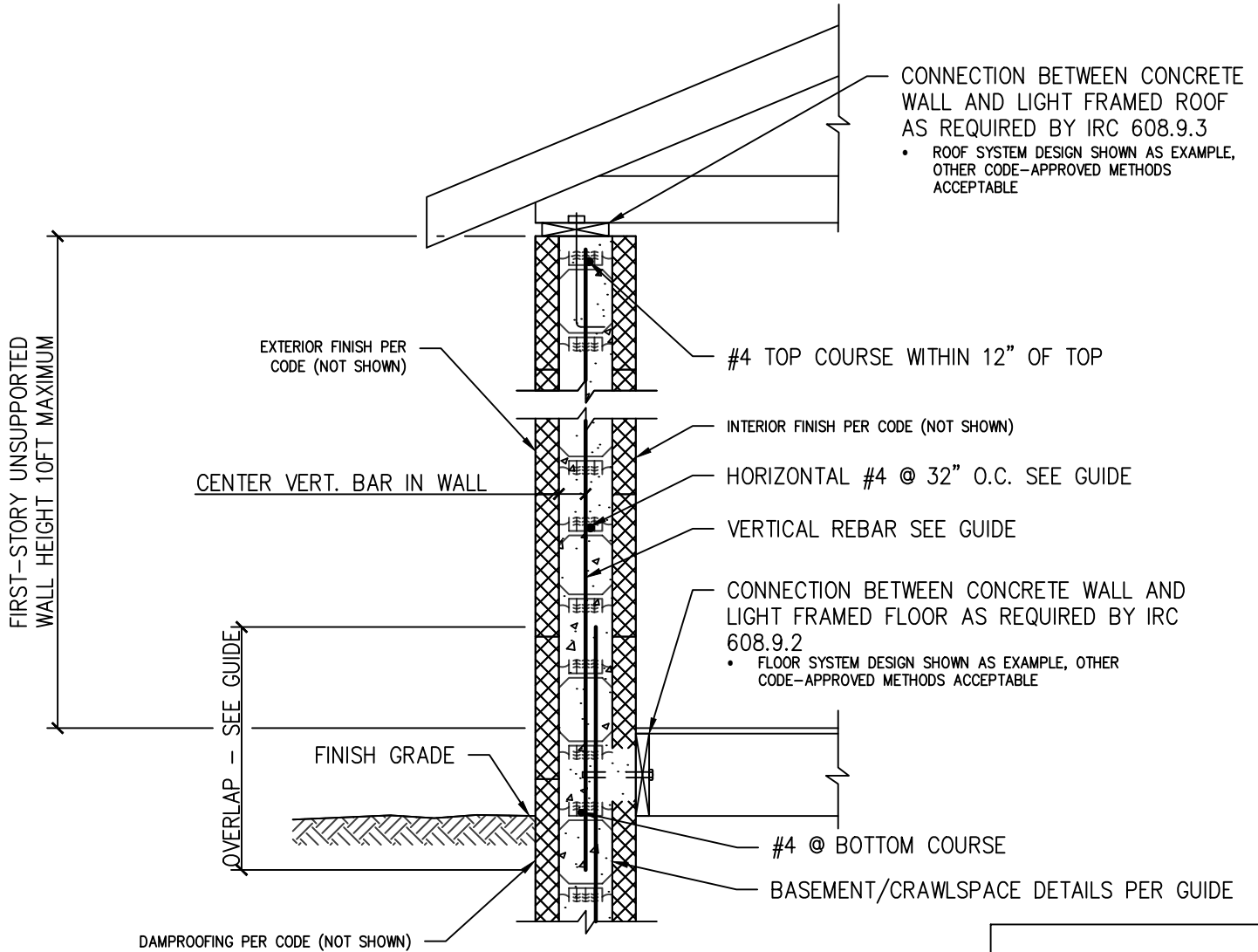
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ABOVE-GRADE CONCRETE SINGLE STORY WALL (TYP. 4", 6", 8" & 10" WALLS)

NOT-TO-SCALE



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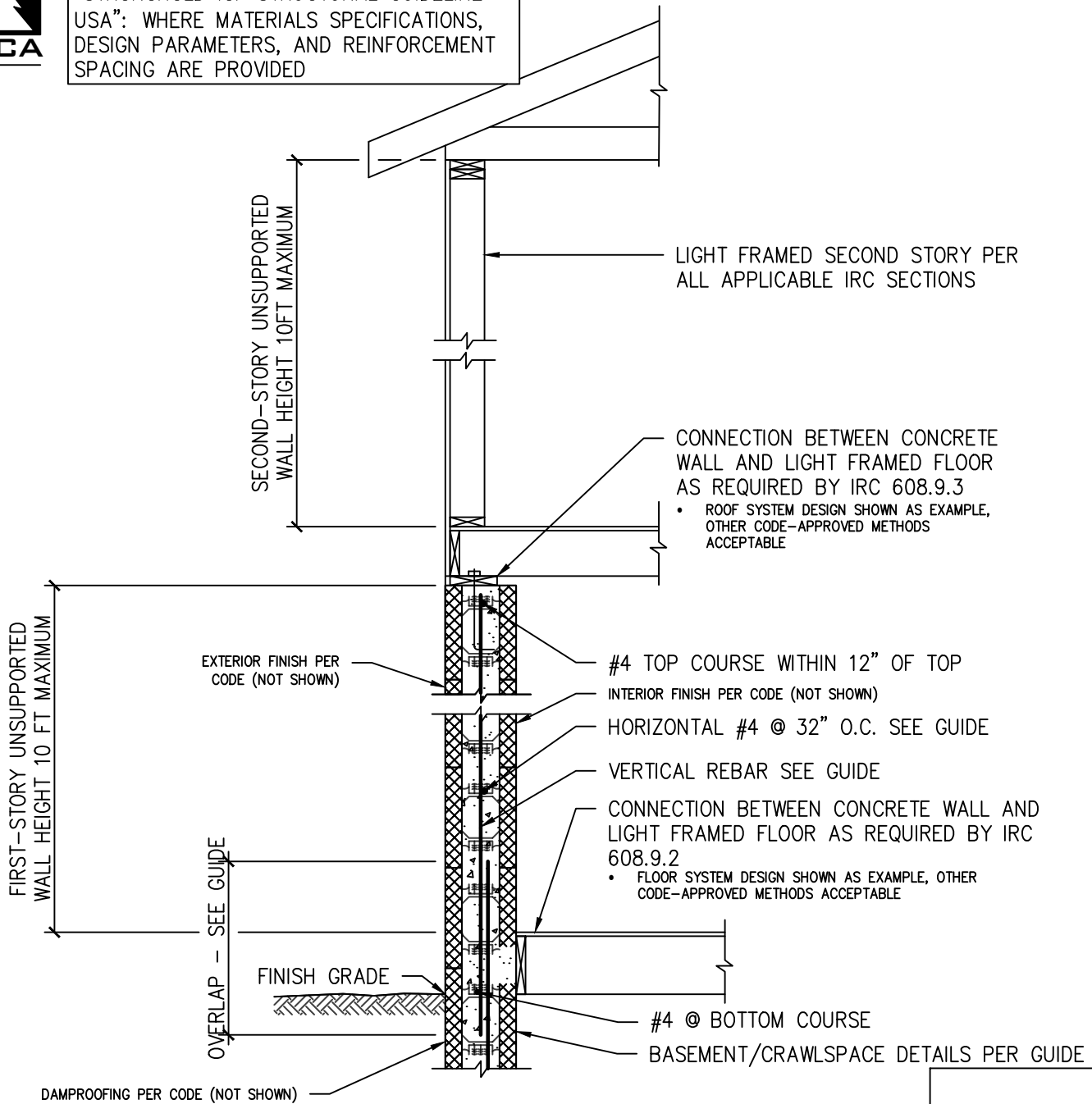
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ABOVE-GRADE CONCRETE WALL FIRST STORY, LIGHT FRAMED SECOND STORY (TYP. 4", 6", 8" & 10" WALLS)

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CONNECTION BETWEEN CONCRETE WALL AND LIGHT FRAMED ROOF AS REQUIRED BY IRC 608.9.3

- ROOF SYSTEM DESIGN SHOWN AS EXAMPLE, OTHER CODE-APPROVED METHODS ACCEPTABLE

SECOND-STORY UNSUPPORTED WALL HEIGHT 10 FT MAXIMUM

CONNECTION BETWEEN CONCRETE WALL AND LIGHT FRAMED FLOOR AS REQUIRED BY IRC 608.9.3

- ROOF SYSTEM DESIGN SHOWN AS EXAMPLE, OTHER CODE-APPROVED METHODS ACCEPTABLE

FIRST-STORY UNSUPPORTED WALL HEIGHT 10 FT MAXIMUM

EXTERIOR FINISH PER CODE (NOT SHOWN)

#4 TOP COURSE WITHIN 12" OF TOP

INTERIOR FINISH PER CODE (NOT SHOWN)

HORIZONTAL #4 @ 32" O.C. SEE GUIDE

VERTICAL REBAR SEE GUIDE

CONNECTION BETWEEN CONCRETE WALL AND LIGHT FRAMED FLOOR AS REQUIRED BY IRC 608.9.2

- FLOOR SYSTEM DESIGN SHOWN AS EXAMPLE, OTHER CODE-APPROVED METHODS ACCEPTABLE

OVERLAP - SEE GUIDE

FINISH GRADE

#4 @ BOTTOM COURSE

BASEMENT/CRAWLSPACE DETAILS PER GUIDE

DAMPROOFING PER CODE (NOT SHOWN)

ABOVE-GRADE CONCRETE WALL TWO STORY
(TYP. 4", 6", 8" & 10" WALLS)

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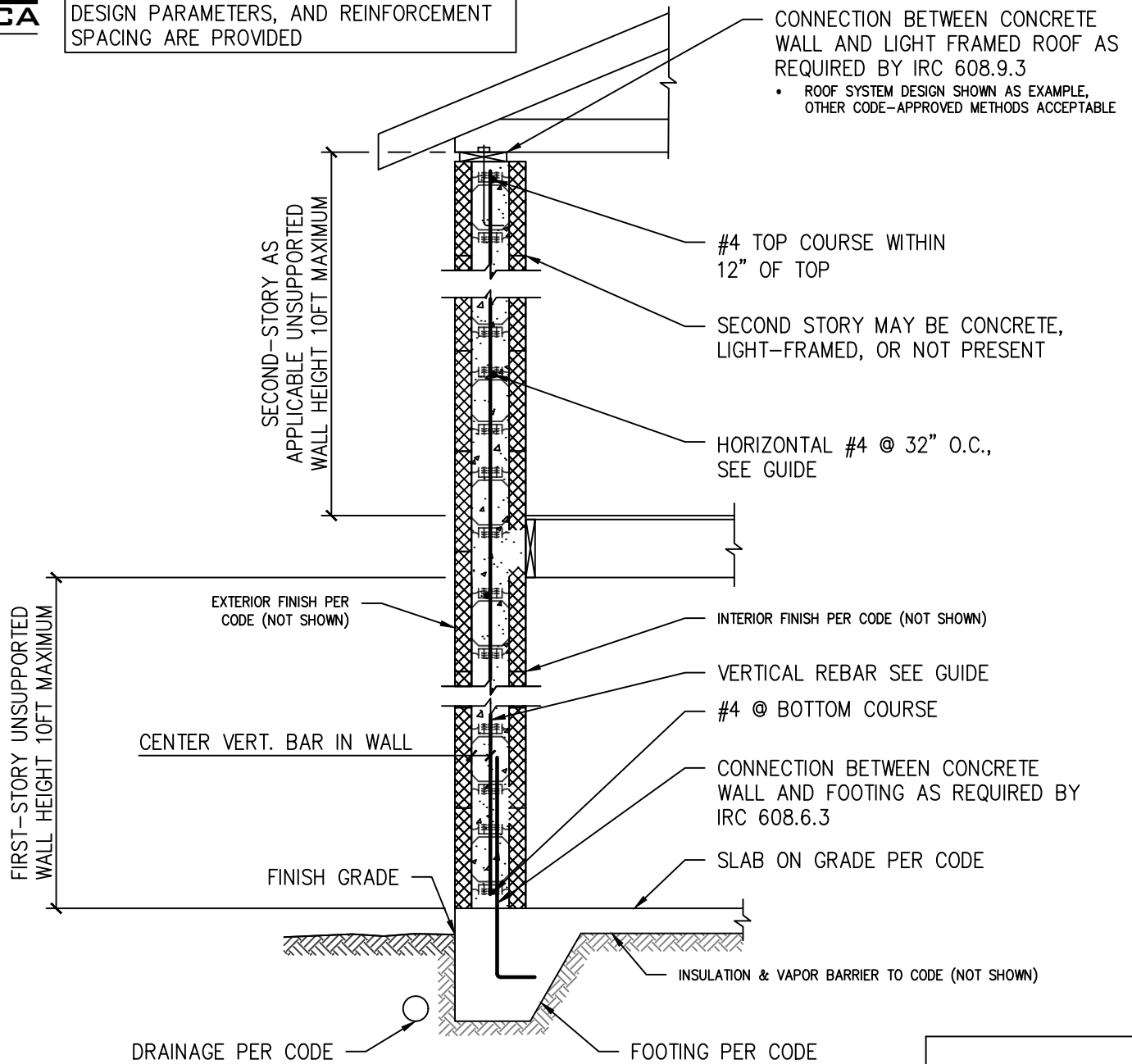
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DRAWING NO.		DES	CB
0068-012		DRN	LI
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ABOVE-GRADE CONCRETE WALL SUPPORTED ON MONOLITHIC SLAB-ON-GRADE FOOTING (TYP. 4", 6", 8" & 10" WALLS)

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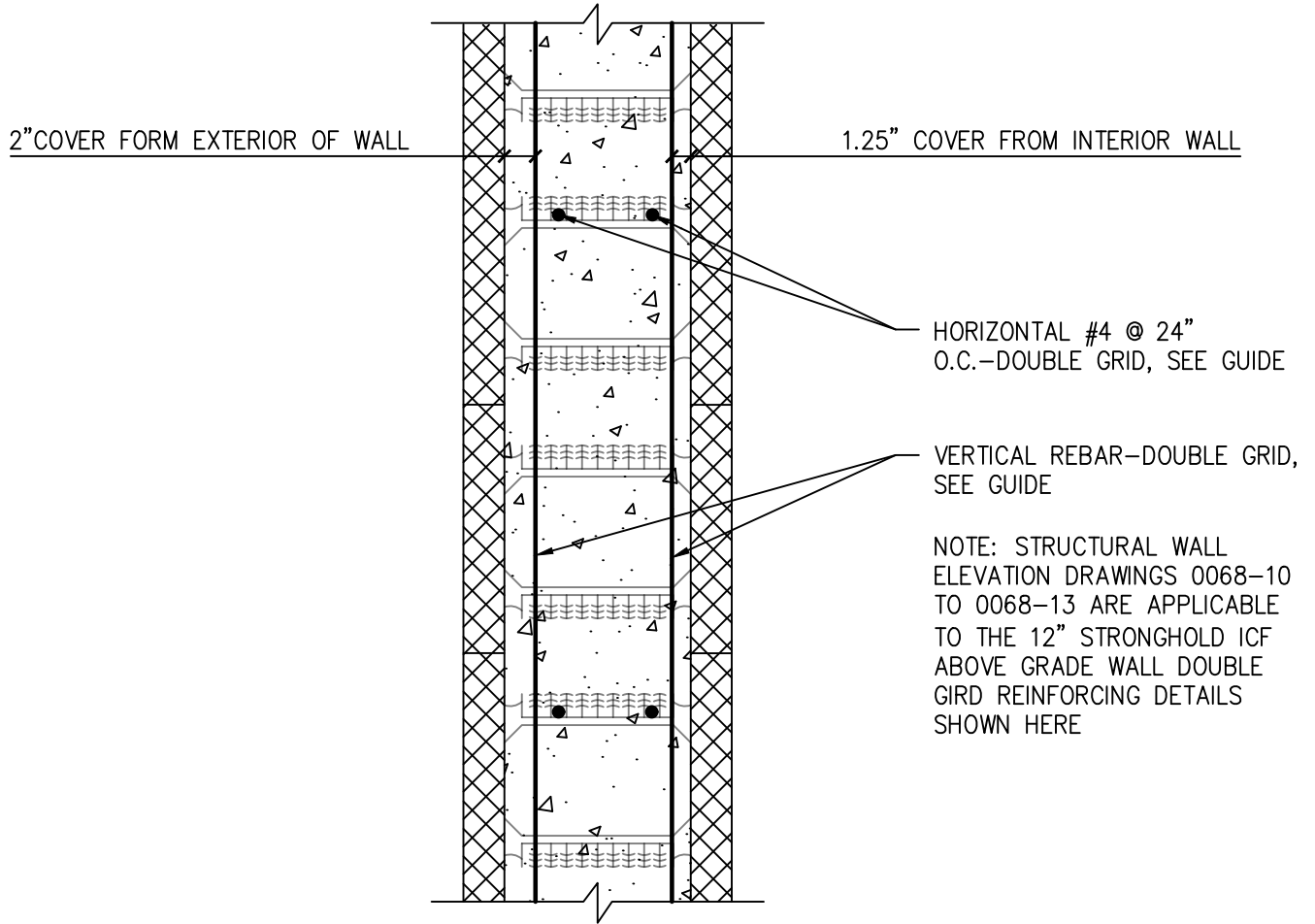
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12" STRONGHOLD ICF
ABOVE-GRADE CONCRETE
WALL DETAIL (TYP.)

NOT-TO-SCALE



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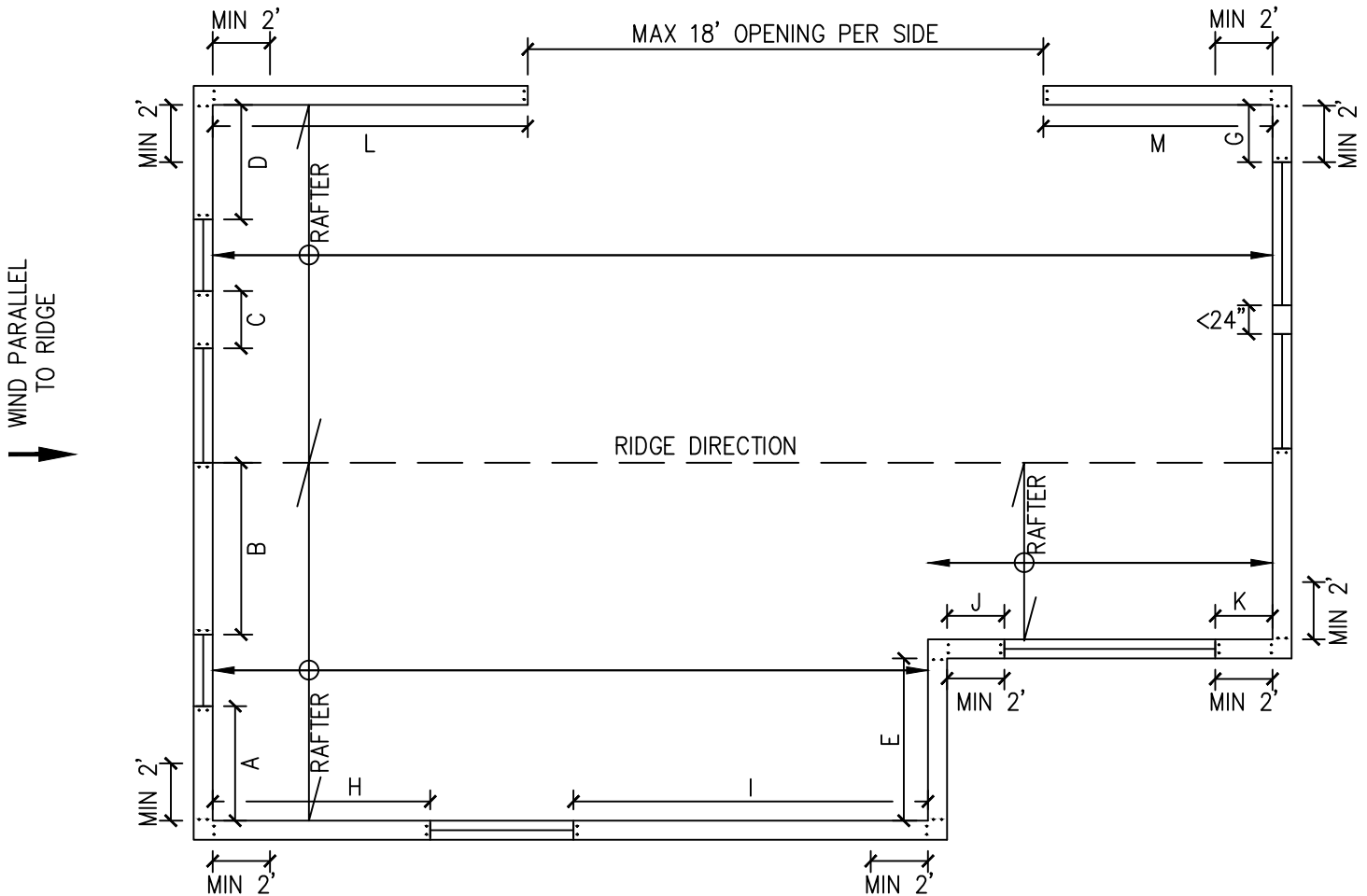
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NOTE: BUILDING PLAN DIMENSIONS, SHAPE AND SOLID WALL LENGTHS SHOWN ARE FOR REFERENCE AND GUIDANCE ONLY. ACTUAL BUILDING PLAN DIMENSIONS, SHAPE AND SOLID WALL LENGTHS ACCORDING TO BUILDING DESIGNER PLANS.

WIND PERPENDICULAR TO RIDGE



ENDWALL SOLID WALL (SW) LENGTH SAMPLE CALCULATION

WIND PERPENDICULAR TO RIDGE

LEFT SIDE: SW LENGTH = A + B + C + D = APPLICABLE LENGTH FROM TABLE 4 OR 5

RIGHT SIDE: SW LENGTH = E + F + G = APPLICABLE LENGTH FROM TABLE 4 OR 5

SIDEWALL SOLID WALL (SW) LENGTH SAMPLE CALCULATION

WIND PARALLEL TO RIDGE

BOTTOM SIDE: SW LENGTH = H + I + J + K = APPLICABLE LENGTH FROM TABLE 6

TOP SIDE: SW LENGTH = L + M = APPLICABLE LENGTH FROM TABLE 6

END SOLID WALL LENGTHS SHALL BE A MIN. OF 2FT AT EACH CHANGE IN WALL DIRECTION.



TYP. STRONGHOLD ICF SOLID WALL BUILDING PLAN REFERENCE

NOT-TO-SCALE

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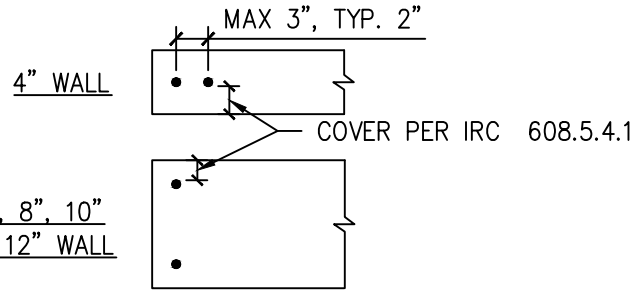
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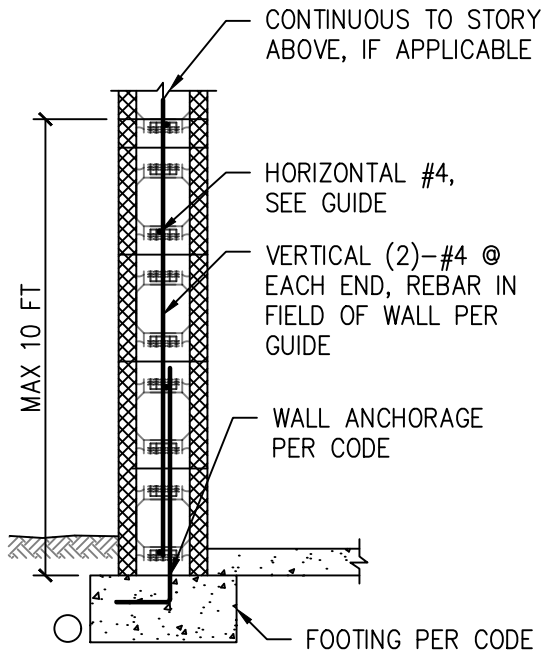
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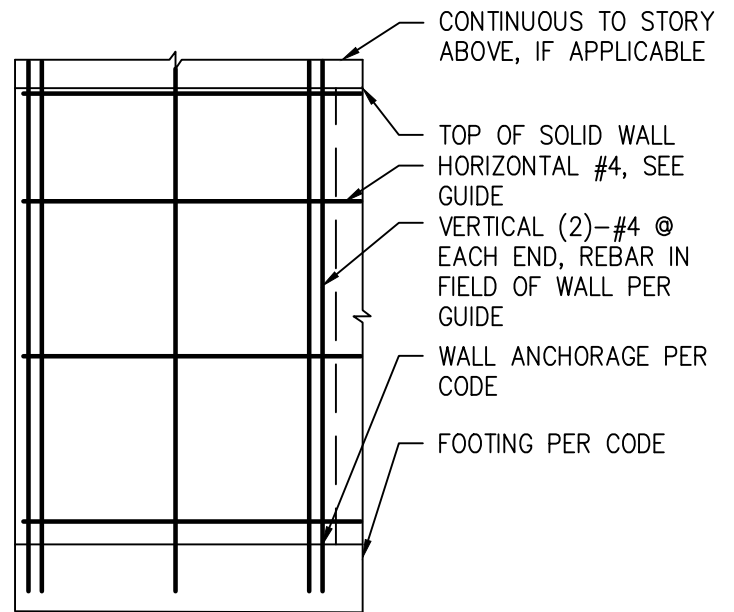
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TYP. #4 REBAR LAYOUT @ ENDS
TOP VIEW



1 TYP. SOLID WALL SECTION
NOT-TO-SCALE



2 TYP. SOLID WALL ELEV. SECTION
NOT-TO-SCALE

TYP. STRONGHOLD ICF SOLID WALL DETAILS
NOT-TO-SCALE



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Preparation of Stronghold ICF Lintels in Wall Openings

Concrete and steel reinforcing materials specifications and installation of lintels are to be consistent with the details of the wall section where the opening occurs.

Development length and lap splices in horizontal reinforcing bars in lintels are to comply with IRC Table R608.5.4(1). The minimum development length of 60 ksi #4 bar is 23-inches, #5 bar is 28-inches, and of #6 bar is 34-inches. The minimum overlap of #4 bars is 30-inches, of #5 bars is 38-inches, and #6 bar is 45-inches. The maximum gap between #4, #5 and #6 splice bars is 6-inches. Refer to Code for overlap and maximum gap of other bar types.

Continuous horizontal reinforcing bars may be used as lintel reinforcing bars when positioned according to the lintel diagrams in this guide.

Lintels in non-load-bearing walls may alternately be prepared following IRC Table 608.8(9).

Notes to Stronghold ICF Lintel Tables 11 - 14

- 1) Table is to be used in conjunction with "Stronghold ICF Structural Guideline" and drawing 0068-017 prepared by BOCA Engineering Co. which contains materials specifications, building conditions, design limitations and installation details.
- 2) Table values are based on uniform loading. Design by professional required for lintels supporting point loads.
- 3) Deflection criteria is $L/240$ where L is the clear span of the lintel in inches or $1/2"$, whichever is less.
- 4) Linear interpolation is not permitted.
- 5) Stirrups shall be fabricated from reinforcing bars having the same yield strength as that used for the main longitudinal reinforcement.
- 6) Allowable clear span without stirrups applicable to all lintels of the same depth, D. Top and bottom reinforcement for all lintels without stirrups shall be not less than the least amount of reinforcement required for a lintel of the same depth with stirrups. All other spans require stirrups spaced at not more than $d/2$.
- 7) Center distance, A, is the center portion of the clear span where stirrups are not required. This is applicable to all longitudinal bar sizes.
- 8) SR - Stirrups required. Indicated stirrups are required in all lintels of this depth, thickness and loading condition at a minimum spacing of $d/2$.
- 9) Minimum concrete 28-day compressive strength of 2500 psi; reinforcing steel bar yield strength of 60,000 psi.

LINTEL REINFORCING TABLES AND DIAGRAMS BEGIN NEXT PAGE



TABLE 11: STRONGHOLD ICF MAXIMUM ALLOWABLE CLEAR SPAN FOR LINTELS SUPPORTING LIGHT-FRAME ROOF ONLY

LINTEL DEPTH, D (INCHES)	NUMBER OF BARS AND BAR SIZE IN TOP AND BOTTOM OF LINTEL	MINIMUM NOMINAL LINTEL THICKNESS (INCHES)														
		4"			6"			8"			10"			12"		
		MAXIMUM GROUND SNOW LOAD (PSF)														
		30	50	70	30	50	70	30	50	70	30	50	70	30	50	70
8"	SPAN WITHOUT STIRRUPS	SR	SR	SR	3' 0"	2' 0"	SR	3' 9"	2' 9"	2' 0"	4' 9"	3' 3"	2' 6"	5' 6"	4' 0"	3' 0"
	1-#4	5' 6"	4' 9"	4' 0"	5' 9"	4' 9"	4' 3"	5' 9"	4' 9"	4' 3"	5' 9"	4' 9"	4' 3"	5' 6"	4' 9"	4' 3"
	1-#5	6' 9"	5' 6"	5' 0"	6' 9"	5' 9"	5' 0"	7' 0"	5' 9"	5' 3"	7' 0"	5' 9"	5' 3"	7' 0"	5' 9"	5' 3"
	2-#4 1-#6	-	-	-	7' 9"	6' 6"	5' 9"	7' 9"	6' 6"	5' 9"	7' 9"	6' 6"	5' 9"	7' 9"	6' 6"	5' 9"
	2-#5	-	-	-	-	-	-	9' 3"	7' 9"	7' 0"	9' 6"	8' 0"	7' 0"	9' 6"	8' 0"	7' 0"
	2-#6	-	-	-	-	-	-	-	-	-	10' 9"	9' 0"	8' 0"	11' 0"	9' 3"	8' 3"
	CENTRE DISTANCE "A"	1' 0"	0' 0"	0' 0"	1' 6"	1' 0"	0' 0"	1' 9"	1' 3"	1' 0"	2' 3"	1' 6"	1' 3"	2' 9"	2' 0"	1' 6"
12"	SPAN WITHOUT STIRRUPS	3' 3"	2' 3"	1' 9"	5' 0"	3' 6"	2' 9"	6' 6"	4' 9"	3' 6"	8' 0"	5' 9"	4' 6"	9' 3"	6' 9"	5' 3"
	1-#4	7' 6"	6' 3"	5' 6"	7' 6"	6' 3"	5' 6"	7' 6"	6' 3"	5' 6"	7' 3"	6' 3"	5' 6"	7' 3"	6' 3"	5' 6"
	1-#5	9' 3"	7' 9"	6' 9"	9' 3"	7' 9"	6' 9"	9' 3"	7' 9"	6' 9"	9' 3"	7' 9"	6' 9"	9' 0"	7' 9"	6' 9"
	2-#4 1-#6	10' 3"	8' 6"	7' 6"	10' 3"	8' 9"	7' 9"	10' 3"	8' 9"	7' 9"	10' 3"	8' 9"	7' 9"	10' 3"	8' 9"	7' 9"
	2-#5	-	-	-	12' 6"	10' 6"	9' 3"	12' 9"	10' 9"	9' 6"	12' 9"	10' 9"	9' 6"	12' 6"	10' 9"	9' 6"
	2-#6	-	-	-	14' 3"	12' 3"	10' 9"	14' 9"	12' 6"	11' 0"	14' 9"	12' 6"	11' 0"	14' 9"	12' 6"	11' 3"
	CENTRE DISTANCE "A"	1' 6"	1' 0"	0' 0"	2' 6"	1' 9"	1' 3"	3' 3"	2' 3"	1' 9"	4' 0"	2' 9"	2' 3"	4' 6"	3' 3"	2' 6"
16"	SPAN WITHOUT STIRRUPS	4' 9"	3' 3"	2' 6"	7' 0"	5' 0"	3' 9"	9' 0"	6' 6"	5' 0"	10' 9"	8' 0"	6' 3"	12' 6"	9' 3"	7' 3"
	1-#4	9' 0"	7' 6"	6' 9"	9' 0"	7' 6"	6' 9"	8' 9"	7' 6"	6' 6"	8' 9"	7' 6"	6' 6"	8' 6"	7' 3"	6' 6"
	1-#5	11' 0"	9' 3"	8' 3"	11' 0"	9' 3"	8' 3"	11' 0"	9' 3"	8' 3"	10' 9"	9' 3"	8' 3"	10' 6"	9' 0"	8' 0"
	2-#4 1-#6	12' 6"	10' 6"	9' 3"	12' 6"	10' 6"	9' 3"	12' 3"	10' 6"	9' 3"	12' 3"	10' 6"	9' 3"	12' 0"	10' 3"	9' 3"
	2-#5	15' 0"	12' 6"	11' 0"	15' 3"	12' 9"	11' 3"	15' 3"	13' 0"	11' 6"	15' 0"	12' 9"	11' 6"	14' 9"	12' 9"	11' 3"
	2-#6	-	-	-	17' 6"	15' 0"	13' 3"	17' 9"	15' 0"	13' 3"	17' 9"	15' 0"	13' 6"	17' 6"	15' 0"	13' 6"
	CENTRE DISTANCE "A"	2' 3"	1' 6"	1' 3"	3' 6"	2' 6"	1' 9"	4' 6"	3' 3"	2' 6"	5' 3"	4' 0"	3' 0"	6' 3"	4' 6"	3' 6"
20"	SPAN WITHOUT STIRRUPS	6' 0"	4' 3"	3' 3"	8' 9"	6' 3"	5' 0"	11' 3"	8' 3"	6' 6"	13' 6"	10' 0"	8' 0"	15' 9"	11' 9"	9' 3"
	1-#4	10' 3"	8' 9"	7' 6"	10' 0"	8' 6"	7' 6"	10' 0"	8' 6"	7' 6"	9' 9"	8' 3"	7' 6"	9' 6"	8' 3"	7' 3"
	1-#5	12' 6"	10' 9"	9' 6"	12' 6"	10' 6"	9' 3"	12' 3"	10' 6"	9' 3"	12' 0"	10' 3"	9' 3"	11' 9"	10' 3"	9' 3"
	2-#4 1-#6	14' 3"	12' 0"	10' 6"	14' 0"	12' 0"	10' 6"	14' 0"	12' 0"	10' 6"	13' 9"	11' 9"	10' 6"	13' 6"	11' 6"	10' 3"
	2-#5	17' 3"	14' 6"	12' 9"	17' 3"	14' 9"	13' 0"	17' 3"	14' 9"	13' 0"	17' 0"	14' 6"	13' 0"	16' 9"	14' 6"	12' 9"
	2-#6	18' 0"	16' 9"	15' 0"	18' 0"	17' 3"	15' 3"	18' 0"	17' 3"	15' 3"	18' 0"	17' 3"	15' 3"	18' 0"	17' 0"	15' 3"
	CENTRE DISTANCE "A"	3' 0"	2' 0"	1' 6"	4' 3"	3' 0"	2' 6"	5' 6"	4' 0"	3' 3"	6' 9"	5' 0"	4' 0"	7' 9"	5' 9"	4' 6"
24"	SPAN WITHOUT STIRRUPS	7' 3"	5' 3"	4' 0"	10' 6"	7' 9"	6' 0"	13' 6"	10' 0"	7' 9"	16' 0"	12' 0"	9' 6"	18' 6"	14' 0"	11' 3"
	1-#4	11' 3"	9' 6"	8' 6"	11' 0"	9' 6"	8' 3"	10' 9"	9' 3"	8' 3"	10' 6"	9' 3"	8' 3"	10' 3"	9' 0"	8' 0"
	1-#5	14' 0"	11' 9"	10' 6"	13' 9"	11' 9"	10' 3"	13' 6"	11' 6"	10' 3"	13' 3"	11' 3"	10' 3"	13' 0"	11' 3"	10' 0"
	2-#4 1-#6	15' 9"	13' 3"	11' 9"	15' 6"	13' 3"	11' 9"	15' 3"	13' 0"	11' 9"	15' 0"	13' 0"	11' 6"	14' 9"	12' 9"	11' 6"
	2-#5	18' 0"	16' 3"	14' 6"	18' 0"	16' 3"	14' 6"	18' 0"	16' 3"	14' 6"	18' 0"	16' 0"	14' 3"	18' 0"	15' 9"	14' 0"
	2-#6	18' 0"	18' 0"	16' 9"	18' 0"	18' 0"	17' 0"	18' 0"	18' 0"	17' 0"	18' 0"	18' 0"	16' 9"	18' 0"	18' 0"	16' 9"
	CENTRE DISTANCE "A"	3' 6"	2' 6"	2' 0"	5' 3"	3' 9"	3' 0"	6' 9"	5' 0"	3' 9"	8' 0"	6' 0"	4' 9"	9' 3"	7' 0"	5' 6"

SHADED AREA SPANS ARE IDENTIFIED AS "DR" (DESIGN REQUIRED) IN IRC TABLES R608.8(2) TO R608.8(5). SPANS PROVIDED ARE DETERMINED ACCORDING TO LIMITS OUTLINED IN STRUCTURAL GUIDE AND STRENGTH DESIGN IN ACCORDANCE TO WITH ACI 318-14.

See Table Notes on page 28 of guide.



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TABLE 12: STRONGHOLD ICF MAXIMUM ALLOWABLE CLEAR SPAN FOR LINTELS SUPPORTING SECOND STOREY ICF WALL & LIGHT-FRAME ROOF

LINTEL DEPTH, D (INCHES)	NUMBER OF BARS AND BAR SIZE IN TOP AND BOTTOM OF LINTEL	MINIMUM NOMINAL LINTEL THICKNESS (INCHES)														
		4"			6"			8"			10"			12"		
		MAXIMUM GROUND SNOW LOAD (PSF)														
		30	50	70	30	50	70	30	50	70	30	50	70	30	50	70
8"	SPAN WITHOUT STIRRUPS	SR	SR	SR	SR	SR	SR	SR	SR	SR	SR	SR	SR	SR	SR	SR
	1-#4	3' 3"	3' 0"	3' 0"	3' 3"	3' 0"	2' 9"	3' 0"	3' 0"	2' 9"	3' 0"	2' 9"	2' 9"	3' 0"	2' 9"	2' 6"
	1-#5	4' 0"	3' 9"	3' 6"	4' 0"	3' 9"	3' 6"	3' 9"	3' 6"	3' 6"	3' 9"	3' 6"	3' 3"	3' 6"	3' 6"	3' 3"
	2-#4 1-#6	-	-	-	4' 6"	4' 0"	4' 0"	4' 3"	4' 0"	3' 9"	4' 3"	4' 0"	3' 9"	4' 0"	3' 9"	3' 9"
	2-#5	-	-	-	-	-	-	5' 3"	4' 9"	4' 6"	5' 0"	4' 9"	4' 6"	5' 0"	4' 9"	4' 6"
	2-#6	-	-	-	-	-	-	-	-	-	5' 9"	5' 6"	5' 3"	5' 9"	5' 6"	5' 3"
	CENTRE DISTANCE "A"	0' 0"	0' 0"	0' 0"	0' 0"	0' 0"	0' 0"	0' 0"	0' 0"	0' 0"	0' 0"	0' 0"	0' 0"	0' 0"	0' 0"	0' 0"
12"	SPAN WITHOUT STIRRUPS	SR	SR	SR	SR	SR	SR	2' 0"	SR	SR	2' 3"	2' 0"	SR	2' 6"	2' 3"	2' 0"
	1-#4	4' 6"	4' 3"	4' 0"	4' 3"	4' 0"	3' 9"	4' 3"	4' 0"	3' 9"	4' 0"	3' 9"	3' 6"	3' 9"	3' 9"	3' 6"
	1-#5	5' 6"	5' 3"	4' 9"	5' 6"	5' 0"	4' 9"	5' 3"	4' 9"	4' 6"	5' 0"	4' 9"	4' 6"	4' 9"	4' 6"	4' 3"
	2-#4 1-#6	6' 3"	5' 9"	5' 6"	6' 0"	5' 9"	5' 3"	5' 9"	5' 6"	5' 3"	5' 6"	5' 3"	5' 0"	5' 6"	5' 3"	5' 0"
	2-#5	-	-	-	7' 3"	6' 9"	6' 6"	7' 3"	6' 9"	6' 3"	7' 0"	6' 6"	6' 3"	6' 9"	6' 3"	6' 0"
	2-#6	-	-	-	8' 6"	7' 9"	7' 6"	8' 3"	7' 9"	7' 6"	8' 0"	7' 9"	7' 3"	7' 9"	7' 6"	7' 0"
	CENTRE DISTANCE "A"	0' 0"	0' 0"	0' 0"	0' 0"	0' 0"	0' 0"	1' 0"	0' 0"	0' 0"	1' 0"	1' 0"	0' 0"	1' 3"	1' 0"	1' 0"
16"	SPAN WITHOUT STIRRUPS	2' 0"	2' 0"	2' 0"	2' 3"	2' 0"	2' 0"	2' 9"	2' 6"	2' 3"	3' 3"	3' 0"	2' 9"	3' 9"	3' 3"	3' 0"
	1-#4	5' 6"	5' 0"	4' 9"	5' 3"	5' 0"	4' 6"	5' 0"	4' 9"	4' 6"	4' 9"	4' 6"	4' 3"	4' 6"	4' 3"	4' 3"
	1-#5	6' 9"	6' 3"	6' 0"	6' 6"	6' 0"	5' 9"	6' 3"	5' 9"	5' 6"	6' 0"	5' 9"	5' 3"	5' 9"	5' 6"	5' 3"
	2-#4 1-#6	7' 6"	7' 0"	6' 9"	7' 3"	6' 9"	6' 6"	7' 0"	6' 6"	6' 3"	6' 9"	6' 6"	6' 0"	6' 6"	6' 3"	6' 0"
	2-#5	9' 3"	8' 6"	8' 0"	9' 0"	8' 6"	8' 0"	8' 9"	8' 3"	7' 9"	8' 3"	8' 0"	7' 6"	8' 0"	7' 9"	7' 3"
	2-#6	-	-	-	10' 6"	9' 9"	9' 3"	10' 0"	9' 6"	9' 0"	9' 9"	9' 3"	8' 9"	9' 6"	9' 0"	8' 6"
	CENTRE DISTANCE "A"	0' 0"	0' 0"	0' 0"	1' 0"	1' 0"	0' 0"	1' 3"	1' 3"	1' 0"	1' 6"	1' 6"	1' 3"	1' 9"	1' 6"	1' 6"
20"	SPAN WITHOUT STIRRUPS	2' 3"	2' 0"	2' 0"	3' 0"	2' 9"	2' 6"	3' 9"	3' 3"	3' 0"	4' 3"	3' 9"	3' 6"	4' 9"	4' 3"	4' 0"
	1-#4	6' 3"	5' 9"	5' 6"	6' 0"	5' 6"	5' 3"	5' 9"	5' 3"	5' 0"	5' 6"	5' 3"	5' 0"	5' 3"	5' 0"	4' 9"
	1-#5	7' 9"	7' 3"	6' 9"	7' 6"	7' 0"	6' 6"	7' 0"	6' 9"	6' 3"	6' 9"	6' 6"	6' 0"	6' 6"	6' 3"	6' 0"
	2-#4 1-#6	8' 9"	8' 3"	7' 9"	8' 6"	7' 9"	7' 6"	8' 0"	7' 6"	7' 3"	7' 9"	7' 3"	7' 0"	7' 6"	7' 0"	6' 9"
	2-#5	10' 9"	10' 0"	9' 3"	10' 3"	9' 9"	9' 0"	10' 0"	9' 3"	8' 9"	9' 6"	9' 0"	8' 6"	9' 3"	8' 9"	8' 3"
	2-#6	12' 3"	11' 6"	10' 6"	12' 0"	11' 3"	10' 9"	11' 9"	11' 0"	10' 6"	11' 3"	10' 9"	10' 3"	10' 9"	10' 3"	9' 9"
	CENTRE DISTANCE "A"	1' 0"	1' 0"	0' 0"	1' 6"	1' 3"	1' 3"	1' 9"	1' 6"	1' 6"	2' 0"	1' 9"	1' 9"	2' 3"	2' 0"	2' 0"
24"	SPAN WITHOUT STIRRUPS	2' 9"	2' 6"	2' 0"	3' 9"	3' 3"	3' 0"	4' 6"	4' 0"	3' 9"	5' 3"	4' 9"	4' 3"	5' 9"	5' 3"	4' 9"
	1-#4	7' 0"	6' 6"	6' 0"	6' 6"	6' 3"	5' 9"	6' 3"	6' 0"	5' 9"	6' 0"	5' 9"	5' 6"	5' 9"	5' 6"	5' 3"
	1-#5	8' 9"	8' 0"	7' 6"	8' 3"	7' 9"	7' 3"	7' 9"	7' 6"	7' 0"	7' 6"	7' 0"	6' 9"	7' 3"	6' 9"	6' 6"
	2-#4 1-#6	9' 9"	9' 0"	8' 6"	9' 3"	8' 9"	8' 3"	9' 0"	8' 6"	8' 0"	8' 6"	8' 0"	7' 9"	8' 3"	7' 9"	7' 6"
	2-#5	12' 0"	11' 0"	10' 6"	11' 6"	10' 9"	10' 3"	11' 0"	10' 6"	9' 9"	10' 6"	10' 0"	9' 6"	10' 3"	9' 9"	9' 3"
	2-#6	14' 0"	12' 9"	11' 3"	13' 6"	12' 9"	12' 0"	13' 0"	12' 3"	11' 6"	12' 6"	11' 9"	11' 3"	12' 0"	11' 6"	11' 0"
	CENTRE DISTANCE "A"	1' 3"	1' 3"	1' 0"	1' 9"	1' 6"	1' 6"	2' 3"	2' 0"	1' 9"	2' 6"	2' 3"	2' 0"	2' 9"	2' 6"	2' 3"

SHADED AREA SPANS ARE IDENTIFIED AS "DR" (DESIGN REQUIRED) IN IRC TABLES R608.8(2) TO R608.8(5). SPANS PROVIDED ARE DETERMINED ACCORDING TO LIMITS OUTLINED IN STRUCTURAL GUIDE AND STRENGTH DESIGN IN ACCORDANCE TO WITH ACI 318-14.

See Table Notes on page 28 of guide.



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TABLE 13: STRONGHOLD ICF MAXIMUM ALLOWABLE CLEAR SPAN FOR LINTELS SUPPORTING SINGLE STOREY LIGHT-FRAME WALL & LIGHT-FRAME

LINTEL DEPTH, D (INCHES)	NUMBER OF BARS AND BAR SIZE IN TOP AND BOTTOM OF LINTEL	MINIMUM NOMINAL LINTEL THICKNESS (INCHES)														
		4"			6"			8"			10"			12"		
		MAXIMUM GROUND SNOW LOAD (PSF)														
		30	50	70	30	50	70	30	50	70	30	50	70	30	50	70
8"	SPAN WITHOUT STIRRUPS	SR	SR	SR	SR	SR	SR	SR	SR	SR	2' 0"	SR	SR	SR	2' 0"	SR
	1-#4	3' 9"	3' 3"	3' 0"	3' 9"	3' 6"	3' 3"	3' 9"	3' 6"	3' 3"	3' 9"	3' 6"	3' 3"	3' 9"	3' 6"	3' 3"
	1-#5	4' 3"	4' 0"	3' 9"	4' 6"	4' 3"	3' 9"	4' 6"	4' 3"	4' 0"	4' 6"	4' 3"	4' 0"	4' 9"	4' 3"	4' 0"
	2-#4 1-#6	-	-	-	5' 0"	4' 6"	4' 3"	5' 3"	4' 9"	4' 6"	5' 3"	4' 9"	4' 6"	5' 3"	4' 9"	4' 6"
	2-#5	-	-	-	-	-	-	6' 3"	5' 9"	5' 3"	6' 3"	5' 9"	5' 6"	6' 3"	5' 9"	5' 6"
	2-#6	-	-	-	-	-	-	-	-	-	7' 3"	6' 9"	6' 3"	7' 3"	6' 9"	6' 3"
	CENTRE DISTANCE "A"	0' 0"	0' 0"	0' 0"	0' 0"	0' 0"	0' 0"	0' 0"	0' 0"	0' 0"	0' 0"	1' 0"	0' 0"	0' 0"	1' 3"	1' 0"
12"	SPAN WITHOUT STIRRUPS	SR	SR	SR	2' 3"	SR	SR	2' 9"	2' 6"	2' 0"	3' 6"	3' 0"	2' 6"	4' 3"	3' 6"	3' 3"
	1-#4	5' 0"	4' 6"	4' 3"	5' 0"	4' 6"	4' 3"	5' 0"	4' 6"	4' 3"	5' 0"	4' 6"	4' 3"	5' 0"	4' 6"	4' 3"
	1-#5	6' 0"	5' 6"	5' 3"	6' 3"	5' 9"	5' 3"	6' 3"	5' 9"	5' 3"	6' 3"	5' 9"	5' 3"	6' 3"	5' 9"	5' 3"
	2-#4 1-#6	6' 9"	6' 3"	5' 9"	7' 0"	6' 3"	6' 0"	7' 0"	6' 6"	6' 0"	7' 0"	6' 6"	6' 0"	7' 0"	6' 6"	6' 0"
	2-#5	-	-	-	8' 3"	7' 9"	7' 3"	8' 6"	7' 9"	7' 3"	8' 6"	7' 9"	7' 3"	8' 6"	8' 0"	7' 3"
	2-#6	-	-	-	9' 6"	8' 9"	8' 3"	9' 9"	9' 0"	8' 6"	10' 0"	9' 3"	8' 6"	10' 0"	9' 3"	8' 9"
	CENTRE DISTANCE "A"	0' 0"	0' 0"	0' 0"	0' 0"	0' 0"	0' 0"	1' 3"	1' 3"	1' 0"	1' 9"	1' 6"	1' 3"	2' 0"	1' 9"	1' 6"
16"	SPAN WITHOUT STIRRUPS	2' 0"	2' 0"	2' 0"	3' 0"	2' 6"	2' 3"	4' 0"	3' 6"	3' 0"	5' 0"	4' 3"	3' 9"	6' 0"	5' 0"	4' 6"
	1-#4	6' 0"	5' 6"	5' 0"	6' 0"	5' 6"	5' 0"	6' 0"	5' 6"	5' 0"	6' 0"	5' 6"	5' 0"	6' 0"	5' 6"	5' 0"
	1-#5	7' 3"	6' 9"	6' 3"	7' 6"	6' 9"	6' 3"	7' 3"	6' 9"	6' 3"	7' 3"	6' 9"	6' 3"	7' 3"	6' 9"	6' 3"
	2-#4 1-#6	8' 3"	7' 6"	7' 0"	8' 3"	7' 9"	7' 3"	8' 3"	7' 9"	7' 3"	8' 3"	7' 9"	7' 3"	8' 3"	7' 9"	7' 3"
	2-#5	10' 0"	9' 3"	8' 6"	10' 3"	9' 3"	8' 9"	10' 3"	9' 6"	8' 9"	10' 3"	9' 6"	8' 9"	10' 3"	9' 6"	8' 9"
	2-#6	-	-	-	11' 9"	11' 0"	10' 3"	12' 0"	11' 0"	10' 3"	12' 0"	11' 3"	10' 6"	12' 0"	11' 3"	10' 6"
	CENTRE DISTANCE "A"	1' 0"	0' 0"	0' 0"	1' 6"	1' 3"	1' 0"	2' 0"	1' 9"	1' 6"	2' 6"	2' 0"	1' 9"	3' 0"	2' 6"	2' 3"
20"	SPAN WITHOUT STIRRUPS	2' 9"	2' 3"	2' 0"	4' 0"	3' 3"	3' 0"	5' 3"	4' 6"	3' 9"	6' 6"	5' 6"	4' 9"	7' 6"	6' 6"	5' 9"
	1-#4	6' 9"	6' 3"	5' 9"	6' 9"	6' 3"	5' 9"	6' 9"	6' 3"	5' 9"	6' 9"	6' 3"	5' 9"	6' 9"	6' 3"	5' 9"
	1-#5	8' 6"	7' 9"	7' 3"	8' 6"	7' 9"	7' 3"	8' 6"	7' 9"	7' 3"	8' 3"	7' 9"	7' 3"	8' 3"	7' 9"	7' 3"
	2-#4 1-#6	9' 6"	8' 9"	8' 0"	9' 6"	8' 9"	8' 3"	9' 6"	8' 9"	8' 3"	9' 6"	8' 9"	8' 3"	9' 6"	8' 9"	8' 0"
	2-#5	11' 6"	10' 6"	10' 0"	11' 9"	10' 9"	10' 0"	11' 9"	10' 9"	10' 0"	11' 9"	10' 9"	10' 0"	11' 6"	10' 9"	10' 0"
	2-#6	13' 3"	12' 3"	11' 6"	13' 9"	12' 6"	11' 9"	13' 9"	12' 9"	12' 0"	13' 9"	12' 9"	12' 0"	13' 9"	12' 9"	12' 0"
	CENTRE DISTANCE "A"	1' 3"	1' 0"	1' 0"	2' 0"	1' 6"	1' 6"	2' 6"	2' 3"	1' 9"	3' 3"	2' 9"	2' 3"	3' 9"	3' 3"	2' 9"
24"	SPAN WITHOUT STIRRUPS	3' 3"	2' 9"	2' 6"	4' 9"	4' 0"	3' 6"	6' 3"	5' 6"	4' 9"	7' 9"	6' 9"	5' 9"	9' 3"	8' 0"	7' 0"
	1-#4	7' 6"	7' 0"	6' 6"	7' 6"	7' 0"	6' 6"	7' 6"	7' 0"	6' 6"	7' 6"	6' 9"	6' 6"	7' 3"	6' 9"	6' 3"
	1-#5	9' 3"	8' 6"	8' 0"	9' 3"	8' 6"	8' 0"	9' 3"	8' 6"	8' 0"	9' 3"	8' 6"	8' 0"	9' 0"	8' 6"	8' 0"
	2-#4 1-#6	10' 6"	9' 9"	9' 0"	10' 6"	9' 9"	9' 0"	10' 6"	9' 9"	9' 0"	10' 6"	9' 9"	9' 0"	10' 3"	9' 6"	9' 0"
	2-#5	13' 0"	12' 0"	11' 0"	13' 0"	12' 0"	11' 3"	13' 0"	12' 0"	11' 3"	13' 0"	12' 0"	11' 3"	12' 9"	11' 9"	11' 0"
	2-#6	15' 0"	13' 9"	12' 6"	15' 3"	14' 0"	13' 3"	15' 3"	14' 3"	13' 3"	15' 3"	14' 3"	13' 3"	15' 3"	14' 0"	13' 3"
	CENTRE DISTANCE "A"	1' 6"	1' 3"	1' 3"	2' 3"	2' 0"	1' 9"	3' 0"	2' 9"	2' 3"	3' 9"	3' 3"	2' 9"	4' 6"	4' 0"	3' 6"

SHADED AREA SPANS ARE IDENTIFIED AS "DR" (DESIGN REQUIRED) IN IRC TABLES R608.8(2) TO R608.8(5). SPANS PROVIDED ARE DETERMINED ACCORDING TO LIMITS OUTLINED IN STRUCTURAL GUIDE AND STRENGTH DESIGN IN ACCORDANCE TO WITH ACI 318-14.

See Table Notes on page 28 of guide.



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TABLE 14: STRONGHOLD ICF MAXIMUM ALLOWABLE CLEAR SPAN FOR LINTELS SUPPORTING TWO STOREYS OF CONCRETE WALLS & LIGHT-FRAME

LINTEL DEPTH, D (INCHES)	NUMBER OF BARS AND BAR SIZE IN TOP AND BOTTOM OF LINTEL	MINIMUM NOMINAL LINTEL THICKNESS (INCHES)														
		4"			6"			8"			10"			12"		
		MAXIMUM GROUND SNOW LOAD (PSF)														
		30	50	70	30	50	70	30	50	70	30	50	70	30	50	70
8"	SPAN WITHOUT STIRRUPS	SR	SR	SR	SR	SR	SR	SR	SR	SR	SR	SR	SR	SR	SR	SR
	1-#4	2' 6"	2' 6"	2' 3"	2' 6"	2' 6"	2' 6"	2' 3"	2' 3"	2' 3"	2' 3"	2' 3"	2' 0"	2' 3"	2' 0"	2' 0"
	1-#5	3' 0"	3' 0"	2' 9"	3' 0"	3' 0"	3' 0"	3' 0"	2' 9"	2' 9"	2' 9"	2' 9"	2' 9"	2' 9"	2' 6"	2' 6"
	2-#4 1-#6	-	-	-	3' 6"	3' 3"	3' 3"	3' 3"	3' 3"	3' 0"	3' 3"	3' 0"	3' 0"	3' 0"	3' 0"	2' 9"
	2-#5	-	-	-	-	-	-	4' 0"	3' 9"	3' 9"	3' 9"	3' 9"	3' 6"	3' 9"	3' 6"	3' 6"
	2-#6	-	-	-	-	-	-	-	-	-	4' 6"	4' 3"	4' 3"	4' 3"	4' 3"	4' 0"
	CENTRE DISTANCE "A"	0' 0"	0' 0"	0' 0"	0' 0"	0' 0"	0' 0"	0' 0"	0' 0"	0' 0"	0' 0"	0' 0"	0' 0"	0' 0"	0' 0"	0' 0"
12"	SPAN WITHOUT STIRRUPS	SR	SR	SR	SR	SR	SR	SR	SR	SR	SR	SR	SR	SR	SR	SR
	1-#4	3' 6"	3' 6"	3' 3"	3' 3"	3' 3"	3' 3"	3' 3"	3' 0"	3' 0"	3' 0"	3' 0"	2' 9"	3' 0"	2' 9"	2' 9"
	1-#5	4' 3"	4' 3"	4' 0"	4' 3"	4' 0"	4' 0"	4' 0"	3' 9"	3' 9"	3' 9"	3' 9"	3' 6"	3' 9"	3' 6"	3' 6"
	2-#4 1-#6	4' 9"	4' 6"	4' 6"	4' 9"	4' 6"	4' 6"	4' 6"	4' 3"	4' 3"	4' 3"	4' 3"	4' 0"	4' 0"	4' 0"	3' 9"
	2-#5	-	-	-	5' 9"	5' 6"	5' 6"	5' 6"	5' 3"	5' 0"	5' 3"	5' 0"	5' 0"	5' 0"	5' 0"	4' 9"
	2-#6	-	-	-	6' 6"	6' 3"	6' 3"	6' 3"	6' 3"	6' 0"	6' 3"	6' 0"	5' 9"	6' 0"	5' 9"	5' 6"
	CENTRE DISTANCE "A"	0' 0"	0' 0"	0' 0"	0' 0"	0' 0"	0' 0"	0' 0"	0' 0"	0' 0"	0' 0"	0' 0"	0' 0"	0' 0"	0' 0"	0' 0"
16"	SPAN WITHOUT STIRRUPS	2' 0"	2' 0"	2' 0"	2' 0"	2' 0"	2' 0"	2' 0"	2' 0"	2' 0"	2' 0"	2' 0"	2' 0"	2' 0"	2' 0"	2' 0"
	1-#4	4' 3"	4' 0"	4' 0"	4' 0"	4' 0"	4' 0"	3' 9"	3' 9"	3' 6"	3' 9"	3' 6"	3' 6"	3' 6"	3' 6"	3' 3"
	1-#5	5' 3"	5' 0"	4' 9"	5' 0"	4' 9"	4' 9"	4' 9"	4' 6"	4' 6"	4' 6"	4' 6"	4' 3"	4' 3"	4' 3"	4' 0"
	2-#4 1-#6	6' 0"	5' 9"	5' 6"	5' 9"	5' 6"	5' 6"	5' 6"	5' 3"	5' 0"	5' 3"	5' 0"	4' 9"	5' 0"	4' 9"	4' 9"
	2-#5	7' 3"	6' 9"	6' 6"	7' 0"	6' 9"	6' 9"	6' 9"	6' 6"	6' 3"	6' 6"	6' 3"	6' 0"	6' 3"	6' 0"	5' 9"
	2-#6	-	-	-	7' 9"	7' 3"	7' 3"	7' 9"	7' 3"	6' 9"	7' 6"	7' 3"	7' 0"	7' 3"	7' 0"	6' 9"
	CENTRE DISTANCE "A"	0' 0"	0' 0"	0' 0"	0' 0"	0' 0"	0' 0"	0' 0"	0' 0"	0' 0"	1' 0"	0' 0"	0' 0"	1' 0"	1' 0"	0' 0"
20"	SPAN WITHOUT STIRRUPS	2' 0"	2' 0"	2' 0"	2' 0"	2' 0"	2' 0"	2' 3"	2' 0"	2' 0"	2' 6"	2' 3"	2' 3"	2' 9"	2' 6"	2' 6"
	1-#4	5' 0"	4' 9"	4' 6"	4' 9"	4' 6"	4' 6"	4' 6"	4' 3"	4' 0"	4' 3"	4' 0"	4' 0"	4' 0"	3' 9"	3' 9"
	1-#5	6' 0"	5' 9"	5' 6"	5' 9"	5' 6"	5' 6"	5' 6"	5' 3"	5' 0"	5' 3"	5' 0"	5' 0"	5' 0"	4' 9"	4' 9"
	2-#4 1-#6	6' 9"	6' 6"	6' 3"	6' 6"	6' 3"	6' 3"	6' 3"	6' 0"	5' 9"	6' 0"	5' 9"	5' 6"	5' 9"	5' 6"	5' 3"
	2-#5	8' 3"	7' 9"	7' 0"	8' 0"	7' 9"	7' 9"	7' 9"	7' 6"	7' 3"	7' 3"	7' 0"	6' 9"	7' 0"	6' 9"	6' 6"
	2-#6	8' 3"	7' 9"	7' 0"	8' 9"	8' 0"	8' 0"	8' 9"	8' 3"	7' 9"	8' 9"	8' 3"	8' 0"	8' 3"	8' 0"	7' 9"
	CENTRE DISTANCE "A"	0' 0"	0' 0"	0' 0"	0' 0"	0' 0"	0' 0"	1' 0"	1' 0"	1' 0"	1' 3"	1' 0"	1' 0"	1' 3"	1' 3"	1' 3"
24"	SPAN WITHOUT STIRRUPS	2' 0"	2' 0"	2' 0"	2' 3"	2' 0"	2' 0"	2' 9"	2' 6"	2' 3"	3' 0"	2' 9"	2' 9"	3' 3"	3' 3"	3' 0"
	1-#4	5' 6"	5' 3"	5' 0"	5' 3"	5' 0"	5' 0"	4' 9"	4' 9"	4' 6"	4' 9"	4' 6"	4' 3"	4' 6"	4' 3"	4' 3"
	1-#5	6' 9"	6' 6"	6' 3"	6' 6"	6' 3"	6' 3"	6' 0"	5' 9"	5' 9"	5' 9"	5' 6"	5' 6"	5' 6"	5' 3"	5' 3"
	2-#4 1-#6	7' 9"	7' 3"	7' 0"	7' 3"	7' 0"	7' 0"	6' 9"	6' 6"	6' 6"	6' 3"	6' 3"	6' 3"	6' 3"	6' 0"	6' 0"
	2-#5	9' 0"	8' 3"	7' 6"	9' 0"	8' 6"	8' 6"	8' 6"	8' 3"	8' 0"	8' 3"	7' 9"	7' 9"	7' 9"	7' 6"	7' 3"
	2-#6	9' 0"	8' 3"	7' 6"	9' 6"	8' 9"	8' 9"	9' 9"	9' 3"	8' 6"	9' 6"	9' 3"	9' 0"	9' 3"	9' 0"	8' 9"
	CENTRE DISTANCE "A"	0' 0"	0' 0"	0' 0"	1' 0"	1' 0"	1' 0"	1' 3"	1' 3"	1' 0"	1' 6"	1' 3"	1' 3"	1' 6"	1' 6"	1' 6"

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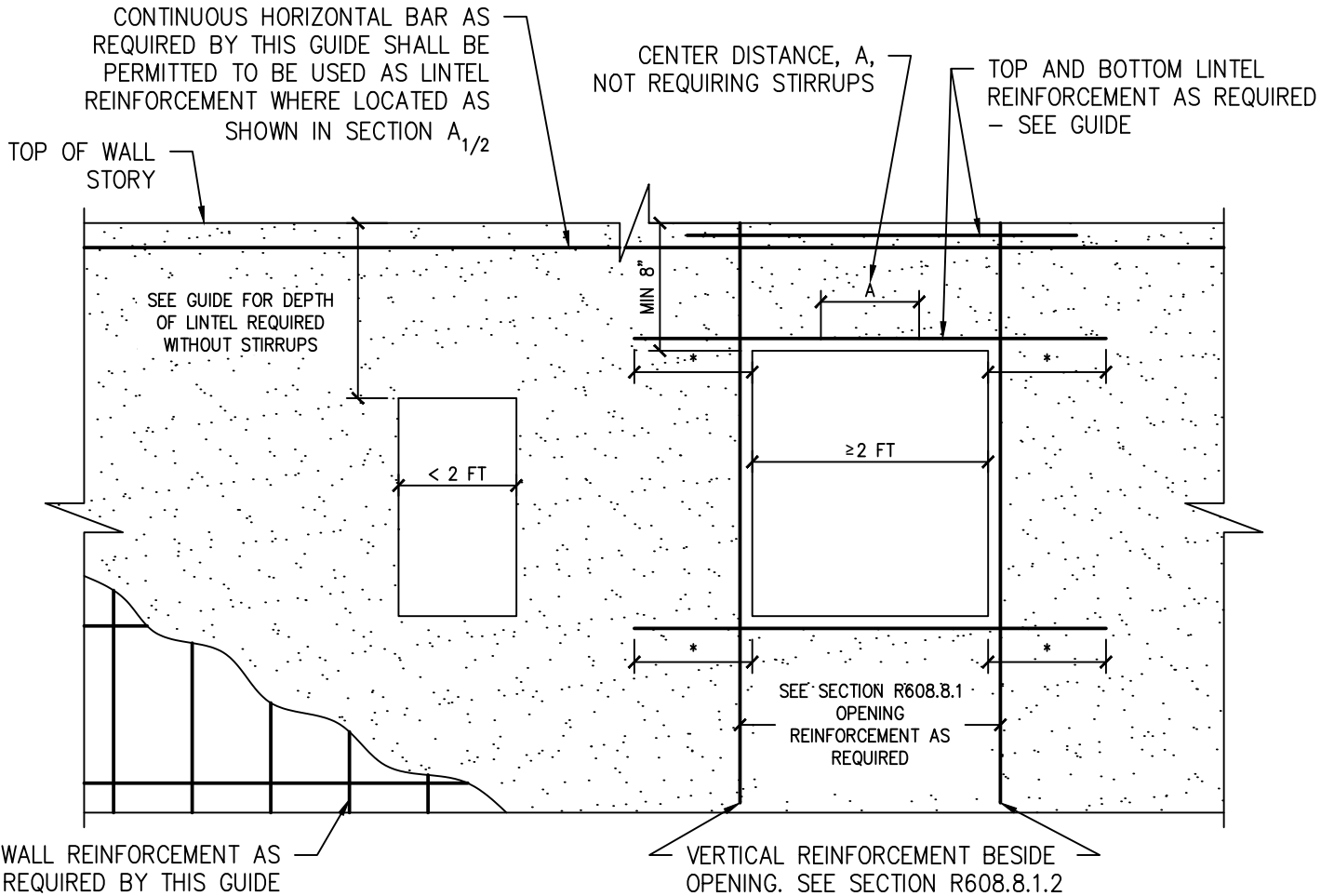
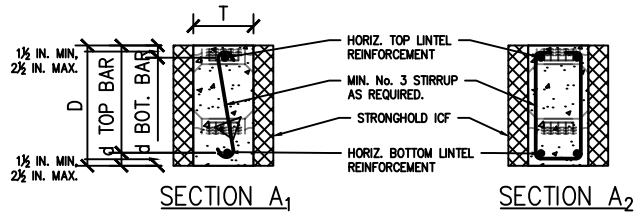
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*LENGTH REQUIRED TO DEVELOP BAR IN TENSION - SEE SECTION R608.8.1.1

TYP. LINTEL ELEVATION
(TYP. ALL WALL THICKNESS')
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1	2020/12/23	FOR PUBLICATION	CB
REV	DATE	ISSUE	APP
DRAWING NO. 0068-017		DES CB	
DATE DECEMBER 23, 2020		DRN LI	
		CHK CB	



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