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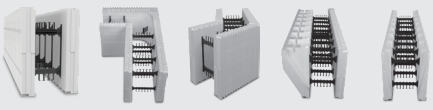
BUILDBLOCK FLAT WALL ENGINEERING MANUAL

ABOVE & BELOW GRADE ICF WALLS, REBAR REINFORCEMENT, AND SAFE ROOM DESIGN

REVISED APRIL 2023



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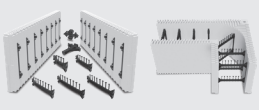

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8/22/23

August 22, 2023

BuildBlock Building Systems
9705 Broadway Extension
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Re: Engineering Certification

Dear Sir:

We have reviewed the contents of this BuildBlock ICF Products and Safe Room Engineering Manual and its referenced documents. Based on the scope and limitations, and disclaimers described therein, the information contained in this engineering manual meets the structural requirements of the 2021 International Residential Code (IRC) and the 2021 International Building Code (IBC).

Based on the scope and limitations, and disclaimers described therein, the BuildBlock Safe Room Engineering information meets the structural requirements of *ICC 500-2020, ICC/NSSA Standard for the Design and Construction of Storm Shelters* and *FEMA 361 Safe Rooms for Tornadoes and Hurricanes: Guidance for Community and Residential Safe Rooms.*

Sincerely,

8/22/23

Robert F. Oleck, Ph.D., PE
FL PE # 52514

1.0 INTRODUCTION

OVERVIEW

This engineering manual is intended to provide prescriptive requirements for the design of BuildBlock Building Systems ICF flat wall and Global Block wall systems for limited scope and applications. A prescriptive specification is one that includes clauses for means and methods of construction and composition of the concrete mix rather than defining performance requirements. In this manual the requirements only apply to residential structures of 1 and 2 stories with a basement within load and dimensional limits specified in Table 1.1 and must comply with local building department requirements and the referenced building codes stated within this manual.

1.1 PRESCRIPTIVE APPROACH

The prescriptive requirements of this document are based primarily on the Prescriptive Method for Insulating Concrete Forms in Residential Construction [1], Building Code Requirements for Structural Concrete [2], and the Structural Design of Insulating Concrete Form Walls in Residential Construction [3] for member strength and reinforcement requirements, and is intended to be consistent with the provisions in the International Residential Code (IRC 2012) [9]. The design loading requirements are based on Minimum Design Loads for Buildings and Other Structures [4].

1.2 SCOPE & LIMITATIONS

These provisions apply to the construction of detached one and two-family homes, townhouses, and other attached single-family dwellings in accordance with the general limitations of Table 1.1. The limitations are intended to define the appropriate use of this document for most one and two-family dwellings including townhouses. An engineered design shall be required for houses built along the immediate, hurricane-prone coastline subjected to storm surge (i.e., beach front property) and in high seismic areas. Intermixing of the present provisions with other construction materials in a single structure shall be in accordance with the applicable building code requirements for that material, the general limitations set forth in Table 1.1, and relevant provisions of this document. An engineered design shall be required for applications that do not meet the limitations of Table 1.1.

These tables DO NOT take into account the required horizontal shear force resistance for lateral wind or seismic loads. Refer to references [1] & [3] for the required length of shear wall required for horizontal loads and minimum shear wall length between openings.

1.3 DEFINITION OF TERMS

Accepted Engineering Practice: An engineering approach that conforms with accepted principles, tests, technical standards, and sound judgment.

Anchor Bolt: A headed bolt, or threaded rod with nut embedded in the concrete, used to connect a structural member of different material to a concrete member.

Approved: Acceptable to the building official or other authority having jurisdiction.

Attic: The unfinished space between the ceiling joists of the top story and the roof rafters.

Authority Having Jurisdiction: The organization, political subdivision, office, or individual charged with the responsibility of administering and enforcing the provisions of applicable building codes.

Backfill: The soil that is placed adjacent to completed portions of a structure (e.g., basement wall, stem wall) with suitable compaction and allowance for settlement.

Basement: That portion of a building that is partly or completely below grade. See "story above grade plane."

Basic Wind Speed: In accordance with ASCE 7 ref[4]

Construction Joint: The surface where two successive placements of concrete meet, across which it may be desirable to achieve bond and through which reinforcement may be continuous.

Crawlspace Wall: A perimeter foundation wall 5 feet (1.5 m) or less in height that creates an under floor space which is not habitable.

Dead Load: Forces resulting from the weight of walls, partitions, framing, floors, ceilings, roofs, and all other permanent construction entering into, and becoming part of, a building.

Deflection: Elastic movement of a loaded structural member or assembly (i.e., beam or wall).

Design Lateral Soil Load: The force per unit area produced by the soil on an adjacent structure such as a basement wall.

Enclosure Classifications: Used for the purpose of determining internal wind pressure. Buildings are classified as partially enclosed or enclosed as defined in the applicable building code, or if there is no code as follows:

Enclosed Building: A building not complying with the requirements for a partially enclosed building.

Partially Enclosed Building: A building that complies with both of the following:

- The total area of openings in a wall that receives positive external pressure exceeds the sum of the area of openings in the balance of the building envelope (walls and roof) by more than 10%, and
- The total area of openings in a wall that receives positive external pressure exceeds 4 sq. ft. (0.37 m2) or 1% of the area of the wall, whichever is smaller, and the percentage of openings in the balance of the building envelope (walls and roof) does not exceed 20%.

Endwall: The exterior walls of the building that are perpendicular to the roof ridge. The length of an endwall is designated by W. See "sidewall."

Exposure Categories: Reflects the effect of the ground surface roughness on wind loads in accordance with ASCE 7.

Exposure Category B: includes urban and suburban areas, wooded areas or other terrain with numerous closely spaced obstructions having the size of single-family dwellings or larger.

Exposure Category C: includes open terrain with scattered obstructions having heights generally less than 30 ft (9.1 m).

Exposure Category D: includes flat, unobstructed areas and water surfaces.

Flame-Spread Index: The numerical value assigned to a material tested in accordance with ASTM E84.

Flat Wall: A solid concrete wall of uniform thickness. Refers to BuildBlock and BuildLock ICF Forms.

Floor Joist: A horizontal structural framing member that supports floor loads.

Footing: A below-grade foundation component that transmits loads directly to the underlying soil or rock.

Form Tie: A mechanical connection in tension used to prevent concrete forms from spreading due to the fluid pressure of fresh concrete, and which remains permanently embedded in the concrete.

Foundation: The structural elements through which the dead load of a structure and the loads and forces imposed on it are transmitted to the footing, or directly to the soil or rock.

Foundation Wall: The structural element of a foundation that resists lateral soil loads, if any, and transmits the dead load of a structure and the loads and forces imposed on it to the footing, or directly to the soil or rock; includes basement, stem, and crawlspace walls.

Grade: The finished ground level adjoining the building at all exterior walls.

Grade Plane: A reference plane representing the average of the finished ground level adjoining the building at all exterior walls.

Ground Snow Load: Measured load on the ground due to snow accumulation developed from a statistical analysis of weather records expected to be exceeded once every 50 years at a given site.

Interpolation: A mathematical process used to compute an intermediate value of a quantity between two given values assuming a linear relationship.

Lap Splice: A connection of reinforcing steel made by lapping the ends of bars.

Lateral Load: A horizontal force, created by soil, wind, or earthquake, acting on a structure or its components.

Lateral Support: A horizontal member or assembly providing stability to a wall in the direction perpendicular to the plane of the wall.

Ledger: A horizontal structural member fastened to the side of a wall to serve as a connection point for other structural members, typically floor joists.

Light-Framed Construction: Construction where walls, floors and roofs are primarily formed by a system of repetitive wood or cold-formed steel framing members.

Lintel: A horizontal structural element of reinforced concrete located above an opening in a wall to support the construction and superimposed loads from above.

Live Load: Any gravity vertical load other than dead load,or environmental loads, such as from wind, snow, rain, earthquake, or flood. Includes furniture, people, and personal effects.

Load-Bearing Value of Soil: The allowable load per surface area of soil. It is usually expressed in pounds per square foot (psf) or kilonewtons per square meter (kN/m2).

Multiple Dwelling: A building with three or more attached single-family dwelling units, including townhouses, where means of egress from each dwelling unit are independent.

Roof Snow Load: Uniform load on the roof due to snow accumulation; typically 70 to 80 percent of the ground snow load in accordance with ASCE 7.

Screen-Grid Wall: A perforated concrete wall with closely spaced vertical and horizontal concrete members (cores) with voids in the concrete between the members created by the stay-in-place form. Refers to GlobalBlock.

Seismic Force: The force exerted on a structure or portion thereof resulting from seismic (earthquake) ground motions.

Sidewall: The exterior walls of the building that are parallel to the roof ridge. The length of a sidewall is designated by L. See "endwall."

Slab-on-Ground (Grade): A concrete slab, which is continuously supported by, and rests on, the soil directly below.

Slump: A measure of consistency of freshly mixed concrete equal to the subsidence of the molded specimen measured immediately after the removal of the slump cone.

Smoke-Developed Index: The numerical value assigned to a material tested in accordance with ASTM E84.

Span: The clear horizontal distance between supports.

Specified Compressive Strength of Concrete: The compressive strength of concrete, f'c, used in design and evaluated in accordance with Chapter 5 of ACI 318.

Stay-in-Place Concrete Forms: A concrete forming system using stay-in-place forms of foam plastic insulation, a composite of cement and foam insulation, a composite of cement and wood chips, or other insulating material for constructing cast-in-place concrete walls.

Stem Wall: A foundation wall supported directly by the soil or rock, or on a footing that supports an above-grade concrete wall and retains unbalanced backfill beneath the slab-on-ground of the first story above grade plane.

Stirrup: Steel bars, wires, or welded wire reinforcement generally oriented perpendicular to longitudinal reinforcement, properly anchored, and extending across the depth of concrete beams, lintels, or similar members to resist shear and diagonal tension stresses in excess of those permitted to be carried by the concrete alone.

Story: That portion of the building included between the upper surface of any floor and the upper surface of the floor next above, except that the top-most story shall be from the upper surface of the top-most floor to the top of the ceiling joists, or where there is no ceiling, to the top of the roof rafters.

Story Above Grade Plane: Any story with its finished floor surface entirely above grade plane except that a basement shall be considered as a story above grade plane where the finished surface of the floor above the basement is (a) more than 6 feet (1.8 m) above the grade plane, or (b) more than 12 feet (3.7 m) above the finished ground level at any point.

Unbalanced Backfill Height: The difference between the interior and exterior finish ground level. Where an interior concrete slab-on-ground is provided, the unbalanced backfill height is the difference in height between the exterior finish ground level and the top of the slab. For a stem wall, the difference in height between the exterior finish ground level and the underside of the slab-on-ground.

Unsupported Wall Height: Within a basement or crawlspace, the maximum clear vertical distance between the exterior finish ground level, or interior finish ground level or top of finished floor, whichever is lower, and the finished ceiling or sill plate. In other stories, the maximum clear vertical distance from the top of the finished floor to the finished ceiling or sill plate.

Vapor Retarder: A layer of material used to retard the transmission of water vapor through a building wall or floor.

Waffle-Grid Wall: A solid concrete wall with closely spaced vertical and horizontal concrete members (cores) with a concrete web between the members created by the stay-in-place form. The thicker vertical and horizontal concrete cores and the thinner concrete webs create the appearance of a breakfast waffle. It is also called an uninterrupted-grid wall in other publications. BuildBlock does not produce a waffle-grid product.

Wall, Loadbearing: A concrete wall that supports more than 200 pounds per linear foot (2.92 kN/m) of vertical load in addition to its own weight. The weight of the wall includes any exterior and interior finishes attached to the wall, unless indicated otherwise.

Wall, Non-Loadbearing: A concrete wall that is not a loadbearing wall.

Web: A concrete wall segment, a minimum of 2 inches (51 mm) thick, that connects the vertical and horizontal concrete members (cores) of a waffle-grid stay-in-place wall or lintel member.

Wind Force: The force or pressure exerted on a building structure and its components resulting from wind. Wind forces are typically expressed in pounds per square foot (psf) or kilonewtons per square meter (kN/m)

1.4 DISCLAIMERS

This manual was designed to be used as a reference guide only. This manual is not intended to be used as a replacement or substitute for the actual training by an experienced and properly trained BuildBlock Building System professional. Before starting any project BuildBlock recommends that you receive proper training. BuildBlock also recommends that you consult with design professionals familiar with the type and scope of project to be built. Training is available by contacting BuildBlock Building Systems LLC at buildblock.com or 866-222-2575.

BuildBlock Building Systems, LLC, believes the information contained herein to be accurate at the time of writing and preparation. The information has been compiled using sources believed to be reliable. Neither BuildBlock Building Systems, LLC, nor its employees or representatives make any representation or warranty, either expressed or implied, whether arising by statute, operation of law, custom of trade or otherwise, with respect to the accuracy or completeness of information contained in this document or its fitness for any particular purpose, nor do they assume any liability for damages or injury resulting from the application of such information.

BuildBlock Building Systems, LLC, assumes no responsibility regarding the use of its products or any other third party products referred to in this document. It is the full responsibility of the user to comply with all applicable regulations and building code requirements concerning the use of these products and any other products outlined in this product manual. It is further the responsibility of the user to research and understand safe methods of use and handling of these products. To properly comply with the building codes in your area, contact your local distributor, dealer, or building code inspector.

TABLE 1.1 APPLICABILITY LIMITS

GENERAL	
Number of Stories	2 stories above grade plus basement
Design Wind Speed	150 mph (241 km/hr) 3-second gust (130 mph (209 km/hr) fastest mile)
Ground Snow Load	70 psf (3.4 kPa)
Seismic Design Category	Not Included in This Manual - Requires Structural Engineer

FOUNDATIONS	
Max Wall Height	12ft
Max Unbalanced Backfill Height	1ft below wall height
Equivalent Fluid Density of Soil	75 pcf (1201 kg/m3)
Presumptive Soil Bearing Value	2,000 psf (96 kPa)

WALLS	
Unit Weight of Concrete	150 pcf (23.6kN/m3)
Wall Height (Unsupported)	20ft Max. Varies by core thickness.

FLOORS	
Floor Dead Load	15 psf (0.72 kPa)
First Floor Live Load	40 psf (1.9 kPa)
Second Floor Live Load	30 psf (1.4 kPa)
Floor Clear Span (Unsupported)	32 feet (9.8m)

ROOFS	
Maximum Roof Slope	12:12
Roof and Ceiling Dead Load	15 psf (0.72 kPa)
Roof Live Load (Ground Snow Load)	70 psf (3.4 kPa)
Attic Live Load	20 psf (0.96 kPa)
Roof Clear Span (Unsupported)	40 feet (12m)

2.0 MATERIALS

2.1 CONCRETE

2.1.1 Walls formed with BuildBlock Building Systems forms shall have a minimum concrete thickness of 6 inches (159 mm) for basement walls and 4 inches (102 mm) for above-grade walls and crawl space walls, except in Seismic Design Categories (SDC) D1 and D2 where a wall thickness of 8 inches (159 mm) is required.

2.1.2 Ready-mixed concrete for BuildBlock Building Systems walls shall meet the requirements of ASTM C 94 [6, 10]. Slump shall be determined in accordance with ASTM C 143. Maximum slump and aggregate size requirements shall be in accordance with BuildBlock Building Systems Installation recommendations and meet the concrete compressive strength requirements herein. A suitable concrete mix design and placement methodology shall be selected for each project to ensure that concrete is properly consolidated in BuildBlock walls. Mix designs with a slump greater than 6 inches (152 mm) are not permissible.

2.1.3 The minimum compressive strength of concrete (f'c) shall be 3,000 psi at 28 days as determined in accordance with ASTM C 31 [5].

2.2 REINFORCING STEEL

2.2.1 Reinforcing steel used in BuildBlock Building Systems walls shall meet the requirements of ASTM A 615 [7], The minimum yield strength of the reinforcing steel shall be Grade 60 (420 MPa). Steel reinforcement shall have a minimum concrete cover in accordance with ACI 318.

2.2.2 Horizontal wall reinforcement shall not vary outside of the middle third of beams, columns, lintels, horizontal and vertical cores, and walls for all wall thicknesses, except as noted below.

2.2.2(a) Exception: Horizontal wall reinforcement in foundation walls is permitted to be placed closer to the inside face of the wall (Tension Side), provided that it does not conflict with the minimum required cover.

2.2.3 Vertical wall reinforcement in above-grade BuildBlock and GlobalBlock walls shall be placed in the center of the wall. Vertical wall reinforcement in below-grade (i.e., basement and crawlspace) BuildBlock and GlobalBlock walls shall be placed in accordance with BuildBlock Building System below grade wall tables in this manual.

2.2.4 Steel reinforcement in amounts and sizes required by these provisions shall be installed in accordance with the following requirements:

Vertical Reinforcement. Vertical reinforcement in above grade walls shall extend continuously to each story above and below.

Horizontal Reinforcement. Horizontal reinforcement shall be continuous around corners. Bent bars meeting a minimum required lap splice with the horizontal reinforcement shall be permissible at corners.

Splicing of Reinforcement. The longest practicable continuous length of horizontal or vertical rebar shall be used. When a splice is required in continuous reinforcement, rebar shall overlap a minimum of 40db with a separation between bars of not greater than 8db.

Bar Size (Diameter in Eighths)	Lap Splice Length (Inches)
#3	15
#4	20
#5	25
#6	30
#7	35
#8	40

2.3 FORM MATERIALS

Expanded Polystyrene (EPS) & Polypropylene Plastic Web Ties
The physical properties of the Expanded Polystyrene (EPS) should comply with ASTM C578, latest edition. The plastic ties shall have sufficient strength to resist at least 8 feet of wet concrete which can be calculated in accordance with ACI 347-04 or latest edition.

3.0 TYPES OF STRUCTURAL MEMBERS

3.1 BEAMS, WALLS, LINTELS

The structural elements addressed in this document consist of walls, below and above grade, and lintels which are primarily beams in bending. The wall elements are analyzed as structural members in combined compression and bending. Lintel elements are analyzed as flexural members or reinforced concrete beams in bending. ACI 318 chapters 10 and 11 are the primary references for flexural and shear requirements that apply to reinforced concrete beams.

Concrete walls constructed with ICF systems in accordance with this document shall comply with the shapes and minimum concrete cross-sectional dimensions required in ref. [11]. Under the current ACI 318 code (ACI 318-19), chapters 10 and 14 contain most of the requirements for reinforced concrete walls, whether below grade or above grade. In some cases, wall elements can be analyzed and designed as unreinforced, or structural plain concrete walls provided they meet the provisions of chapter 14 of ACI 318.

4.0 STRUCTURAL BUILDING TYPES & CONFIGURATIONS

4.1 LOAD CASES 1, 2, 3 & 4

Refer to Table 1.1 of ref. [11] for design criteria used for the wall and basement configurations that the following tables are based. (See wall diagrams) These 4 load cases comprise the limitations on loads and structural configuration used to build the tables for both the below grade and above grade wall tables. Each table lists the required reinforcing for the worst case load combinations from these 4 load cases show in the wall diagrams.

The design criteria assumed for each of these four construction cases are shown in this section. The below grade wall tables reflect the reinforcement required for the governing case for each loading condition. In other words, the table reflects the reinforcement required for whichever of the four cases is the most restrictive. The tables do not apply to construction cases not covered by these assumed conditions, and such cases should receive special design consideration. For cases that fall in between the assumptions, the more conservative or restrictive case should be assumed and interpolation should not be used. Shaded cells indicate the capacity of the wall is exceeded for the assumed design criteria. Specific project information and design criteria should be used to properly design the wall. Reinforcement requirements may be reduced and/or a design may be achieved with the specific project information and design criteria. Consult a design professional.

5.0 BELOW GRADE WALLS

5.1 BELOW GRADE WALL REINFORCEMENT FOR BUILDBLOCK

The information in the below grade wall tables has been determined using four different construction cases for below grade walls which were intended to cover the range of residential construction conditions typically used. The design criteria used for these four different configurations is based on Table 1.1 ref [11]. The construction load cases are summarized as follows (See wall diagrams):

5.2 HOW TO USE THE BELOW GRADE WALL REINFORCEMENT TABLES

1. Determine appropriate below grade wall reinforcement table.

- Table 5a – Flat Panel ICF Basement Walls
- Table 5b-6: 6″ GlobalBlock Basement Wall
- Table 5b-8- 8″ GlobalBlock Basement Wall

2. Determine the equivalent fluid density category of soil. (30, 45, 60 or 75 pcf) Consult a professional Geotechnical Engineer for help in determining these values or use the following as an approximation that should be verified:

SOIL TYPE	SAND	SILT	CLAY	WET SILT OR CLAY	FAT CLAY
Equivalent Fluid Pressure (pcf)	30	45	60	75	90

3. Determine the unsupported wall height. See Figures 5.4A and 5.4B for Typical Below Grade BuildBlock Wall

4. Determine the maximum backfill height on the below grade wall. See Figure 5.1

5. Determine the reinforcement required from the applicable table.

5.3 BELOW GRADE BUILDBLOCK WALL REINFORCEMENT TABLE NOTES

Minimum vertical reinforcement required for temperature and shrinkage:

- 4″ BuildBlock / BuildLock wall: #4 @ 48″ o.c.
- 6″ BuildBlock / BuildLock wall: #4 @ 48″ o.c.
- 8″ BuildBlock / BuildLock wall: #5 @ 48″ o.c. or #4 @ 30″ o.c.
- 10″ BuildBlock wall #5 @ 48″ o.c. or #4 @ 30″ o.c.
- 12″ BuildBlock wall #5 @ 48″ o.c. or #4 @ 30″ o.c.
- Minimum horizontal reinforcement required for temperature and shrinkage: One #4 rebar in the top and bottom course of the wall. A total of 2 #4 horizontal rebars and #3@ 32″o.c. to fill between top and bottom courses.
- Deflection meets L/240.
- Additional reinforcement is required around openings, corners, and discontinuities.
- Place the vertical reinforcement at center or toward the inside face as indicated in the applicable basement wall tables.
- The wall must be braced against sway at the top and bottom.
- One #6 rebar may be substituted with two #5 rebars. The two #5 rebars must be spaced no closer than 1″ apart and each #5 rebar must have its own lap splice.
- Shaded cells indicate the capacity of the wall is exceeded for the assumed design criteria.
- A vertical rebar shall be placed at each corner.

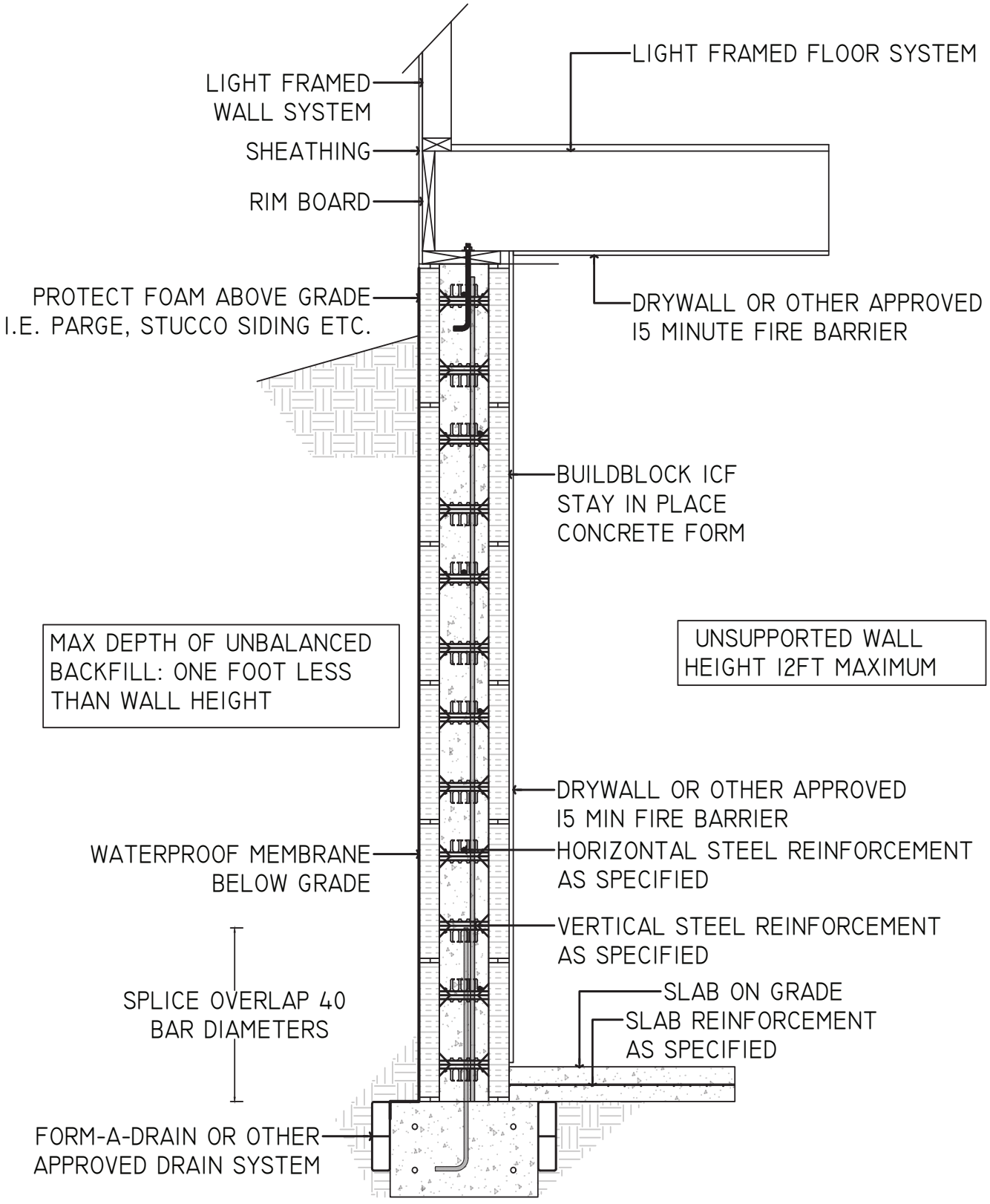


FIGURE 5.4A TYPICAL BELOW GRADE BUILDBLOCK WALL SECTION CUT THROUGH FLAT WALL OR VERTICAL CORE OF SCREEN GRID WALL. SUPPORTING LIGHT FRAMED WALL.

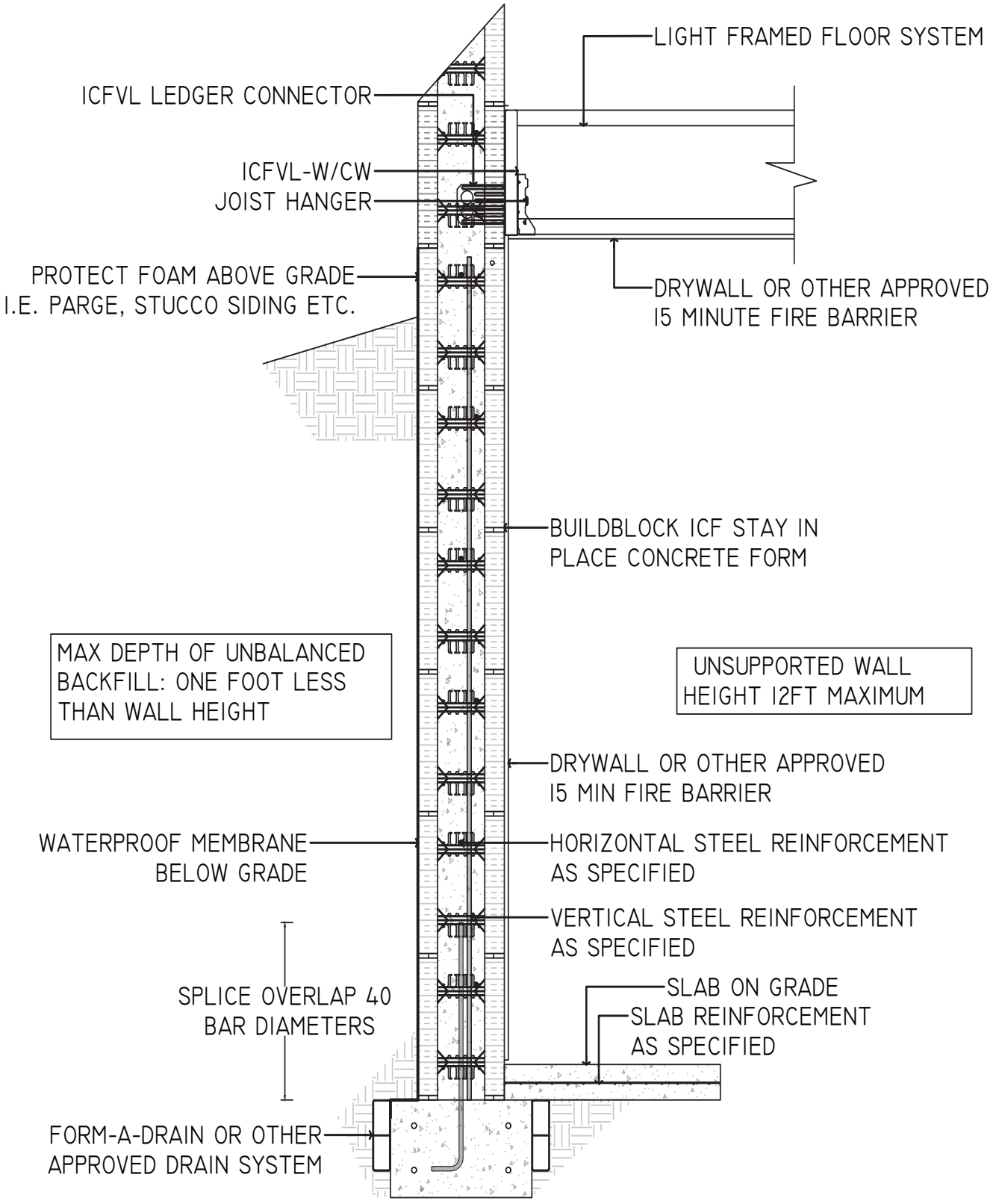
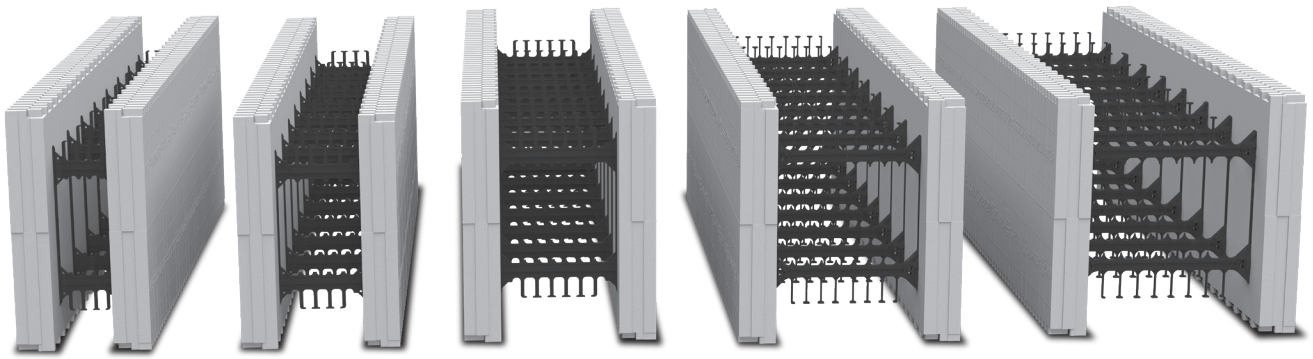


FIGURE 5.4B TYPICAL BELOW GRADE BUILDBLOCK WALL SECTION CUT THROUGH FLAT WALL OR VERTICAL CORE OF SCREEN GRID WALL. SUPPORTING CONCRETE WALL

[Flat Wall]

A solid concrete wall of uniform thickness. Refers to BuildBlock and BuildLock ICF Forms.



TYPICAL BELOW GRADE BUILDBLOCK FLAT WALL REINFORCEMENT FOR BUILDBLOCK AND BUILDLOCK KNOCKDOWN ICFS

TYPICAL BUILDBLOCK AND BUILDLOCK KNOCKDOWN ICF FLAT WALL

TABLE 5A VERTICAL REBAR SPACING (INCHES)*
BUILDBLOCK FLAT PANEL BASEMENT WALLS

Equivalent Fluid Density (pcf)	Max. Wall Height (ft.) Per Floor	Vertical Rebar Spacing (inches)*															
		Buildblock Flat Panel Wall thickness (inches)															
		6"				8"				10"				12"			
		#3	#4	#5	#6	#3	#4	#5	#6	#3	#4	#5	#6	#3	#4	#5	#6
30	8	6	18	30	42	6	12	24	30	24	30	48	48	24	48	48	48
	9	6	12	24	30	6	12	18	30	18	30	48	48	12	24	36	42
	10	6	6	18	24	6	12	18	24	12	24	30	42	12	18	30	36
	11		6	12	18	6	12	18	24	6	18	24	30	6	18	24	30
	12						6	12	18	6	12	18	24	6	18	24	30
	13														6	12	18
	14															12	18
45	8	6	12	18	24	6	18	24	36	12	24	36	48	18	30	42	48
	9		6	12	18	6	12	18	30	6	18	24	36	12	18	30	42
	10			6	12		6	12	18	6	12	18	24	6	12	24	30
	11				6			6	12		6	12	18	6	12	18	24
	12							6	6			6	12		6	12	18
	13															6	12
	14															6	12
60	8	6	6	12	18	6	12	24	30	6	18	30	36	12	24	36	48
	9		6	6	12	6	6	12	18	6	12	18	24	6	12	24	36
	10							6	12		6	12	18	6	12	18	24
	11								6			6	12		6	12	18
	12												6		6	6	12
	13																6
	14																

1. See notes regarding equivalent fluid density.
2. Refer to the design criteria limits in Table 1.1 and the Load Case diagrams for this table.
3. Vertical rebar is to be placed in the center of the form/wall.
4. The wall must be braced against sidesway at top of wall prior to pouring concrete and before soil backfilling.
5. Refer to Below-Grade Notes and Procedure (i.e.: no surcharge assumed)
6. Minimum horizontal reinforcing shall be 1 #4 bar in the top and bottom course, and #3 or #4@ 32" o.c. for remainder of wall.
7. Not less than two No. 5 bars shall be provided around all window and door openings. Such bars shall extend at least 24 in. beyond the corners of openings.
8. Chapter 14 of ACI318 for Plain concrete Basement walls only applicable to 8" & greater wall thickness
9. Per ACI 10.5.3: The requirements of 10.5.1 and 10.5.2 need not be applied if, at every section, As provided is at least one-third greater than that required by analysis.

6.0 ABOVE GRADE WALLS

6.1 OVERVIEW

The information in the above grade wall tables has been determined using four different construction cases for above grade walls that were intended to cover the range of residential construction conditions typically used. The construction cases are summarized as follows:

Load Case 1: BuildBlock basement wall supporting 1-story and wood framed roof. (Minimum axial load)

Load Case 2: BuildBlock basement wall supporting 2-story wood framed construction and roof.

Load Case 3: BuildBlock basement wall supporting one-story BuildBlock wall and wood framed floor and roof.

Load Case 4: BuildBlock supporting one-story BuildBlock and wood framed floor and roof. Maximum axial load.

The design criteria assumed for each of these four construction cases are shown in this section. The reinforcement tables do not apply to construction cases not covered by these assumed conditions, and such cases should receive special design consideration. For conditions that fall in between the assumptions, the more conservative or restrictive case should be assumed and interpolation should not be used.

For design purposes, the vertical rebar was placed in the center of the core.

This section includes above-grade wall reinforcement for seismic and wind loads. Wind pressures of 20 to 80 psf are included. Seismic Design Categories A, B, C, D1, and D2 are included. Wind calculations are based on ASCE 7-10 components and cladding and a mean roof height of 35 feet. The above grade wall tables are as follows:

Equivalent Basic Wind Speed Conversions Table 6.1a

Design Wind Pressures Table 6.1b

BuildBlock Above Grade Wall Vertical Reinforcement Table for Wind Pressure using the applicable Load Case (6.2a&b, 6.3a&b, 6.4a&b, 6.5a&b)

Horizontal reinforcement 1-#4 @ 32"o.c. Alternatively 1-#3 @ 16"o.c. may be used.

6.2 HOW TO USE THE ABOVE GRADE BUILDBLOCK ICF WALL REINFORCEMENT TABLES

- Determine the local building code requirements for wind load criteria.
- Fastest mile wind speed or 3-second gust wind speed or Basic Wind Speed
- If the local wind load criteria are based upon fastest mile wind speed, or 3-second gust wind speed, convert to the Equivalent Basic Wind Speed Tables 6.1a
- Determine if building is enclosed or partially enclosed. (Partially enclosed requires design professional assistance)

Partially Enclosed Building: A building that complies with both of the following:

- The total area of openings in a wall that receives positive external pressure exceeds the sum of the area of openings in the balance of the building envelope (walls and roof) by more than 10%, and
- The total area of openings in a wall that receives positive external pressure exceeds 4 sq. ft. (0.37 m2) or 1% of the area of the wall, whichever is smaller, and the percentage of openings in the balance of the building envelope (walls and roof) does not exceed 20%.

- Determine exposure category (B, C or D).
- Determine the design wind pressure from Table 6.1b
- Determine the BuildBlock ICF Form being used (4", 6", 8", 10" or 11" cores).
- Determine the unsupported wall height.
- Determine the vertical reinforcement required from the applicable core thickness table.
- For Seismic Design obtain design professional assistance.

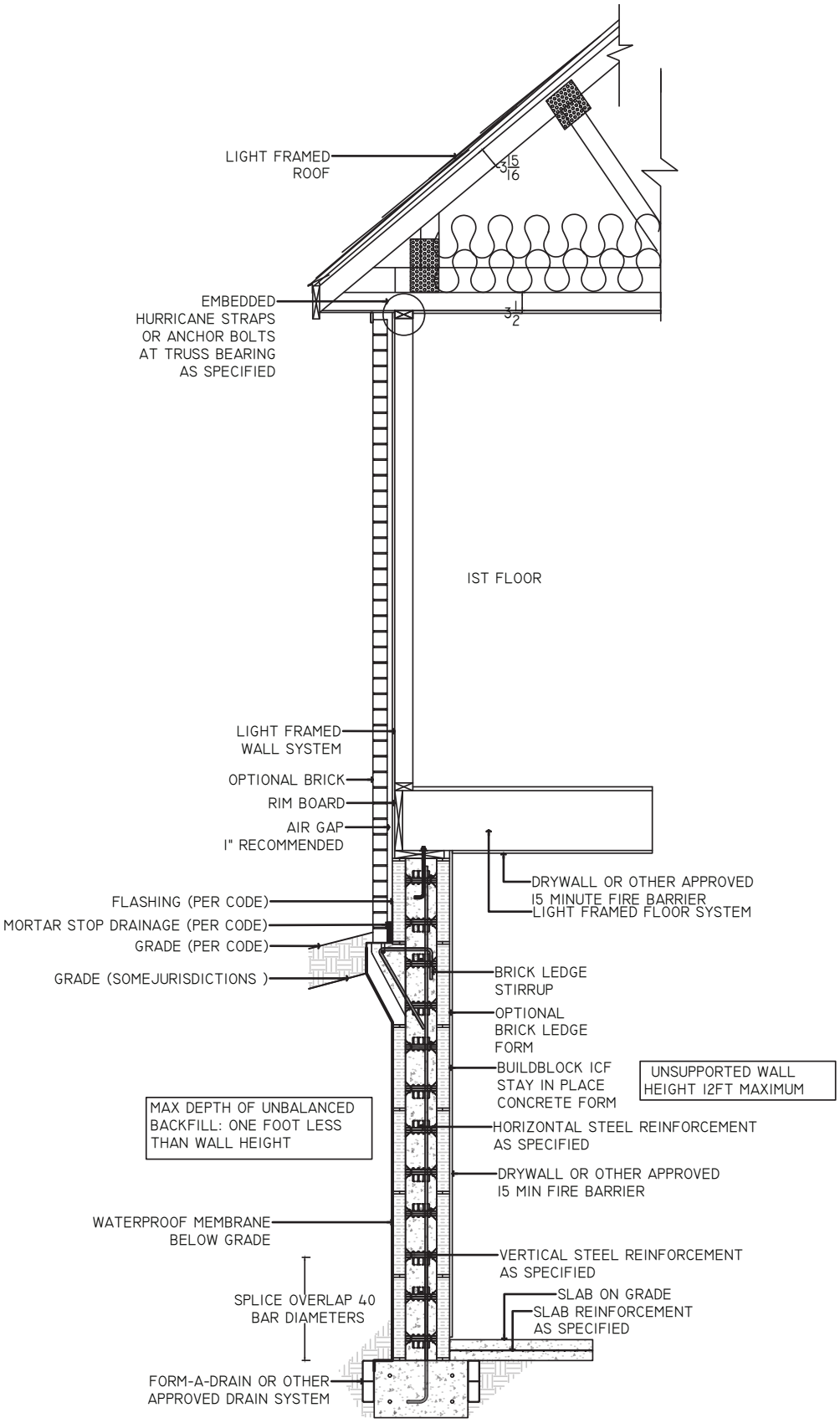


FIGURE 6.1. LOAD CASE 1. SECTION CUT THROUGH FLAT WALL OR VERTICAL CORE OF SCREEN GRID WALL. SUPPORTING LIGHT FRAMED WALL.

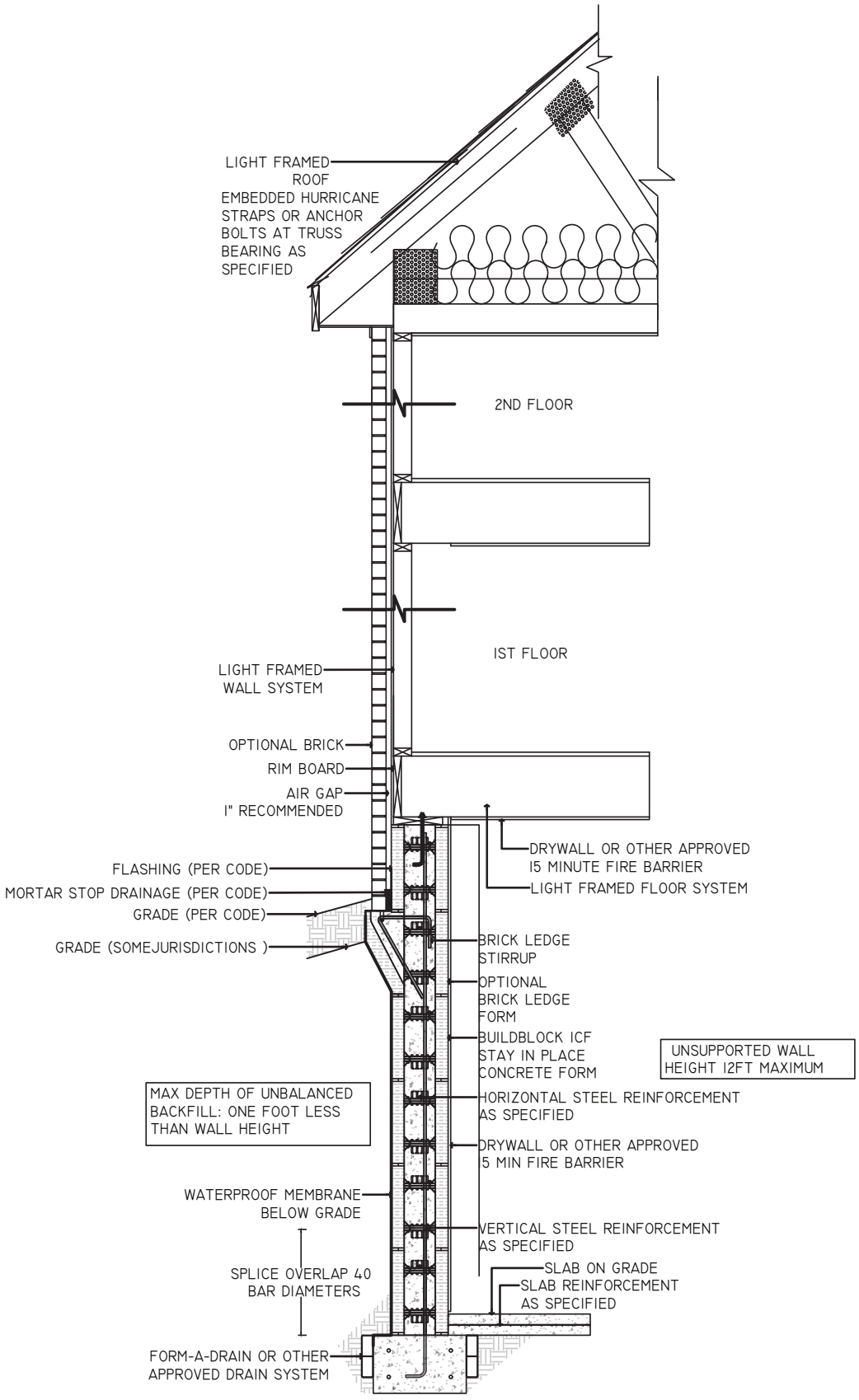


FIGURE 6.2. LOAD CASE 2. SECTION CUT THROUGH FLAT WALL OR VERTICAL CORE OF SCREEN GRID WALL. SUPPORTING 2 STORIES OF LIGHT FRAMED WALL.

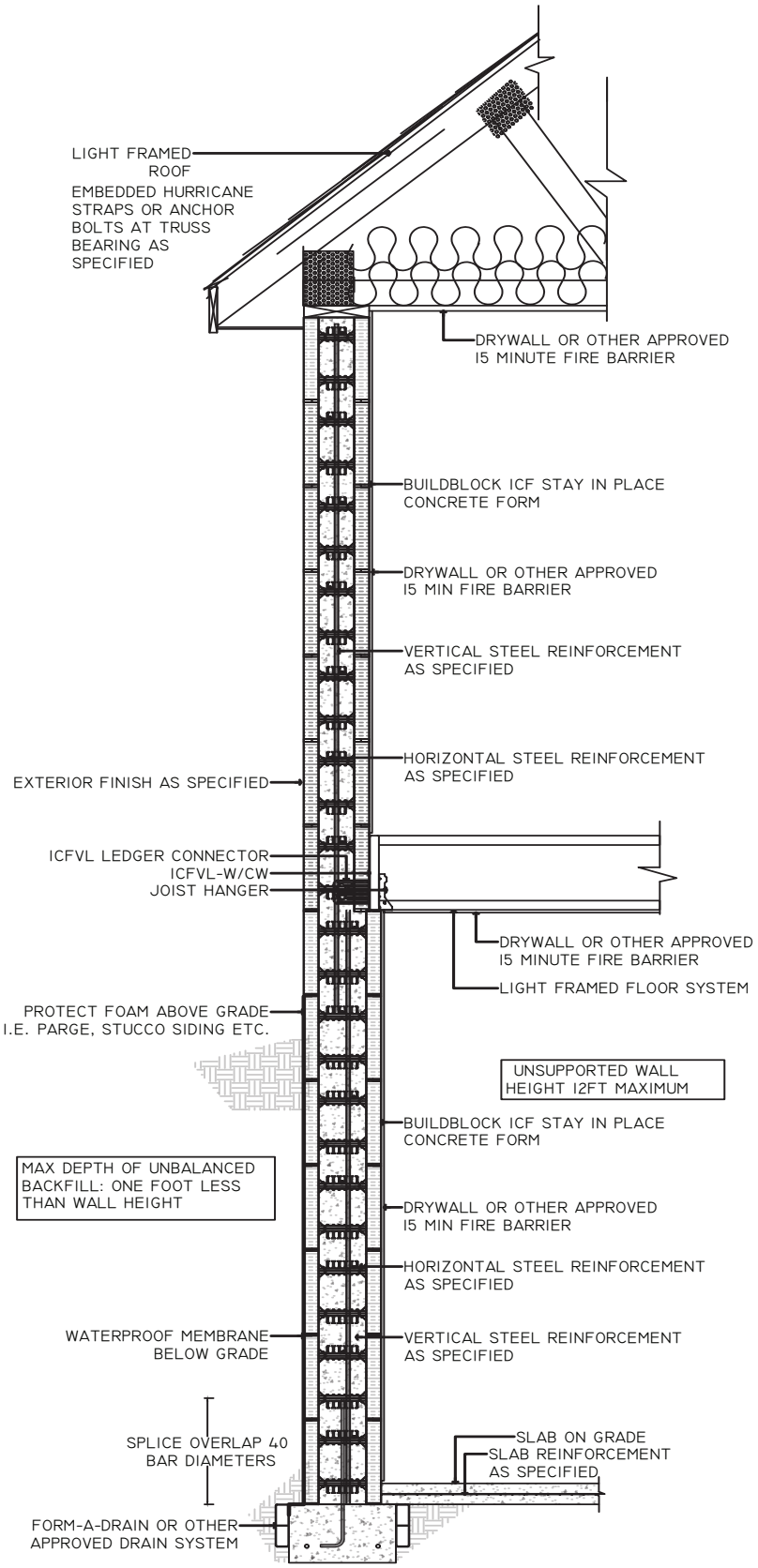


FIGURE 6.3. LOAD CASE 3. SECTION CUT THROUGH FLAT WALL OR VERTICAL CORE OF SCREEN GRID WALL. SUPPORTING 1 STORY OF ICF WALL.

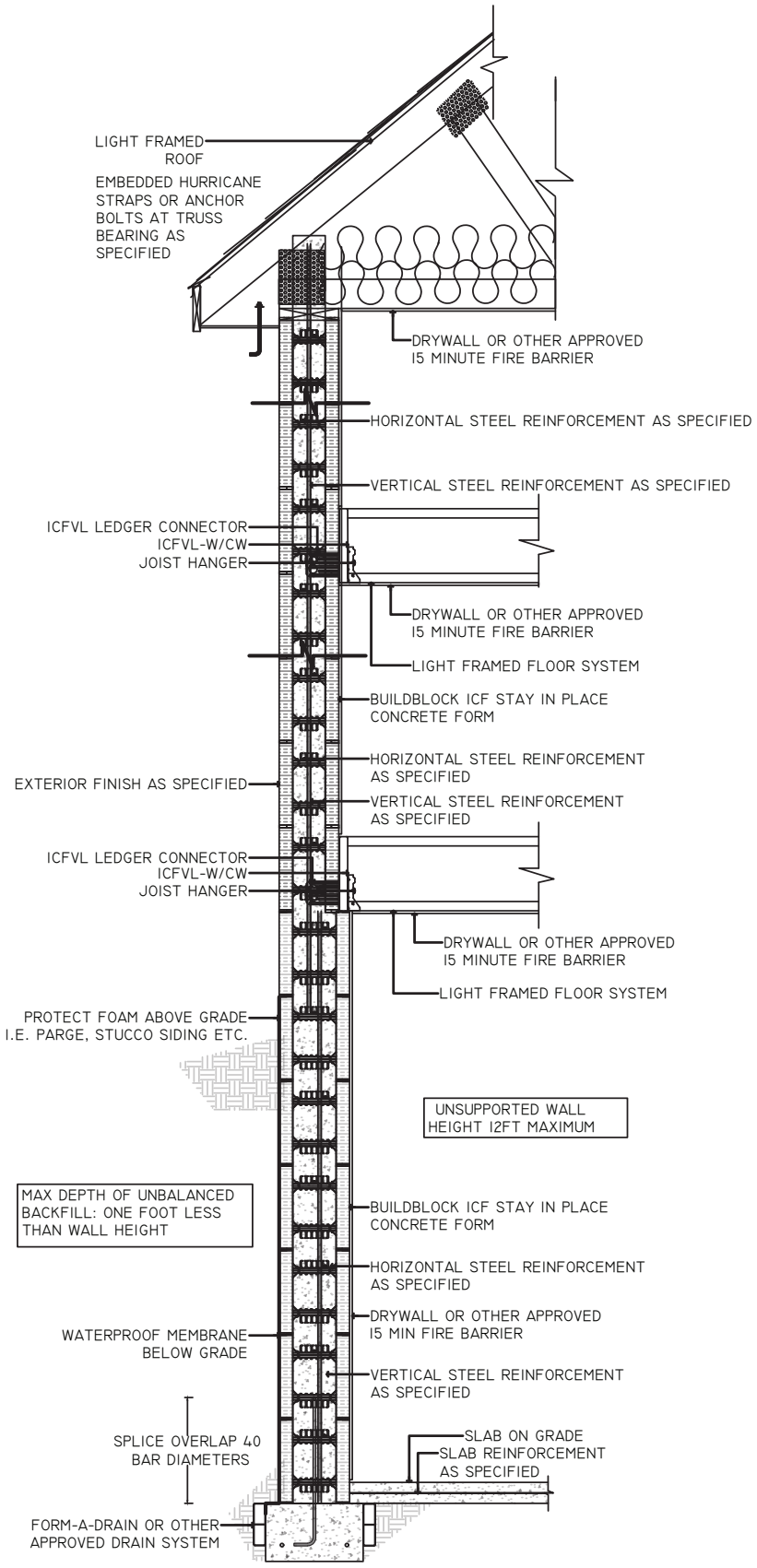


FIGURE 6.4. LOAD CASE 4. SECTION CUT THROUGH FLAT WALL OR VERTICAL CORE OF SCREEN GRID WALL. SUPPORTING 2 STORIES OF ICF WALL.

WIND SPEEDS AND EXPOSURE CATEGORIES

TABLE 6.1A ULTIMATE WIND SPEED V_{ULT} TO ALLOWABLE STRESS DESIGN V_{ASD}

Wind Speed Conversion Table											
V_{ULT}	100	110	120	130	140	150	160	170	180	190	200
V_{ASD}	77	85	93	101	108	116	124	132	139	147	155

TABLE 6.1B
BASIC WIND SPEED VELOCITY PRESSURE (PSF) *1)

BASIC WIND SPEED,V_{ULT}	ENCLOSED			PARTIALLY ENCLOSED		
	EXPOSURE			EXPOSURE		
	B	C	D	B	C	D
100	16	22	26	Design Required	Design Required	Design Required
110	20	27	32	Design Required	Design Required	Design Required
120	23	32	38	Design Required	Design Required	Design Required
130	27	38	44	Design Required	Design Required	Design Required
140	32	44	51	Design Required	Design Required	Design Required
150	36	50	59	Design Required	Design Required	Design Required
160	41	57	67	Design Required	Design Required	Design Required
170	46	64	75	Design Required	Design Required	Design Required
180	52	72	84	Design Required	Design Required	Design Required
190	58	80	94	Design Required	Design Required	Design Required
200	64	89	104	Design Required	Design Required	Design Required

1. This table is based on ASCE7-16 Main Wind Force Resisting System loads for a Category II bldg, mean roof height = 35ft.
2. Calculation of MWFRS wind pressures for various building/roof shapes and partially enclosed buildings should be calculated by a qualified engineer.

LOAD CASES

The information in the above grade wall tables has been determined using four different construction cases for above grade walls that were intended to cover the range of residential construction conditions typically used. The construction cases are summarized as follows:
Load Case A1 Buildblock wall supporting wood framed roof. - Figure 6.1: Table 6.2a & b
Load Case A2 Buildblock wall supporting one-story wood framed construction. - Figure 6.2; Table 6.3a&b
Load Case A3 Buildblock wall supporting one-story Buildblock wall and wood framed floor and roof. Minimum axial load. - Figure 6.3; Table 6.4a&b
Load Case A4 Buildblock wall supporting one-story Buildblock wall and wood framed floor and roof. Maximum axial load. - Figure 6.4; Tables 6.5a&b

BUILDBLOCK FLAT PANEL ABOVE GRADE WALLS

TABLE 6.2A BUILDBLOCK / BUILDLOCK ABOVE GRADE WALLS LOAD CASE 1. 8FT - 12FT

DESIGN WIND PRESSURE (PSF)	Max. Wall Height (ft.) Per Floor	BUILDBLOCK FLAT PANEL WALL THICKNESS (INCHES)									
		VERTICAL REBAR SPACING (INCHES) *2,*3,*4,*5									
		4"		6"		8"		10"		12" *8	
		#4	#5	#4	#5	#4	#5	#4	#5	#4	#5
20	8	48	48	48	48	48	48	48	48	48	48
	10	36	48	48	48	48	48	48	48	48	48
	12			48	48	48	48	48	48	48	48
30	8	48	48	48	48	48	48	48	48	48	48
	10	30	36	48	48	48	48	48	48	48	48
	12			42	48	48	48	48	48	48	48
40	8	42	48	48	48	48	48	48	48	48	48
	10	30	36	42	48	48	48	48	48	48	48
	12			30	48	48	48	48	48	48	48
50*1	8	36	48	48	48	48	48	48	48	48	48
	10			30	48	48	48	48	48	48	48
	12			18	36	48	48	48	48	48	48
60*1	8	30	48	48	48	48	48	48	48	48	48
	10			24	42	42	48	48	48	48	48
	12			18	30	26	42	48	48	48	48
70*1	8	24	36	36	48	48	48	48	48	48	48
	10			24	36	34	48	44	48	48	48
	12			18	24	22	36	30	48	48	48
80*1	8	16	24	30	48	48	48	48	48	48	48
	10			20	32	30	44	36	48	48	48
	12			12	20	18	30	24	42	30	48

1. Horizontal Rebar #4 @ 32" o.c. Minimum or #3 @ 16" o.c.
2. For design wind pressures > 40psf, all vertical rebar in the top-most story shall terminate with a 90 degree standard hook.
3. The free end of the hook shall be within 4" of the top of the wall and shall be oriented parallel to the horizontal rebar at the top of the wall.
4. Refer to the design criteria limits in Table 1.1 and the Load Case diagrams for this table
5. Vertical rebar is to be placed in the center of the form/wall.
6. The wall must be braced against sidesway at the top of the wall.
7. Refer to Above-Grade Notes and Procedure
8. Per ACI318-11.7.2.3, 12" walls require 2 layers of reinforcing for concrete shrinkage, but ICF's have much less shrinkage-refer to ref.[3], section 1.2

6.2B BUILDBLOCK / BUILDLOCK ABOVE GRADE WALLS
LOAD CASE 1. 14FT - 20FT

Design Wind Pressure (psf)	Max. Wall Height (ft.) Per Floor	Buildblock Flat Panel Wall thickness (inches)									
		Vertical Rebar Spacing (inches) *2,*3,*4,*5									
		4"		6"		8"		10"		12" *8	
		#4	#5	#4	#5	#4	#5	#4	#5	#4	#5
20	14			12	24	30	48	48	48	48	48
	16					24	42	48	48	48	48
	18					18	30	48	48	48	48
	20					12	24	48	48	48	48
30	14			12	24	30	42	48	48	48	48
	16					24	30	48	48	42	48
	18				40	18	24	42	48	36	42
	20					12	18	36	48	30	36
40	14			9	16	18	30	48	48	42	48
	16					12	24	48	48	36	42
	18					9	12	30	42	30	36
	20						9	24	30	24	30
50*1	14			9	16	18	30	42	48	36	42
	16					12	18	30	48	30	36
	18					6	9	24	42	24	30
	20						6	18	30	12	24
60*1	14					12	24	36	48	30	36
	16					12	18	14	42	24	30
	18							18	30	18	24
	20							12	18	6	12
70*1	14					12	24	30	48	12	24
	16					12	18	18	36	12	18
	18							12	24	9	12
	20							9	18	6	12
80*1	14					12	18	24	42	12	24
	16					9	12	18	24	12	18
	18							12	18	9	12
	20							6	12	6	12

1. Horizontal Rebar #4 @ 32" o.c. Minimum or #3 @ 16" o.c.
2. For design wind pressures > 40psf, all vertical rebar in the top-most story shall terminate with a 90 degree standard hook.
3. The free end of the hook shall be within 4" of the top of the wall and shall be oriented parallel to the horizontal rebar at the top of the wall.
4. Refer to the design criteria limits in Table 1.1 and the Load Case diagrams for this table
5. Vertical rebar is to be placed in the center of the form/wall.
6. The wall must be braced against sidesway at the top of the wall.
7. Refer to Above-Grade Notes and Procedure
8. Per ACI318-11.7.2.3, 12" walls require 2 layers of reinforcing for concrete shrinkage, but ICF's have much less shrinkage-refer to ref.[3], section 1.2

TABLE 6.3A MINIMUM VERTICAL REINFORCING SPACING FOR BUILDBLOCK FLAT PANEL WALLS LOAD CASE 2. 8FT - 12FT

DESIGN WIND PRESSURE (PSF)	MAX. WALL HEIGHT (FT.) PER FLOOR	VERTICAL REBAR SPACING (INCHES) *2,*3,*4,*5									
		BUILDBLOCK FLAT PANEL WALL THICKNESS (INCHES)									
		4"		6"		8"		10"		12" *8	
		#4	#5	#4	#5	#4	#5	#4	#5	#4	#5
20	8	48	48	48	48	48	48	48	48	48	48
	10	36	48	48	48	48	48	48	48	48	48
	12			48	48	48	48	48	48	48	48
30	8	48	48	48	48	48	48	48	48	48	48
	10	30	36	48	48	48	48	48	48	48	48
	12			42	48	48	48	48	48	48	48
40	8	42	48	48	48	48	48	48	48	48	48
	10	30	36	48	48	48	48	48	48	48	48
	12			30	48	48	48	48	48	48	48
50*1	8	36	48	48	48	48	48	48	48	48	48
	10			42	48	48	48	48	48	48	48
	12			24	36	48	48	48	48	48	48
60*1	8	30	48	48	48	48	48	48	48	48	48
	10			30	48	48	48	48	48	48	48
	12			18	30	48	48	48	48	48	48
70*1	8			48	48	48	48	48	48	48	48
	10			30	42	36	48	48	48	48	48
	12			18	30	24	48	42	48	48	48
80*1	8			42	48	42	48	48	48	48	48
	10			24	36	36	48	42	48	48	48
	12			12	24	24	42	36	48	48	48

1. Horizontal Rebar #4 @ 32" o.c. Minimum or #3 @ 16" o.c.
2. For design wind pressures > 40psf, all vertical rebar in the top-most story shall terminate with a 90 degree standard hook.
3. The free end of the hook shall be within 4" of the top of the wall and shall be oriented parallel to the horizontal rebar at the top of the wall.
4. Refer to the design criteria limits in Table 1.1 and the Load Case diagrams for this table
5. Vertical rebar is to be placed in the center of the form/wall.
6. The wall must be braced against sidesway at the top of the wall.
7. Refer to Above-Grade Notes and Procedure
8. Per ACI318-11.7.2.3, 12" walls require 2 layers of reinforcing for concrete shrinkage, but ICF's have much less shrinkage-refer to ref.[3], section 1.2

TABLE 6.3B MINIMUM VERTICAL REINFORCING SPACING FOR BUILDBLOCK FLAT PANEL WALLS LOAD CASE 2. 14FT - 20FT

DESIGN WIND PRESSURE (PSF)	MAX. WALL HEIGHT (FT.) PER FLOOR	VERTICAL REBAR SPACING (INCHES) *2,*3,*4,*5									
		BUILDBLOCK FLAT PANEL WALL THICKNESS (INCHES)									
		4"		6"		8"		10"		12" *8	
		#4	#5	#4	#5	#4	#5	#4	#5	#4	#5
20	14			18	24	30	48	48	48	48	48
	16					24	42	48	48	48	48
	18					18	36	48	48	48	48
	20					12	30	48	48	48	48
30	14			12	24	30	42	48	48	48	48
	16					24	30	48	48	42	48
	18					12	24	42	48	36	42
	20					12	18	30	42	30	36
40	14			9	12	18	30	48	48	42	48
	16					12	24	42	48	36	42
	18					9	18	30	42	30	36
	20						12	24	36	24	30
50*1	14			9	12	18	30	42	48	36	42
	16					12	24	30	48	30	36
	18					6	12	24	42	24	30
	20						9	18	30	12	24
60*1	14					12	24	36	48	30	36
	16					12	18	24	42	24	30
	18							28	30	18	24
	20							12	18	6	12
70*1	14					12	24	30	48	12	24
	16					12	18	18	36	12	18
	18							12	24	9	12
	20							9	18	6	12
80*1	14					12	18	24	42	12	24
	16					9	12	16	24	12	18
	18							12	18	9	12
	20							6	12	6	12

1. Horizontal Rebar #4 @ 32" o.c. Minimum or #3 @ 16" o.c.
2. For design wind pressures > 40psf, all vertical rebar in the top-most story shall terminate with a 90 degree standard hook.
3. The free end of the hook shall be within 4" of the top of the wall and shall be oriented parallel to the horizontal rebar at the top of the wall.
4. Refer to the design criteria limits in Table 1.1 and the Load Case diagrams for this table
5. Vertical rebar is to be placed in the center of the form/wall.
6. The wall must be braced against sidesway at the top of the wall.
7. Refer to Above-Grade Notes and Procedure
8. Per ACI318-11.7.2.3, 12" walls require 2 layers of reinforcing for concrete shrinkage, but ICF's have much less shrinkage-refer to ref.[3], section 1.2

TABLE 6.4A MINIMUM VERTICAL REINFORCING SPACING FOR BUILDBLOCK FLAT PANEL WALLS LOAD CASE 3 & 4. 8FT - 12FT

DESIGN WIND PRES-SURE (PSF)	MAX. WALL HEIGHT (FT.) PER FLOOR	VERTICAL REBAR SPACING (INCHES) *2,*3,*4,*5									
		BUILDBLOCK FLAT PANEL WALL THICKNESS (INCHES)									
		4"		6"		8"		10"		12" *8	
		#4	#5	#4	#5	#4	#5	#4	#5	#4	#5
20	8	48	48	48	48	48	48	48	48	48	48
	10	36	48	48	48	48	48	48	48	48	48
	12			48	48	48	48	48	48	48	48
30	8	48	48	48	48	48	48	48	48	48	48
	10	30	36	48	48	42	48	48	48	48	48
	12			42	48	30	42	48	48	48	48
40	8	42	48	48	48	48	48	48	48	48	48
	10	30	36	48	48	42	48	48	48	48	48
	12			30	48	30	42	48	48	48	48
50*1	8	36	48	48	48	36	42	42	48	48	48
	10			36	42	30	42	42	48	48	48
	12			24	36	24	36	36	42	48	48
60*1	8	30	48	36	42	30	42	36	48	48	48
	10			24	36	24	36	30	42	48	48
	12			18	24	18	30	30	42	48	48
70*1	8			30	36	30	42	30	42	48	48
	10			24	30	24	36	24	36	48	48
	12			18	24	18	30	24	36	48	48
80*1	8			30	36	30	36	36	42	48	48
	10			18	30	24	36	24	36	48	48
	12			12	24	12	30	24	36	48	48

1. Horizontal Rebar #4 @ 32" o.c. Minimum or #3 @ 16" o.c.
2. For design wind pressures > 40psf, all vertical rebar in the top-most story shall terminate with a 90 degree standard hook.
3. The free end of the hook shall be within 4" of the top of the wall and shall be oriented parallel to the horizontal rebar at the top of the wall.
4. Refer to the design criteria limits in Table 1.1 and the Load Case diagrams for this table
5. Vertical rebar is to be placed in the center of the form/wall.
6. The wall must be braced against sidesway at the top of the wall.
7. Refer to Above-Grade Notes and Procedure
8. Per ACI318-11.7.2.3, 12" walls require 2 layers of reinforcing for concrete shrinkage, but ICF's have much less shrinkage-refer to ref.[3], section 1.2

TABLE 6.4B MINIMUM VERTICAL REINFORCING SPACING FOR BUILDBLOCK FLAT PANEL WALLS LOAD CASE 3 & 4. 14FT - 20FT

DESIGN WIND PRES-SURE (PSF)	MAX. WALL HEIGHT (FT.) PER FLOOR	VERTICAL REBAR SPACING (INCHES) *2,*3,*4,*5									
		BUILDBLOCK FLAT PANEL WALL THICKNESS (INCHES)									
		4"		6"		8"		10"		12" *8	
		#4	#5	#4	#5	#4	#5	#4	#5	#4	#5
20	14			12	18	30	48	48	48	48	48
	16					30	42	48	48	48	48
	18					18	36	48	48	48	48
	20					12	30	48	48	48	48
30	14			12	18	30	42	48	48	48	48
	16					24	30	48	48	42	48
	18					18	24	42	48	36	42
	20					12	18	30	42	30	36
40	14			9	18	24	30	48	48	42	48
	16					18	24	42	48	36	42
	18					9	18	30	42	30	36
	20						12	24	36	24	30
50*1	14			9	12	18	30	42	48	36	42
	16					12	24	30	42	30	36
	18					6	12	24	30	24	30
	20						9	12	24	12	24
60*1	14					18	24	30	48	30	36
	16					12	18	24	42	24	30
	18							18	24	18	24
	20							9	12	6	12
70*1	14					12	24	24	42	12	24
	16					9	18	18	30	12	18
	18							9	18	9	12
	20							6	12	6	12
80*1	14					12	24	24	36	12	24
	16					6	12	18	24	12	18
	18							9	18	9	12
	20							6	12	6	12

1. Horizontal Rebar #4 @ 32" o.c. Minimum or #3 @ 16" o.c.
2. For design wind pressures > 40psf, all vertical rebar in the top-most story shall terminate with a 90 degree standard hook.
3. The free end of the hook shall be within 4" of the top of the wall and shall be oriented parallel to the horizontal rebar at the top of the wall.
4. Refer to the design criteria limits in Table 1.1 and the Load Case diagrams for this table
5. Vertical rebar is to be placed in the center of the form/wall.
6. The wall must be braced against sidesway at the top of the wall.
7. Refer to Above-Grade Notes and Procedure
8. Per ACI318-11.7.2.3, 12" walls require 2 layers of reinforcing for concrete shrinkage, but ICF's have much less shrinkage-refer to ref.[3], section 1.2

7.0 LINTELS

7.1 LINTEL REINFORCEMENT FOR BUILDBLOCK BUILDING SYSTEMS

Lintels are exterior beams subjected to flexure (bending) and shear. Flexural loads are resisted by reinforcing bars placed at the top and bottom of the lintel. The lintel is generally poured as an integral part of the wall, and so for design purposes the ends of the lintel are assumed to be rigid or fixed against rotation. Consistent with this design assumption, the reinforcing bars must extend into the wall beyond the edges of the opening. The length of the extension depends on the size of the bar and is given in the lintel reinforcement tables. When the end of the lintel is close to the corner of a wall, the extension should be bent 90 degrees to extend around the corner. Shear reinforcement, when required, is provided by #3 stirrups which can be "S" or "C" shaped as shown in the stirrup detail in this manual. The shear reinforcement must be adequately anchored at top and bottom as shown in the stirrup details.

Lintels are designed per the ACI 318 Building Code Requirements for Structural Concrete to act as beams spanning over openings in exterior walls. Tables are provided for lintel heights of 8", 12", 16", 24", and 32". The height of the lintel is limited to the height of the BuildBlock wall above the opening, and the higher the lintel the less will be the amount of reinforcement required. The lintel reinforcement tables assume a minimum of 3,000 psi concrete strength (at 28 days) and grade 40 for stirrups and grade 60 rebar for flexural or longitudinal reinforcement.

These tables may also be used for higher strengths of concrete or rebar. The information in these tables has been determined assuming the ends of the lintel are rigid or fixed against rotation and the superimposed load on the lintel is uniformly distributed (i.e., there are no concentrated point loads). Any arching action of the lintel has conservatively been ignored. These tables do not apply to construction cases not covered by the assumed conditions, and such cases should receive special design consideration. Intermediate lintel heights should be designed using the next smaller lintel height.

Intermediate lintel spans should be designed using the next longer lintel span.

To use the lintel reinforcement tables the applied service loads superimposed on the lintel must be multiplied by load factors. Refer to ACI 318 or applicable building codes for appropriate load factors applied to dead and live loads as well as for minimum live load requirements. Examples are given in Table 7.1.

The lintels have also been checked for deflection. Allowable deflection is limited to L/480 for that part of the deflection occurring after installation of the nonstructural element (e.g., window or door) in the opening. L represents the span of the lintel. To design lintels consistent with the typical residential construction conditions used to establish the vertical wall reinforcement tables found elsewhere in this manual, the following loads and load factors may be used.

Total Floor Factored Uniform Load on Lintel= 1360 plf (includes DL+LL for 1 structural floor; x2 for 2 floors)

Total Roof Factored Uniform Load on Lintel (16 Feet Tributary Area per Foot)		
	Without Attic	With Attic
Roof Dead Load + Live Load	1080 plf	1720 plf
Roof Dead Load + Snow Load	2040 plf	2680 plf

7.2 HOW TO USE THE LINTEL REINFORCEMENT TABLES

Review the design criteria used to establish the lintel reinforcement tables to determine if they are applicable. In particular, verify that there are no concentrated loads applied to the lintel.

Determine the lintel height above the opening. Tables are provided for lintel heights of 8", 12", 16", 24", and 32". Intermediate lintel heights may be reinforced according to the table for the next smaller lintel height.

Determine the lintel span that is the width of the clear opening under the lintel. For spans that are intermediate to the spans shown in the lintel tables, use the next largest lintel span.

Determine the factored load per foot of lintel. Use the expected dead and live applied loads or the code required minimum loads multiplied by the appropriate load factors. The factored loads given may be used for conditions that do not exceed those shown above for typical residential construction. Examples are given in Table 7.1.

Find the appropriate table for the selected lintel height and the BuildBlock form size being used (9", 11", 13", 15", or 17"). Find a load in the table equal to or greater than the applied factored load determined above. Read from the table the required bending (top & bottom) reinforcement (1-#5, 1-#6, 2-#5) – and the required shear reinforcement (#3 stirrups and spacing.)

7.3 LINTEL REINFORCEMENT TABLE NOTES

Consult with the local building code for minimum required service loads.

Applied service loads must be multiplied by load factors to use these tables. See ACI 318 or applicable building code for appropriate load factors applied to dead and live loads.

These tables apply only when the following conditions are met: Superimposed loads on the lintel are uniformly distributed. Lintel is not subject to any concentrated loads. Both ends of the lintel are fixed against rotation.

Where required, (2) #5 bars may be bundled together (in

contact with each other). Alternately 1-#7 may substitute for 2-#5 bars.

Longitudinal or flexural lintel reinforcement must extend 24 inches development length beyond each face of the opening.

A minimum of 2-#5 vertical bars shall be provided on each side of every opening to meet ACI 318 requirements.

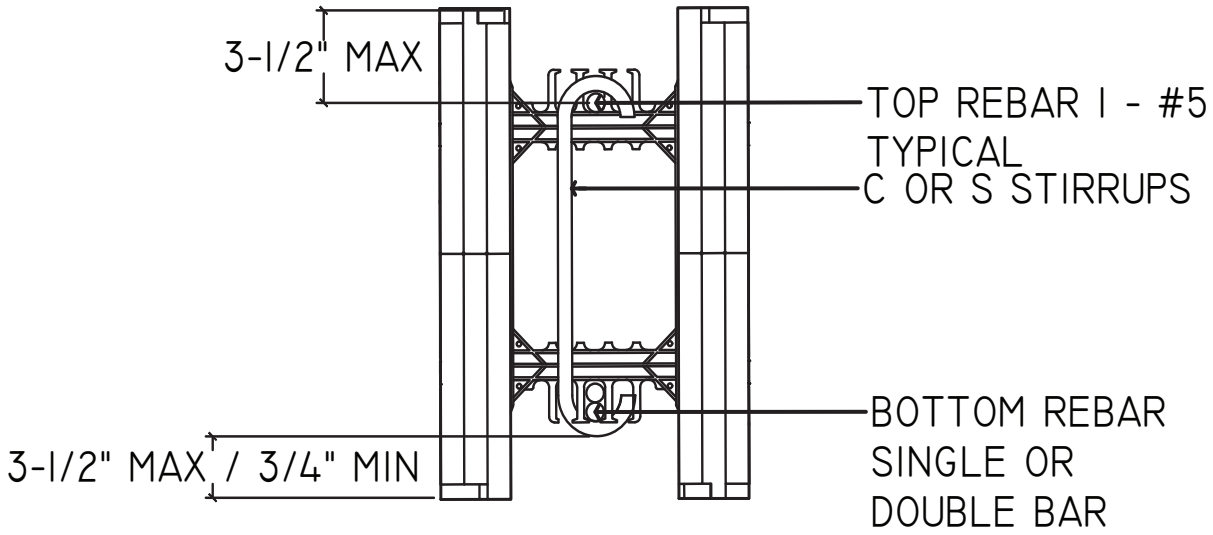
See details in introduction to lintel reinforcement for reinforcement placement.

Lintels designed for typical residential construction cases used to establish the vertical reinforcement tables found elsewhere in this manual may use the following factored loads (these factored loads are based on 1 structural floor system and using 16 feet of tributary area per linear foot). Consult an engineer beyond these parameters.

Total Roof Factored Uniform Load on Lintel (16 Feet Tributary Area per Foot)		
	Without Attic	With Attic
Roof Dead Load + Live Load	1080 plf	1720 plf
Roof Dead Load + Snow Load	2040 plf	2680 plf

The #3 stirrups must be placed at the required spacing as indicated in the legend at the top of the lintel tables.

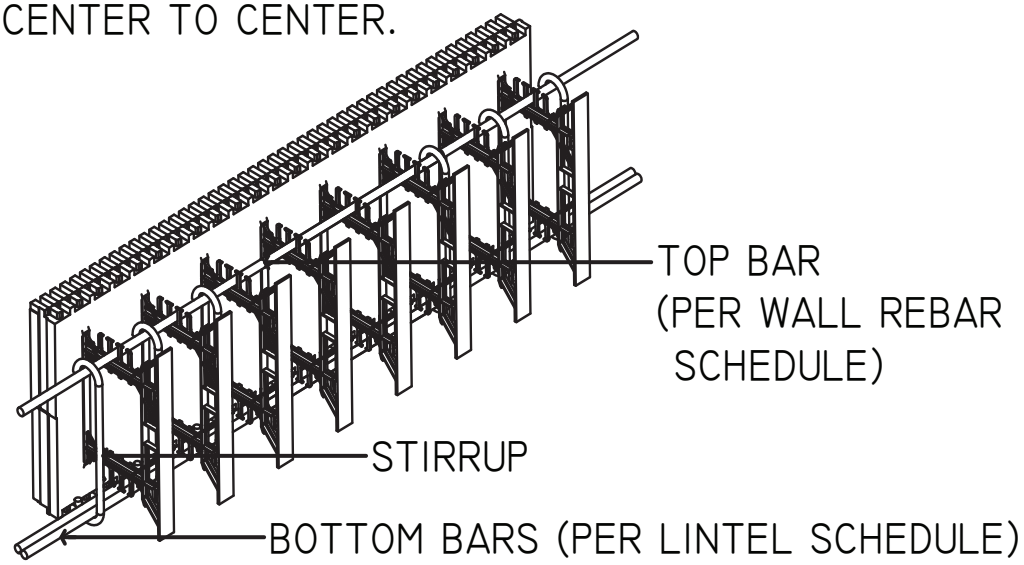
When (2) horizontal lintel bars are required, the (2) bars are to be stacked one on top of the other and centered in the wall. The stirrups, if required, are wrapped around the stacked top and bottom.



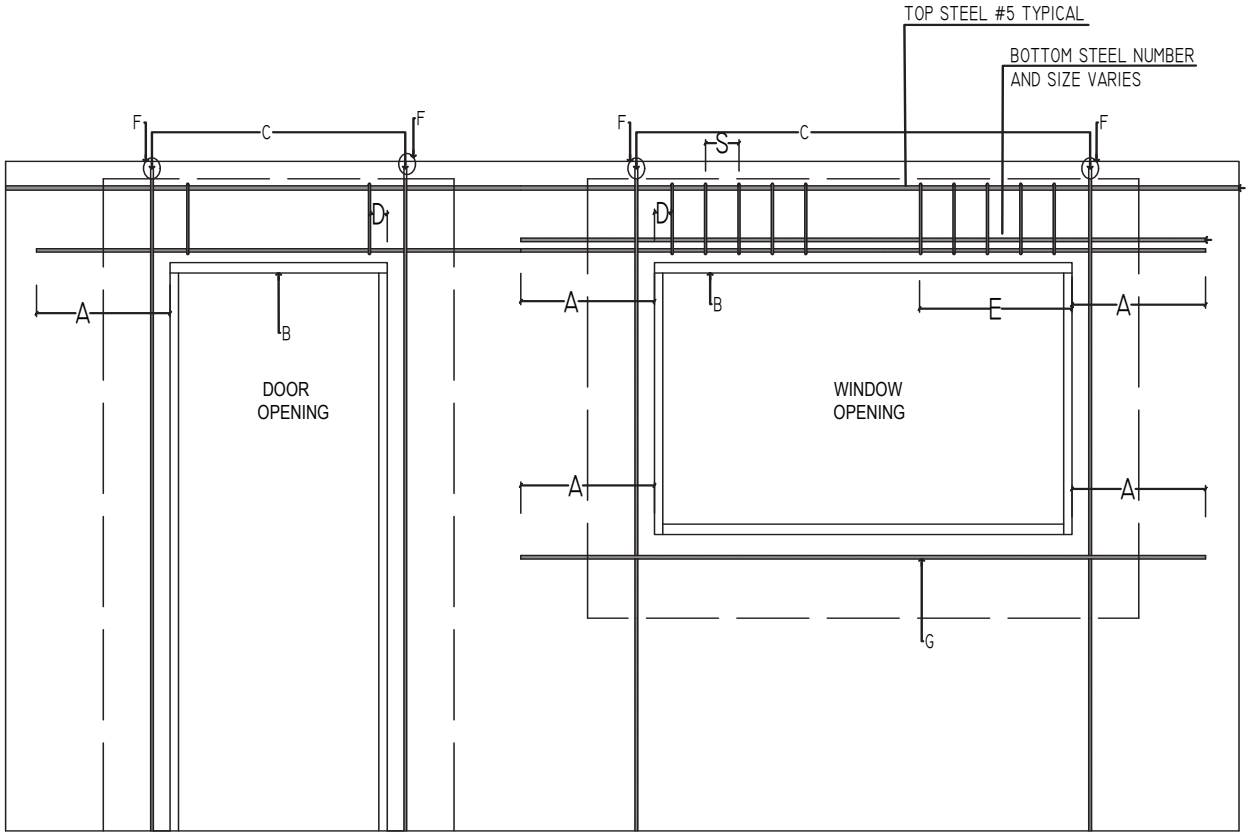
SEE LINTEL SCHEDULE FOR:
-SPACING AND END DISTANCE OF STIRRUPS
-REINFORCEMENT SCHEDULE

SEE TYPICAL REINFORCEMENT DETAIL FOR WALL OPENINGS FOR:
-ADDITIONAL LINTEL DESIGN AND INSTRUCTIONS.

STIRRUP END DISTANCE:
FROM INSIDE FACE OF OPENING TOWARD CENTER
OF OPENING EACH SIDE.
STIRRUPS ARE SPACED 1/2 HEADER HEIGHT,
CENTER TO CENTER.



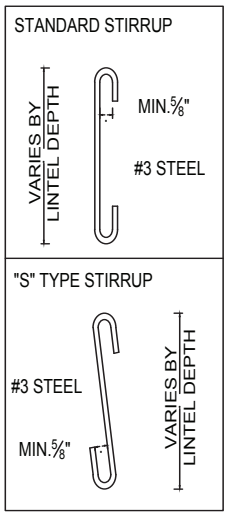
LINTEL DETAIL



REQUIRED LINTEL AND OPENING REINFORCEMENT

A. 24" MINIMUM DISTANCE. MAY WRAP 90° AROUND CORNERS.
B. BUCKING SYSTEM
   VERTICAL REINFORCEMENT. MIN 2 - #5 EACH SIDE. EXTEND TO TOP OF WALL, LESS CONCRETE COVER.
C. LOCATE FIRST STIRRUP AT 1/2 SPACING (S) FROM FACE OF OPENING.
D. REMAINING STIRRUPS AT "S" TO STIRRUP END DISTANCE.
E. STIRRUP END DISTANCE - SPECIFIED IN LINTEL TABLES.
F. 90 DEGREE HOOK AT TOP OF VERTICAL STEEL
G. 2 - #5 ADDITIONAL REBAR AROUND ALL OPENINGS, IN ADDITION TO REQUIRED LINTEL AND WALL REINFORCEMENT.
H. IF LINTEL TABLE HAS BOTTOM REINFORCING OF AT LEAST 2 - #5 REBAR, ADD 1 - #5 REBAR AT TOP OF OPENING.
I. STIRRUP SPACING, "S" TO BE 6" UNLESS NOTED OTHERWISE IN LINTEL TABLES.

NOTE: REQUIRED WALL REINFORCEMENT NOT SHOWN FOR CLARITY.



BUILDBLOCK & BUILDLOCK FLAT WALL LINTEL TABLES

TABLE 7.1A LINTEL LOAD CONDITIONS FOR USE WITH LINTEL TABLES

LOAD RANGE	EXAMPLE LOAD CONDITION
250 lbs./ft	1-story house; gable end wood roof trusses - non-load bearing wall
500 lbs./ft	1-story house; wood roof trusses 40 ft. span
750 lbs./ft	1-story house; wood roof trusses 40 ft. span; + finished attic
1000 lbs./ft	1-story house; wood roof trusses 40 ft. span; tile roof + finished attic
1500 lbs./ft	2-story house; wood roof trusses (no attic, asphalt shingles) & wood floor system - both 25 ft. spans plus 8 ft high 4" ICF wall
2000 lbs./ft	2-story house; wood roof trusses (attic storage) & wood floor system - both 25 ft. spans plus 10 ft high 4" ICF wall
2500 lbs./ft	2-story house; wood roof trusses (attic storage& tile roof) & wood floor system - both 40 ft. spans plus 10 ft high 4" ICF wall
3000 lbs./ft	2-story house; wood roof trusses (attic storage& tile roof) & wood floor system - both 40 ft. spans plus 10 ft high 6" ICF wall

TABLE 7.2A
LONGITUDINAL AND SHEAR REINFORCING
FOR 4" THICK BY 8" HIGH ICF FLAT PANEL LINTELS

OPENING WIDTH (FT)	UNIFORMLY DISTRIBUTED FACTORED LOAD (LB./FT.)															
	250		500		750		1000		1500		2000		2500		3000	
	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)
3	1-#4	NR	1-#4	NR	1-#4	*FL	1-#4	*FL	1-#4	*FL	1-#4	*FL	1-#4	*FL	1-#4	*FL
4	1-#4	NR	1-#4	12	1-#4	*FL	1-#4	*FL	1-#4	*FL	1-#5	*FL	1-#5	*FL	1-#5	*FL
5	1-#4	NR	1-#4	18	1-#5	*FL	1-#5	*FL	1-#5	*FL	2-#5	*FL	1-#5	*FL		
6	1-#4	NR	1-#5	30	1-#6	*FL	1-#6	*FL	1-#6	*FL	2-#5	*FL	2-#5	*FL		
8	1-#4	12	1-#6	42	2-#5	*FL	1-#6	*FL	2-#6	*FL						
10	1-#4	18	1-#6	54	2-#5	*FL										
12	1-#5	30	2-#5	60												
14	1-#6	42														
16																
18																
20																

NOTES:

This table only applies to gravity loads(including self weight of the beam itself); any lateral loads due to wind or seismic need to be taken into account by a qualified structural engineer
All shear reinforcement (#3 rebar) is at 6" spacing up to end distance at each end of lintel beam.
*FL = Stirrups are required the Full Length of the Lintel Beam
*NR = Not Required

TABLE 7.2B
LONGITUDINAL AND SHEAR REINFORCING FOR 4" THICK BY 12" HIGH ICF FLAT PANEL LINTELS

OPENING WIDTH (FT)	UNIFORMLY DISTRIBUTED FACTORED LOAD (LB./FT.)															
	250		500		750		1000		1500		2000		2500		3000	
	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)
3	1-#4	NR	1-#4	NR	1-#4	12	1-#4	*FL	1-#4	*FL	1-#4	*FL	1-#4	*FL	1-#4	*FL
4	1-#4	NR	1-#4	12	1-#4	12	1-#4	*FL	1-#4	*FL	1-#5	*FL	1-#5	*FL	1-#5	*FL
5	1-#4	NR	1-#4	12	1-#4	18	1-#5	*FL	1-#5	*FL	1-#5	*FL	1-#6 & 1-#5	*FL	1-#5	*FL
6	1-#4	NR	1-#4	18	1-#5	24	1-#5	*FL	1-#5	*FL	1-#6	*FL	1-#6 & 1-#5	*FL	2-#5	*FL
8	1-#4	NR	1-#4	24	1-#5	36	1-#6	*FL	2-#5	*FL						
10	1-#4	12	1-#5	36	1-#6	48	2-#5	*FL								
12	1-#5	12	1-#6	49	2-#5	54										
14	1-#5	24	2-#5	60												
16	1-#6	36														
18																
20																

NOTES:

This table only applies to gravity loads(including self weight of the beam itself); any lateral loads due to wind or seismic need to be taken into account by a qualified structural engineer
All shear reinforcement (#3 rebar) is at 6" spacing up to end distance at each end of lintel beam.
*FL = Stirrups are required the Full Length of the Lintel Beam
*NR = Not Required

TABLE 7.2C
LONGITUDINAL AND SHEAR REINFORCING FOR 4" THICK BY 16" HIGH ICF FLAT PANEL LINTELS

OPENING WIDTH (FT)	UNIFORMLY DISTRIBUTED FACTORED LOAD (LB./FT.)															
	250		500		750		1000		1500		2000		2500		3000	
	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)
3	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	12	1-#4	*FL	1-#4	*FL	1-#4	*FL
4	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	18	1-#4	*FL	1-#4	*FL	1-#4	*FL
5	1-#4	NR	1-#4	NR	1-#4	6.5	1-#4	13	1-#4	24	1-#4	*FL	1-#5	*FL	1-#5	*FL
6	1-#4	NR	1-#4	NR	1-#4	13	1-#4	13	1-#5	30	1-#5	*FL	1-#5	*FL	1-#5	*FL
8	1-#4	NR	1-#4	NR	1-#4	13	1-#4	26	1-#5	36	1-#6	*FL	1-#6	*FL	2-#5	*FL
10	1-#4	NR	1-#4	12	1-#4	26	1-#5	39	1-#6	54	2-#5	*FL	2-#6	*FL	2-#6	*FL
12	1-#4	NR	1-#4	30	1-#5	39	1-#6	52	2-#5	66	2-#6	*FL				
14	1-#4	NR	1-#5	42	1-#6	52	1-#7/2-#5	65	2-#6	78						
16	1-#4	12	1-#6	60	1-#7/2-#5	65	1-#8/2-#6	78								
18	1-#5	18	1-#6	66	1-#8/2-#6	78										
20	1-#5	30	1-#7	78												

NOTES:

This table only applies to gravity loads(including self weight of the beam itself); any lateral loads due to wind or seismic need to be taken into account by a qualified structural engineer
All shear reinforcement (#3 rebar) is at 6" spacing up to end distance at each end of lintel beam.
*FL = Stirrups are required the Full Length of the Lintel Beam
*NR = Not Required

TABLE 7.2D
LONGITUDINAL AND SHEAR REINFORCING FOR 4" THICK BY 24" HIGH ICF FLAT PANEL LINTELS

OPENING WIDTH (FT)	UNIFORMLY DISTRIBUTED FACTORED LOAD (LB./FT.)															
	250		500		750		1000		1500		2000		2500		3000	
	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)
3	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	*FL	1-#4	*FL
4	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	*FL	1-#4	*FL	1-#4	*FL
5	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	12	1-#4	*FL	1-#4	*FL	1-#4	*FL
6	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	12	1-#5	*FL	1-#5	*FL	1-#5	*FL
8	1-#4	NR	1-#4	NR	1-#4	12	1-#4	12	1-#5	24	1-#5	*FL	1-#5	*FL	1-#5	*FL
10	1-#4	NR	1-#4	NR	1-#4	12	1-#5	24	1-#5	36	1-#6	*FL	1-#6	*FL	2-#5	*FL
12	1-#4	NR	1-#4	NR	1-#4	18	1-#5	36	1-#6	54	2-#5	*FL	2-#5	*FL	2-#6	*FL
14	1-#4	NR	1-#4	NR	1-#5	30	1-#6	48	2-#5	66	1-#6 + 1-#5	*FL	2-#6	*FL		
16	1-#4	NR	1-#4	NR	1-#5	42	2-#5	60	1-#6 + 1-#5	78	2-#6	*FL				
18	1-#4	NR	1-#5	12	1-#6	54	1-#6 + 1-#5	72	2-#6	90						
20	1-#4	NR	1-#5	18	2-#5	66	2-#6	84								

NOTES:

This table only applies to gravity loads(including self weight of the beam itself); any lateral loads due to wind or seismic need to be taken into account by a qualified structural engineer
All shear reinforcement (#3 rebar) is at 6" spacing up to end distance at each end of lintel beam.
*FL = Stirrups are required the Full Length of the Lintel Beam
*NR = Not Required

TABLE 7.2E
LONGITUDINAL AND SHEAR REINFORCING FOR 4" THICK BY 32" HIGH ICF FLAT PANEL LINTELS

UNIFORMLY DISTRIBUTED FACTORED LOAD (LB./FT.)																
OPENING WIDTH (FT)	250		500		750		1000		1500		2000		2500		3000	
	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)
3	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR		NR		NR	1-#4	NR	1-#4	NR
4	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	12	1-#4	12
5	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	12	1-#4	12	1-#4	12
6	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	12	1-#4	18	1-#4	24
8	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	12	1-#4	24	1-#4	30	1-#5	30
10	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	12	1-#4	24	1-#5	36	1-#5	42	1-#6	48
12	1-#4	NR	1-#4	NR	1-#4	12	1-#4	18	1-#5	36	1-#6	48	1-#6	54	2-#5	60
14	1-#4	NR	1-#4	NR	1-#4	18	1-#4	36	1-#6	48	2-#5	60	2-#5	66	2-#6	72
16	1-#4	NR	1-#4	NR	1-#5	24	1-#5	48	2-#5	60	1-#6 + 1-#5	72	2-#6	78		
18	1-#4	NR	1-#4	12	1-#5	36	1-#6	60	1-#5	72	2-#6	84				
20	1-#4	NR	1-#5	18	1-#6	48	2-#5	72	1-#6 + 1-#5	84						

NOTES:
This table only applies to gravity loads(including self weight of the beam itself); any lateral loads due to wind or seismic need to be taken into account by a qualified structural engineer
All shear reinforcement (#3 rebar) is at 6" spacing up to end distance at each end of lintel beam.
*FL = Stirrups are required the Full Length of the Lintel Beam
*NR = Not Required

TABLE 7.3A
LONGITUDINAL AND SHEAR REINFORCING FOR 6" THICK BY 8" HIGH ICF FLAT PANEL LINTELS

OPENING WIDTH (FT)	UNIFORMLY DISTRIBUTED FACTORED LOAD (LB./FT.)															
	250		500		750		1000		1500		2000		2500		3000	
	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)
3	1-#4	NR	1-#4	NR	1-#4	*FL	1-#4	*FL	1-#4	*FL	1-#4	*FL	1-#4	*FL	1-#5	*FL
4	1-#4	NR	1-#4	NR	1-#4	*FL	1-#4	*FL	1-#5	*FL	1-#5	*FL	1-#5	*FL	1-#6	*FL
5	1-#4	NR	1-#5	12	1-#5	*FL	1-#5	*FL	1-#5	*FL						
6	1-#4	NR	1-#5	18	1-#5	*FL	1-#5	*FL	1-#6	*FL						
8	1-#5	12	1-#5	30	1-#6	*FL	2-#5	*FL								
10	1-#5	12	1-#6	42	2#6	*FL										
12	1-#5	18	2-#5	54												
14	1-#6	30														
16	2-#5	42														
18																
20																

NOTES:

This table only applies to gravity loads(including self weight of the beam itself); any lateral loads due to wind or seismic need to be taken into account by a qualified structural engineer
All shear reinforcement (#3 rebar) is at 6" spacing up to end distance at each end of lintel beam.
*FL = Stirrups are required the Full Length of the Lintel Beam
*NR = Not Required

TABLE 7.3B
LONGITUDINAL AND SHEAR REINFORCING FOR 6" THICK BY 12" HIGH ICF FLAT PANEL LINTELS

OPENING WIDTH (FT)	UNIFORMLY DISTRIBUTED FACTORED LOAD (LB./FT.)															
	250		500		750		1000		1500		2000		2500		3000	
	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)
3	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	*FL	1-#4	*FL	1-#4	*FL	1-#4	*FL	1-#4	*FL
4	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	*FL	1-#4	*FL	1-#5	*FL	1-#5	*FL	1-#5	*FL
5	1-#4	NR	1-#4	8	1-#5	12	1-#5	*FL	1-#5	*FL	1-#5	*FL	1-#6	*FL	1-#6	*FL
6	1-#5	NR	1-#5	12	1-#5	12	1-#5	*FL	1-#5	*FL	1-#6	*FL	1-#6	*FL	2-#6	*FL
8	1-#5	NR	1-#5	18	1-#6	24	1-#5	*FL	2-#5	*FL	2-#5	*FL	2-#6	*FL		
10	1-#5	NR	1-#6	24	1#6	36	2-#5	*FL	2#6	*FL						
12	1-#5	NR	2-#5	30	2-#5	48	2-#6	*FL								
14	1-#6	12	2-#5	42	2-#6	60										
16	1-#6	18	1-#6 + 1-#5	54												
18																
20																

NOTES:

This table only applies to gravity loads(including self weight of the beam itself); any lateral loads due to wind or seismic need to be taken into account by a qualified structural engineer
All shear reinforcement (#3 rebar) is at 6" spacing up to end distance at each end of lintel beam.
*FL = Stirrups are required the Full Length of the Lintel Beam
*NR = Not Required

TABLE 7.3C
LONGITUDINAL AND SHEAR REINFORCING FOR 6" THICK BY 16" HIGH ICF FLAT PANEL LINTELS

OPENING WIDTH (FT)	UNIFORMLY DISTRIBUTED FACTORED LOAD (LB./FT.)															
	250		500		750		1000		1500		2000		2500		3000	
	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)
3	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	*FL	1-#4	*FL	1-#5	*FL
4	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#5	12	1-#5	*FL	1-#4	*FL	1-#5	*FL
5	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#5	12	1-#5	*FL	1-#5	*FL	1-#5	*FL
6	1-#4	NR	1-#4	NR	1-#5	12	1-#5	12	1-#5	18	1-#6	*FL	1-#6	*FL	1-#5	*FL
8	1-#4	NR	1-#5	NR	1-#5	12	1-#5	18	1-#6	24	2-#5	*FL	1-#6	*FL	2-#5	*FL
10	1-#4	NR	1-#5	NR	1-#5	18	1-#6	30	2-#5	36	2-#6	*FL	1-#6 + 1-#5	*FL	2-#6	*FL
12	1-#5	NR	1-#5	12	1-#6	24	2-#5	36	2-#6	48	2-#6	*FL				
14	1-#5	NR	1-#6	18	2-#5	36	2-#6	48	2-#6	60						
16	1-#5	12	2-#5	30	1-#6 + 1-#5	48	2-#6	60								
18	1-#5	18	2-#5	42	2-#6	60										
20	1-#5	30	2-#5	54	2-#6	72										

NOTES:

This table only applies to gravity loads(including self weight of the beam itself); any lateral loads due to wind or seismic need to be taken into account by a qualified structural engineer
All shear reinforcement (#3 rebar) is at 6" spacing up to end distance at each end of lintel beam.
*FL = Stirrups are required the Full Length of the Lintel Beam
*NR = Not Required

TABLE 7.3D
LONGITUDINAL AND SHEAR REINFORCING FOR 6" THICK BY 24" HIGH ICF FLAT PANEL LINTELS

OPENING WIDTH (FT)	UNIFORMLY DISTRIBUTED FACTORED LOAD (LB./FT.)															
	250		500		750		1000		1500		2000		2500		3000	
	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)
3	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	*FL	1-#4	*FL
4	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	*FL	1-#4	*FL	1-#5	*FL
5	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#5	12	1-#5	*FL	1-#5	*FL	1-#5	*FL
6	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#5	12	1-#5	*FL	1-#5	*FL	1-#5	*FL
8	1-#4	NR	1-#4	NR	1-#5	NR	1-#5	12	1-#5	24	1#5	*FL	1-#5	*FL	1-#6	*FL
10	1#5	NR	1#5	NR	1#5	12	1-#5	12	1#5	36	1#6	*FL	1#6	*FL	2-#5	*FL
12	1#5	NR	1#5	NR	1#5	12	1-#5	18	1#6	54	2-#5	*FL	2-#5	*FL	2-#6	*FL
14	1#5	NR	1#5	NR	1#5	18	1#6	30	2-#5	66	1-#6 + 1-#5	*FL	2-#6	*FL		
16	1#5	NR	1#5	NR	1#6	24	2-#5	48	1-#6 + 1-#5	78						
18	1#5	NR	1#5	12	1#6	36	2-#5	54								
20	1#5	NR	1#6	18	2-#5	48	1-#6 + 1-#5	66								

NOTES:

This table only applies to gravity loads(including self weight of the beam itself); any lateral loads due to wind or seismic need to be taken into account by a qualified structural engineer
All shear reinforcement (#3 rebar) is at 6" spacing up to end distance at each end of lintel beam.
*FL = Stirrups are required the Full Length of the Lintel Beam
*NR = Not Required

TABLE 7.3E
LONGITUDINAL AND SHEAR REINFORCING FOR 6" THICK BY 32" HIGH ICF FLAT PANEL LINTELS

OPENING WIDTH (FT)	UNIFORMLY DISTRIBUTED FACTORED LOAD (LB./FT.)															
	250		500		750		1000		1500		2000		2500		3000	
	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)
3	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR
4	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#5	12	1-#5	12
5	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#5	12	1-#5	18	1-#5	18
6	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#5	12	1-#5	24	1-#5	24
8	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#5	12	1-#5	18	1-#5	36	1-#6	36
10	1-#4	NR	1-#4	NR	1-#4	NR	1-#5	NR	1-#5	18	1-#5	24	1-#6	48	2-#5	48
12	1-#4	NR	1-#4	NR	1-#5	NR	1-#5	12	1-#5	24	1-#6	36	2-#5	60	2-#5	60
14	1-#4	NR	1-#4	NR	1-#5	NR	1-#5	18	1-#6	36	2-#5	48	2-#5	72	2-#6	72
16	1-#4	NR	1-#4	NR	1-#5	12	1-#5	24	2-#5	48	2-#5	60	2-#6	78		
18	1-#4	NR	1-#5	12	1-#5	12	1-#6	36	2-#5	60	2-#6	72				
20	1-#4	NR	1-#5	18	1-#6	18	2-#5	48	2-#6	72						

NOTES:

This table only applies to gravity loads(including self weight of the beam itself); any lateral loads due to wind or seismic need to be taken into account by a qualified structural engineer
All shear reinforcement (#3 rebar) is at 6" spacing up to end distance at each end of lintel beam.
*FL = Stirrups are required the Full Length of the Lintel Beam
*NR = Not Required

TABLE 7.4A
LONGITUDINAL AND SHEAR REINFORCING FOR 8" THICK BY 8" HIGH ICF FLAT PANEL LINTELS

OPENING WIDTH (FT)	UNIFORMLY DISTRIBUTED FACTORED LOAD (LB./FT.)															
	250		500		750		1000		1500		2000		2500		3000	
	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)
3	1-#4	NR	1-#4	NR	1-#4	*FL	1-#4	*FL	1-#4	*FL	1-#4	*FL	1-#4	*FL	1-#5	*FL
4	1-#4	NR	1-#4	NR	1-#4	*FL	1-#4	*FL	1-#5	*FL	1-#5	*FL	1-#5	*FL	1-#6	*FL
5	1-#4	NR	1-#5	12	1-#5	*FL	1-#5	*FL	1-#5	*FL						
6	1-#4	NR	1-#5	18	1-#5	*FL	1-#5	*FL	1-#6	*FL						
8	1-#5	NR	1-#5	30	1-#6	*FL	2-#5	*FL								
10	1-#5	12	1-#6	42	2#6	*FL										
12	1-#5	18	2-#5	54												
14	1-#6	30														
16	2-#5	42														
18																
20																

NOTES:

This table only applies to gravity loads(including self weight of the beam itself); any lateral loads due to wind or seismic need to be taken into account by a qualified structural engineer
All shear reinforcement (#3 rebar) is at 6" spacing up to end distance at each end of lintel beam.
*FL = Stirrups are required the Full Length of the Lintel Beam
*NR = Not Required

TABLE 7.4B
LONGITUDINAL AND SHEAR REINFORCING FOR 8" THICK BY 12" HIGH ICF FLAT PANEL LINTELS

OPENING WIDTH (FT)	UNIFORMLY DISTRIBUTED FACTORED LOAD (LB./FT.)															
	250		500		750		1000		1500		2000		2500		3000	
	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)
3	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	*FL	1-#4	*FL	1-#4	*FL	1-#4	*FL	1-#4	*FL
4	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	*FL	1-#4	*FL	1-#5	*FL	1-#5	*FL	1-#5	*FL
5	1-#4	NR	1-#4	8	1-#5	12	1-#5	*FL	1-#5	*FL	1-#5	*FL	1-#6	*FL	1-#6	*FL
6	1-#5	NR	1-#5	12	1-#5	12	1-#5	*FL	1-#5	*FL	1-#6	*FL	1-#6	*FL	2-#6	*FL
8	1-#5	NR	1-#5	18	1-#6	24	1-#5	*FL	2-#5	*FL	2-#5	*FL	2-#6	*FL		
10	1-#5	NR	1-#6	24	1#6	36	2-#5	*FL	2#6	*FL						
12	1-#5	NR	2-#5	30	2-#5	48	2-#6	*FL								
14	1-#6	12	2-#5	42	2-#6	60										
16	1-#6	18	1-#6& 1-#5	54												
18																
20																

NOTES:

This table only applies to gravity loads(including self weight of the beam itself); any lateral loads due to wind or seismic need to be taken into account by a qualified structural engineer
All shear reinforcement (#3 rebar) is at 6" spacing up to end distance at each end of lintel beam.
*FL = Stirrups are required the Full Length of the Lintel Beam
*NR = Not Required

TABLE 7.4C
LONGITUDINAL AND SHEAR REINFORCING FOR 8" THICK BY 16" HIGH ICF FLAT PANEL LINTELS

OPENING WIDTH (FT)	UNIFORMLY DISTRIBUTED FACTORED LOAD (LB./FT.)															
	250		500		750		1000		1500		2000		2500		3000	
	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)
3	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	*FL	1-#4	*FL	1-#5	*FL
4	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#5	12	1-#5	*FL	1-#4	*FL	1-#5	*FL
5	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#5	12	1-#5	*FL	1-#5	*FL	1-#5	*FL
6	1-#4	NR	1-#4	NR	1-#5	12	1-#5	12	1-#5	18	1-#6	*FL	1-#6	*FL	1-#6	*FL
8	1-#4	NR	1-#5	NR	1-#5	12	1-#5	18	1-#6	24	2-#5	*FL	1-#6	*FL	2-#5	*FL
10	1-#4	NR	1-#5	NR	1-#5	18	1-#6	30	2-#5	36	2-#6	*FL	1-#6 + 1-#5	*FL	2-#6	*FL
12	1-#5	NR	1-#5	12	1-#6	24	2-#5	36	2-#6	48	2-#6	*FL				
14	1-#5	NR	1-#6	18	2-#5	36	2-#6	48	2-#6	60						
16	1-#5	12	2-#5	30	1-#6 + 1-#5	48	2-#6	60								
18	1-#5	18	2-#5	42	2-#6	60										
20	1-#5	30	2-#5	54	2-#6	72										

NOTES:

This table only applies to gravity loads(including self weight of the beam itself); any lateral loads due to wind or seismic need to be taken into account by a qualified structural engineer
All shear reinforcement (#3 rebar) is at 6" spacing up to end distance at each end of lintel beam.
*FL = Stirrups are required the Full Length of the Lintel Beam
*NR = Not Required

TABLE 7.4D
LONGITUDINAL AND SHEAR REINFORCING FOR 8" THICK BY 24" HIGH ICF FLAT PANEL LINTELS

OPENING WIDTH (FT)	UNIFORMLY DISTRIBUTED FACTORED LOAD (LB./FT.)															
	250		500		750		1000		1500		2000		2500		3000	
	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)
3	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	*FL	1-#4	*FL
4	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	*FL	1-#5	*FL
5	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	12	1-#5	*FL	1-#5	*FL
6	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#5	12	1-#5	12	1-#5	*FL	1-#5	*FL
8	1-#4	NR	1-#4	NR	1-#5	NR	1-#5	NR	1-#5	12	1-#5	18	1-#5	*FL	1-#6	*FL
10	1#5	NR	1#5	NR	1#5	NR	1-#5	12	1-#5	18	1-#6	24	1#6	*FL	2-#5	*FL
12	1#5	NR	1#5	NR	1#5	NR	1-#5	18	1-#6	24	2-#5	36	2-#5	*FL	2-#6	*FL
14	1#5	NR	1#5	NR	1#5	12	1#6	24	2-#5	36	1-#6 + 1-#5	48	2-#6	*FL		
16	1#5	NR	1#5	NR	1#6	12	2-#5	36	1-#6 + 1-#5	48	2-#6	60				
18	1#5	NR	1#5	12	2-#5	18	2-#5	54	2-#6	60						
20	1#5	NR	1#6	18	2-#5	24	2-#6	60								

NOTES:

This table only applies to gravity loads(including self weight of the beam itself); any lateral loads due to wind or seismic need to be taken into account by a qualified structural engineer
All shear reinforcement (#3 rebar) is at 6" spacing up to end distance at each end of lintel beam.
*FL = Stirrups are required the Full Length of the Lintel Beam
*NR = Not Required

TABLE 7.4E
LONGITUDINAL AND SHEAR REINFORCING FOR 8" THICK BY 32" HIGH ICF FLAT PANEL LINTELS

OPENING WIDTH (FT)	UNIFORMLY DISTRIBUTED FACTORED LOAD (LB./FT.)															
	250		500		750		1000		1500		2000		2500		3000	
	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)
3	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR
4	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#5	12
5	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#5	12	1-#5	18
6	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#5	12	1-#5	18	1-#5	24
8	1-#4	NR	1-#4	NR	1-#4	NR	1-#5	NR	1-#5	12	1-#5	18	1-#5	24	1-#6	36
10	1-#4	NR	1-#4	NR	1-#4	NR	1-#5	NR	1-#5	18	1-#6	24	1-#5	36	2-#5	48
12	1-#4	NR	1-#4	NR	1-#5	NR	1-#5	12	1-#5	24	1-#6	36	1-#6	48	2-#5	60
14	1-#4	NR	1-#4	NR	1-#5	NR	1-#5	18	1-#6	36	2-#5	48	2-#5	60	2-#6	72
16	1-#4	NR	1-#4	NR	1-#5	12	1-#6	24	2-#5	48	2-#5	60	2-#6	72		
18	1-#4	NR	1-#5	12	1-#5	12	2-#5	36	2-#5	60	2-#6	72				
20	1-#4	NR	1-#5	18	1-#6	18	2-#5	48	2-#6	72						

NOTES:

This table only applies to gravity loads(including self weight of the beam itself); any lateral loads due to wind or seismic need to be taken into account by a qualified structural engineer
All shear reinforcement (#3 rebar) is at 6" spacing up to end distance at each end of lintel beam.
*FL = Stirrups are required the Full Length of the Lintel Beam
*NR = Not Required

TABLE 7.5A
LONGITUDINAL AND SHEAR REINFORCING FOR 10" THICK BY 8" HIGH ICF FLAT PANEL LINTELS

OPENING WIDTH (FT)	UNIFORMLY DISTRIBUTED FACTORED LOAD (LB./FT.)															
	250		500		750		1000		1500		2000		2500		3000	
	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)
3	1-#4	NR	1-#4	NR	1-#4	*FL	1-#4	*FL	1-#4	*FL	1-#4	*FL	1-#4	*FL	1-#5	*FL
4	1-#4	NR	1-#4	NR	1-#4	*FL	1-#4	*FL	1-#5	*FL	1-#5	*FL	1-#5	*FL	1-#6	*FL
5	1-#4	NR	1-#5	12	1-#5	*FL	1-#5	*FL	1-#5	*FL						
6	1-#4	NR	1-#5	18	1-#5	*FL	1-#5	*FL	1-#6	*FL						
8	1-#5	NR	1-#5	30	1-#6	*FL	2-#5	*FL								
10	1-#5	12	1-#6	42	2#6	*FL										
12	1-#5	18	2-#5	54												
14	1-#6	30														
16	2-#5	42														
18																
20																

NOTES:

This table only applies to gravity loads(including self weight of the beam itself); any lateral loads due to wind or seismic need to be taken into account by a qualified structural engineer
All shear reinforcement (#3 rebar) is at 6" spacing up to end distance at each end of lintel beam.
*FL = Stirrups are required the Full Length of the Lintel Beam
*NR = Not Required

TABLE 7.5B
LONGITUDINAL AND SHEAR REINFORCING FOR 10" THICK BY 12" HIGH ICF FLAT PANEL LINTELS

OPENING WIDTH (FT)	UNIFORMLY DISTRIBUTED FACTORED LOAD (LB./FT.)															
	250		500		750		1000		1500		2000		2500		3000	
	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)
3	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	*FL	1-#4	*FL	1-#4	*FL	1-#4	*FL	1-#4	*FL
4	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	*FL	1-#4	*FL	1-#5	*FL	1-#5	*FL	1-#5	*FL
5	1-#4	NR	1-#4	8	1-#5	12	1-#5	*FL	1-#5	*FL	1-#5	*FL	1-#6	*FL	1-#6	*FL
6	1-#5	NR	1-#5	12	1-#5	12	1-#5	*FL	1-#5	*FL	1-#6	*FL	1-#6	*FL	2-#6	*FL
8	1-#5	NR	1-#5	18	1-#6	24	1-#5	*FL	2-#5	*FL	2-#5	*FL	2-#6	*FL		
10	1-#5	NR	1-#6	24	1#6	36	2-#5	*FL	2#6	*FL						
12	1-#5	NR	2-#5	30	2-#5	48	2-#6	*FL								
14	1-#6	12	2-#5	42	2-#6	60										
16	1-#6	18	1-#6 + 1-#5	54												
18																
20																

NOTES:

This table only applies to gravity loads(including self weight of the beam itself); any lateral loads due to wind or seismic need to be taken into account by a qualified structural engineer
All shear reinforcement (#3 rebar) is at 6" spacing up to end distance at each end of lintel beam.
*FL = Stirrups are required the Full Length of the Lintel Beam
*NR = Not Required

TABLE 7.5C
LONGITUDINAL AND SHEAR REINFORCING FOR 10" THICK BY 16" HIGH ICF FLAT PANEL LINTELS

OPENING WIDTH (FT)	UNIFORMLY DISTRIBUTED FACTORED LOAD (LB./FT.)															
	250		500		750		1000		1500		2000		2500		3000	
	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)
3	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	*FL	1-#4	*FL	1-#5	*FL
4	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#5	12	1-#5	*FL	1-#4	*FL	1-#5	*FL
5	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#5	12	1-#5	*FL	1-#5	*FL	1-#5	*FL
6	1-#4	NR	1-#4	NR	1-#5	12	1-#5	12	1-#5	18	1-#6	*FL	1-#6	*FL	1-#6	*FL
8	1-#4	NR	1-#5	NR	1-#5	12	1-#5	18	1-#6	24	2-#5	*FL	1-#6	*FL	2-#5	*FL
10	1-#4	NR	1-#5	NR	1-#5	18	1-#6	30	2-#5	36	2-#6	*FL	2-#6	*FL	2-#6	*FL
12	1-#5	NR	1-#5	12	1-#6	24	2-#5	36	2-#6	48	2-#6	*FL				
14	1-#5	NR	1-#6	18	2-#5	36	2-#6	48	2-#6	60						
16	1-#5	12	2-#5	30	1-#6 + 1-#5	48	2-#6	60								
18	1-#5	18	2-#5	42	2-#6	60										
20	1-#5	30	2-#5	54	2-#6	72										

NOTES:

This table only applies to gravity loads(including self weight of the beam itself); any lateral loads due to wind or seismic need to be taken into account by a qualified structural engineer
All shear reinforcement (#3 rebar) is at 6" spacing up to end distance at each end of lintel beam.
*FL = Stirrups are required the Full Length of the Lintel Beam
*NR = Not Required

TABLE 7.5D
LONGITUDINAL AND SHEAR REINFORCING FOR 10" THICK BY 24" HIGH ICF FLAT PANEL LINTELS

OPENING WIDTH (FT)	UNIFORMLY DISTRIBUTED FACTORED LOAD (LB./FT.)															
	250		500		750		1000		1500		2000		2500		3000	
	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)
3	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	*FL	1-#4	*FL
4	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	*FL	1-#5	*FL
5	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	12	1-#5	*FL	1-#5	*FL
6	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#5	12	1-#5	12	1-#5	*FL	1-#5	*FL
8	1-#4	NR	1-#4	NR	1-#5	NR	1-#5	NR	1-#5	12	1-#5	18	1-#5	*FL	1-#6	*FL
10	1#5	NR	1#5	NR	1#5	NR	1-#5	12	1-#5	18	1-#6	24	1#6	*FL	2-#5	*FL
12	1#5	NR	1#5	NR	1#5	NR	1-#5	18	1-#6	24	2-#5	36	2-#5	*FL	2-#6	*FL
14	1#5	NR	1#5	NR	1#5	12	1#6	24	2-#5	36	1-#6 + 1-#5	48	2-#6	*FL		
16	1#5	NR	1#5	NR	1#6	12	2-#5	36	1-#6 + 1-#5	48	2-#6	60				
18	1#5	NR	1#5	12	2-#5	18	2-#5	54	2-#6	60						
20	1#5	NR	1#6	18	2-#5	24	2-#6	60								

NOTES:

This table only applies to gravity loads(including self weight of the beam itself); any lateral loads due to wind or seismic need to be taken into account by a qualified structural engineer
All shear reinforcement (#3 rebar) is at 6" spacing up to end distance at each end of lintel beam.
*FL = Stirrups are required the Full Length of the Lintel Beam
*NR = Not Required

TABLE 7.5E
LONGITUDINAL AND SHEAR REINFORCING FOR 10" THICK BY 32" HIGH ICF FLAT PANEL LINTELS

OPENING WIDTH (FT)	UNIFORMLY DISTRIBUTED FACTORED LOAD (LB./FT.)															
	250		500		750		1000		1500		2000		2500		3000	
	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)
3	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR
4	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#5	12
5	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#5	12	1-#5	18
6	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#5	12	1-#5	18	1-#5	24
8	1-#4	NR	1-#4	NR	1-#4	NR	1-#5	NR	1-#5	12	1-#5	18	1-#5	24	1-#6	36
10	1-#4	NR	1-#4	NR	1-#4	NR	1-#5	NR	1-#5	18	1-#6	24	1-#5	36	2-#5	48
12	1-#4	NR	1-#4	NR	1-#5	NR	1-#5	12	1-#5	24	1-#6	36	1-#6	48	2-#5	60
14	1-#4	NR	1-#4	NR	1-#5	NR	1-#5	18	1-#6	36	2-#5	48	2-#5	60	2-#6	72
16	1-#4	NR	1-#4	NR	1-#5	12	1-#6	24	2-#5	48	2-#5	60	2-#6	72		
18	1-#4	NR	1-#5	12	1-#5	12	2-#5	36	2-#5	60	2-#6	72				
20	1-#4	NR	1-#5	18	1-#6	18	2-#5	48	2-#6	72						

NOTES:

This table only applies to gravity loads(including self weight of the beam itself); any lateral loads due to wind or seismic need to be taken into account by a qualified structural engineer
All shear reinforcement (#3 rebar) is at 6" spacing up to end distance at each end of lintel beam.
*FL = Stirrups are required the Full Length of the Lintel Beam
*NR = Not Required

TABLE 7.6A
LONGITUDINAL AND SHEAR REINFORCING FOR 12" THICK BY 8" HIGH ICF FLAT PANEL LINTELS

OPENING WIDTH (FT)	UNIFORMLY DISTRIBUTED FACTORED LOAD (LB./FT.)															
	250		500		750		1000		1500		2000		2500		3000	
	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)
3	1-#4	NR	1-#4	NR	1-#4	*FL	1-#4	*FL	1-#4	*FL	1-#4	*FL	1-#4	*FL	1-#5	*FL
4	1-#4	NR	1-#4	NR	1-#4	*FL	1-#4	*FL	1-#5	*FL	1-#5	*FL	1-#5	*FL	1-#6	*FL
5	1-#4	NR	1-#5	12	1-#5	*FL	1-#5	*FL	1-#5	*FL						
6	1-#4	NR	1-#5	18	1-#5	*FL	1-#5	*FL	1-#6	*FL						
8	1-#5	NR	1-#5	30	1-#6	*FL	2-#5	*FL								
10	1-#5	12	1-#6	42	2#6	*FL										
12	1-#5	18	2-#5	54												
14	1-#6	30														
16	2-#5	42														
18																
20																

NOTES:

This table only applies to gravity loads(including self weight of the beam itself); any lateral loads due to wind or seismic need to be taken into account by a qualified structural engineer
All shear reinforcement (#3 rebar) is at 6" spacing up to end distance at each end of lintel beam.
*FL = Stirrups are required the Full Length of the Lintel Beam
*NR = Not Required

TABLE 7.6B
LONGITUDINAL AND SHEAR REINFORCING FOR 12" THICK BY 12" HIGH ICF FLAT PANEL LINTELS

OPENING WIDTH (FT)	UNIFORMLY DISTRIBUTED FACTORED LOAD (LB./FT.)															
	250		500		750		1000		1500		2000		2500		3000	
	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)
3	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	*FL	1-#4	*FL	1-#4	*FL	1-#4	*FL	1-#4	*FL
4	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	*FL	1-#4	*FL	1-#5	*FL	1-#5	*FL	1-#5	*FL
5	1-#4	NR	1-#4	8	1-#5	12	1-#5	*FL	1-#5	*FL	1-#5	*FL	1-#6	*FL	1-#6	*FL
6	1-#5	NR	1-#5	12	1-#5	12	1-#5	*FL	1-#5	*FL	1-#6	*FL	1-#6	*FL	2-#6	*FL
8	1-#5	NR	1-#5	18	1-#6	24	1-#5	*FL	2-#5	*FL	2-#5	*FL	2-#6	*FL		
10	1-#5	NR	1-#6	24	1#6	36	2-#5	*FL	2#6	*FL						
12	1-#5	NR	2-#5	30	2-#5	48	2-#6	*FL								
14	1-#6	12	2-#5	42	2-#6	60										
16	1-#6	18	1-#6 + 1-#5	54												
18																
20																

NOTES:

This table only applies to gravity loads(including self weight of the beam itself); any lateral loads due to wind or seismic need to be taken into account by a qualified structural engineer
All shear reinforcement (#3 rebar) is at 6" spacing up to end distance at each end of lintel beam.
*FL = Stirrups are required the Full Length of the Lintel Beam
*NR = Not Required

TABLE 7.6C
LONGITUDINAL AND SHEAR REINFORCING FOR 12" THICK BY 16" HIGH ICF FLAT PANEL LINTELS

OPENING WIDTH (FT)	UNIFORMLY DISTRIBUTED FACTORED LOAD (LB./FT.)															
	250		500		750		1000		1500		2000		2500		3000	
	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)
3	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	*FL	1-#4	*FL	1-#5	*FL
4	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#5	12	1-#5	*FL	1-#4	*FL	1-#5	*FL
5	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#5	12	1-#5	*FL	1-#5	*FL	1-#5	*FL
6	1-#4	NR	1-#4	NR	1-#5	12	1-#5	12	1-#5	18	1-#6	*FL	1-#6	*FL	1-#6	*FL
8	1-#4	NR	1-#5	NR	1-#5	12	1-#5	18	1-#6	24	2-#5	*FL	1-#6 + 1-#5	*FL	2-#5	*FL
10	1-#4	NR	1-#5	NR	1-#5	18	1-#6	30	2-#5	36	2-#6	*FL	2-#6	*FL	2-#6	*FL
12	1-#5	NR	1-#5	12	1-#6	24	2-#5	36	2-#6	48	2-#6	*FL				
14	1-#5	NR	1-#6	18	2-#5	36	2-#6	48	2-#6	60						
16	1-#5	12	2-#5	30	1-#6 + 1-#5	48	2-#6	60								
18	1-#5	18	2-#5	42	2-#6	60										
20	1-#5	30	2-#5	54	2-#6	72										

NOTES:

This table only applies to gravity loads(including self weight of the beam itself); any lateral loads due to wind or seismic need to be taken into account by a qualified structural engineer
All shear reinforcement (#3 rebar) is at 6" spacing up to end distance at each end of lintel beam.
*FL = Stirrups are required the Full Length of the Lintel Beam
*NR = Not Required

TABLE 7.6D
LONGITUDINAL AND SHEAR REINFORCING FOR 12" THICK BY 24" HIGH ICF FLAT PANEL LINTELS

OPENING WIDTH (FT)	UNIFORMLY DISTRIBUTED FACTORED LOAD (LB./FT.)															
	250		500		750		1000		1500		2000		2500		3000	
	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)
3	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	*FL	1-#4	*FL
4	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	*FL	1-#5	*FL
5	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	12	1-#5	*FL	1-#5	*FL
6	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#5	12	1-#5	12	1-#5	*FL	1-#5	*FL
8	1-#4	NR	1-#4	NR	1-#5	NR	1-#5	NR	1-#5	12	1-#5	18	1-#5	*FL	1-#6	*FL
10	1#5	NR	1#5	NR	1#5	NR	1-#5	12	1-#5	18	1-#6	24	1#6	*FL	2-#5	*FL
12	1#5	NR	1#5	NR	1#5	NR	1-#5	18	1-#6	24	2-#5	36	2-#5	*FL	2-#6	*FL
14	1#5	NR	1#5	NR	1#5	12	1#6	24	2-#5	36	1-#6 + 1-#5	48	2-#6	*FL		
16	1#5	NR	1#5	NR	1#6	12	2-#5	36	1-#6 + 1-#5	48	2-#6	60				
18	1#5	NR	1#5	12	2-#5	18	2-#5	54	2-#6	60						
20	1#5	NR	1#6	18	2-#5	24	2-#6	60								

NOTES:

This table only applies to gravity loads(including self weight of the beam itself); any lateral loads due to wind or seismic need to be taken into account by a qualified structural engineer
All shear reinforcement (#3 rebar) is at 6" spacing up to end distance at each end of lintel beam.
*FL = Stirrups are required the Full Length of the Lintel Beam
*NR = Not Required

TABLE 7.6E
LONGITUDINAL AND SHEAR REINFORCING FOR 12" THICK BY 32" HIGH ICF FLAT PANEL LINTELS

OPENING WIDTH (FT)	UNIFORMLY DISTRIBUTED FACTORED LOAD (LB./FT.)															
	250		500		750		1000		1500		2000		2500		3000	
	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)	BOTTOM STEEL	STIRRUP END DISTANCE (INCHES)
3	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR
4	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#5	12
5	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#5	12	1-#5	18
6	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#4	NR	1-#5	12	1-#5	18	1-#5	24
8	1-#4	NR	1-#4	NR	1-#4	NR	1-#5	NR	1-#5	12	1-#5	18	1-#5	24	1-#6	36
10	1-#4	NR	1-#4	NR	1-#4	NR	1-#5	NR	1-#5	18	1-#6	24	1-#5	36	2-#5	48
12	1-#4	NR	1-#4	NR	1-#5	NR	1-#5	12	1-#5	24	1-#6	36	1-#6	48	2-#5	60
14	1-#4	NR	1-#4	NR	1-#5	NR	1-#5	18	1-#6	36	2-#5	48	2-#5	60	2-#6	72
16	1-#4	NR	1-#4	NR	1-#5	12	1-#6	24	2-#5	48	2-#5	60	2-#6	72		
18	1-#4	NR	1-#5	12	1-#5	12	2-#5	36	2-#5	60	2-#6	72				
20	1-#4	NR	1-#5	18	1-#6	18	2-#5	48	2-#6	72						

NOTES:

This table only applies to gravity loads(including self weight of the beam itself); any lateral loads due to wind or seismic need to be taken into account by a qualified structural engineer
All shear reinforcement (#3 rebar) is at 6" spacing up to end distance at each end of lintel beam.
*FL = Stirrups are required the Full Length of the Lintel Beam
*NR = Not Required

8.0 BUILDBLOCK SAFE ROOM ENGINEERING

BUILDBLOCK AND BUILDLOCK KNOCKDOWN FLAT WALL SAFE ROOM TABLES

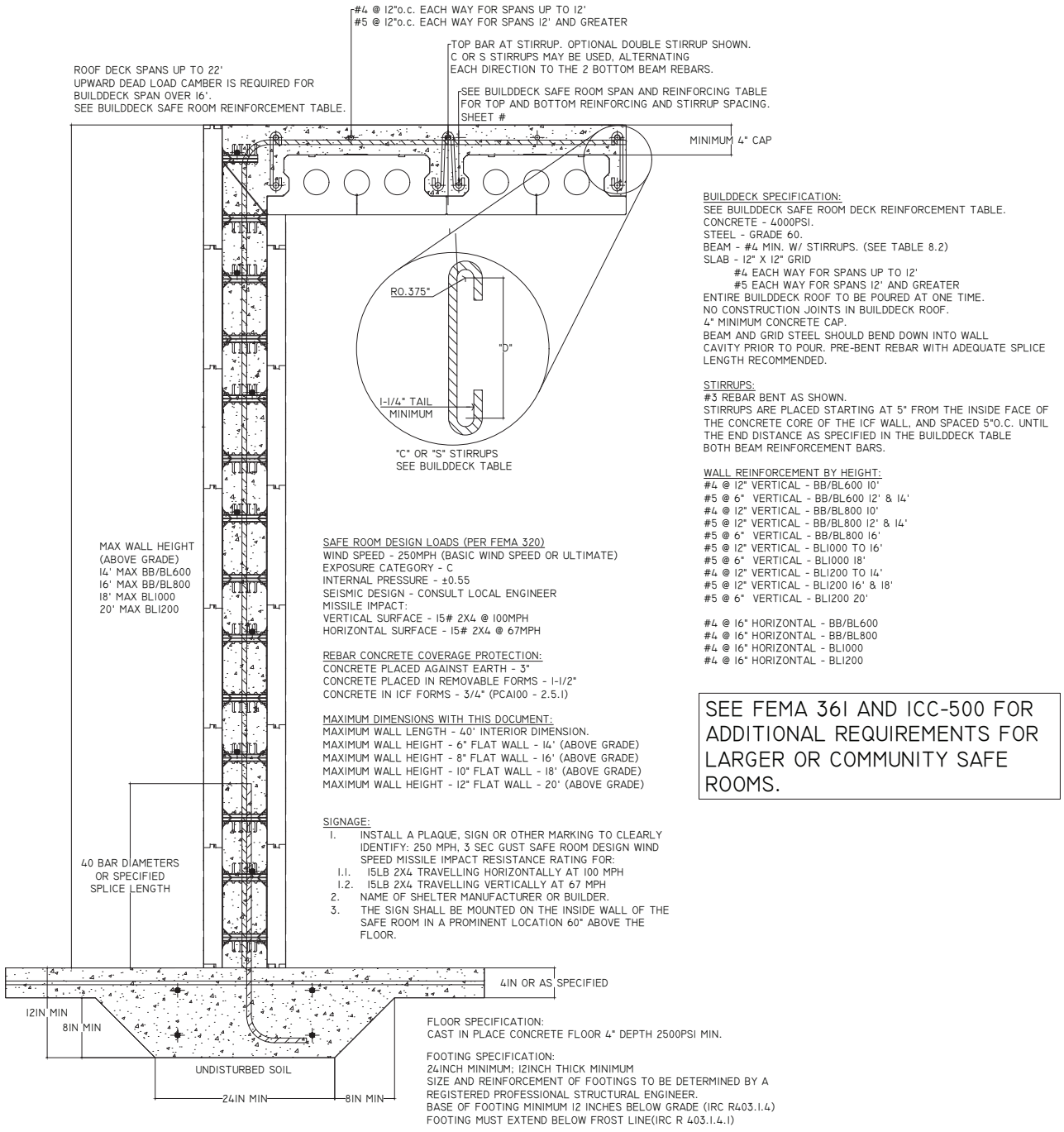
TABLE 8.1 BUILDBLOCK SAFE ROOM WALL REINFORCEMENT *

HEIGHT (ABOVE GRADE)	BLOCK CORE WIDTH							
	6"		8"		10"		12"	
	VERTICAL	HORIZONTAL	VERTICAL	HORIZONTAL	VERTICAL	HORIZONTAL	VERTICAL	HORIZONTAL
10	#4 @ 12"	#4 @ 16"	#4 @ 12"	#4 @ 16"	#4 @ 12"	#4 @ 16"	#4 @ 12"	#4 @ 16"
12	#5 @ 6"	#4 @ 16"	#5 @ 12"	#4 @ 16"	#4 @ 12"	#4 @ 16"	#4 @ 12"	#4 @ 16"
14	#5 @ 6"	#4 @ 16"	#5 @ 12"	#4 @ 16"	#5 @ 12"	#4 @ 16"	#4 @ 12"	#4 @ 16"
16			#5 @ 6"	#4 @ 16"	#5 @ 12"	#4 @ 16"	#5 @ 12"	#4 @ 16"
18					#5 @ 6"	#4 @ 16"	#5 @ 12"	#4 @ 16"
20							#5 @ 6"	#4 @ 16"

TABLE 8.2 TABLE BUILDDECK SAFE ROOM DECK REINFORCEMENT TABLE *

SPAN (FT)	BD800				BD1000				BD1200				
	REBAR		STIRRUP		REBAR		STIRRUP		REBAR		STIRRUP		UPWARD CAMBER
	BOTTOM	TOP	END DISTANCE	"D"	BOTTOM	TOP	END DISTANCE	"D"	BOTTOM	TOP	END DISTANCE	"D"	
12	2 - #5	1 - #5	48"	6-1/4"	2 - #4	1 - #5	48"	8-1/4"	2 - #4	1 - #5	48"	10-1/4"	N/A
14	2 - #6	1 - #5	60"	6-1/4"	2 - #5	1 - #5	48"	8-1/4"	2 - #4	1 - #5	48"	10-1/4"	N/A
16	2 - #7	1 - #6	72"	6-1/4"	2 - #6	1 - #6	60"	8-1/4"	2 - #5	1 - #5	48"	10-1/4"	3/4"
18					2 - #7	1 - #6	72"	8-1/4"	2 - #5	1 - #6	60"	10-1/4"	3/4"
20									2 - #6	1 - #6	72"	10-1/4"	1"
22									2 - #7	1 - #7	84"	10-1/4"	1-1/2"

** Refer to Figures 8.1 - 8.4 for further details.*



BUILDDECK SPECIFICATION:
SEE BUILDDECK SAFE ROOM DECK REINFORCEMENT TABLE.
CONCRETE - 4000PSI.
STEEL - GRADE 60.
BEAM - #4 MIN. W/ STIRRUPS. (SEE TABLE 8.2)
SLAB - 12" X 12" GRID
#4 EACH WAY FOR SPANS UP TO 12'
#5 EACH WAY FOR SPANS 12' AND GREATER
ENTIRE BUILDDECK ROOF TO BE POURED AT ONE TIME.
NO CONSTRUCTION JOINTS IN BUILDDECK ROOF.
4" MINIMUM CONCRETE CAP.
BEAM AND GRID STEEL SHOULD BEND DOWN INTO WALL
CAVITY PRIOR TO POUR. PRE-BENT REBAR WITH ADEQUATE SPLICE
LENGTH RECOMMENDED.

STIRRUPS:
#3 REBAR BENT AS SHOWN.
STIRRUPS ARE PLACED STARTING AT 5" FROM THE INSIDE FACE OF
THE CONCRETE CORE OF THE ICF WALL, AND SPACED 5"O.C. UNTIL
THE END DISTANCE AS SPECIFIED IN THE BUILDDECK TABLE
BOTH BEAM REINFORCEMENT BARS.

WALL REINFORCEMENT BY HEIGHT:
#4 @ 12" VERTICAL - BB/BL600 10'
#5 @ 6" VERTICAL - BB/BL600 12' & 14'
#4 @ 12" VERTICAL - BB/BL800 10'
#5 @ 12" VERTICAL - BB/BL800 12' & 14'
#5 @ 6" VERTICAL - BB/BL800 16'
#5 @ 12" VERTICAL - BLI000 TO 16'
#5 @ 6" VERTICAL - BLI000 18'
#4 @ 12" VERTICAL - BLI200 TO 14'
#5 @ 12" VERTICAL - BLI200 16' & 18'
#5 @ 6" VERTICAL - BLI200 20'

#4 @ 16" HORIZONTAL - BB/BL600
#4 @ 16" HORIZONTAL - BB/BL800
#4 @ 16" HORIZONTAL - BLI000
#4 @ 16" HORIZONTAL - BLI200

SAFE ROOM DESIGN LOADS (PER FEMA 320)
WIND SPEED - 250MPH (BASIC WIND SPEED OR ULTIMATE)
EXPOSURE CATEGORY - C
INTERNAL PRESSURE - ±0.55
SEISMIC DESIGN - CONSULT LOCAL ENGINEER
MISSILE IMPACT:
VERTICAL SURFACE - 15# 2X4 @ 100MPH
HORIZONTAL SURFACE - 15# 2X4 @ 67MPH

REBAR CONCRETE COVERAGE PROTECTION:
CONCRETE PLACED AGAINST EARTH - 3"
CONCRETE PLACED IN REMOVABLE FORMS - 1-1/2"
CONCRETE IN ICF FORMS - 3/4" (PCAI00 - 2.5.1)

MAXIMUM DIMENSIONS WITH THIS DOCUMENT:
MAXIMUM WALL LENGTH - 40' INTERIOR DIMENSION.
MAXIMUM WALL HEIGHT - 6" FLAT WALL - 14' (ABOVE GRADE)
MAXIMUM WALL HEIGHT - 8" FLAT WALL - 16' (ABOVE GRADE)
MAXIMUM WALL HEIGHT - 10" FLAT WALL - 18' (ABOVE GRADE)
MAXIMUM WALL HEIGHT - 12" FLAT WALL - 20' (ABOVE GRADE)

SIGNAGE:
1. INSTALL A PLAQUE, SIGN OR OTHER MARKING TO CLEARLY IDENTIFY: 250 MPH, 3 SEC GUST SAFE ROOM DESIGN WIND SPEED MISSILE IMPACT RESISTANCE RATING FOR:
   1.1. 15LB 2X4 TRAVELLING HORIZONTALLY AT 100 MPH
   1.2. 15LB 2X4 TRAVELLING VERTICALLY AT 67 MPH
2. NAME OF SHELTER MANUFACTURER OR BUILDER.
3. THE SIGN SHALL BE MOUNTED ON THE INSIDE WALL OF THE SAFE ROOM IN A PROMINENT LOCATION 60" ABOVE THE FLOOR.

SEE FEMA 361 AND ICC-500 FOR ADDITIONAL REQUIREMENTS FOR LARGER OR COMMUNITY SAFE ROOMS.

FLOOR SPECIFICATION:
CAST IN PLACE CONCRETE FLOOR 4" DEPTH 2500PSI MIN.

FOOTING SPECIFICATION:
24INCH MINIMUM; 12INCH THICK MINIMUM
SIZE AND REINFORCEMENT OF FOOTINGS TO BE DETERMINED BY A REGISTERED PROFESSIONAL STRUCTURAL ENGINEER.
BASE OF FOOTING MINIMUM 12 INCHES BELOW GRADE (IRC R403.1.4)
FOOTING MUST EXTEND BELOW FROST LINE(IRC R 403.1.4.1)

FIGURE 8.1 INTERIOR WALL (SLAB ON GRADE)

BUILDDECK SPECIFICATION:
SEE BUILDDECK SAFE ROOM DECK REINFORCEMENT TABLE.
CONCRETE - 4000PSI.
STEEL - GRADE 60.
BEAM - #4 MIN. W/ STIRRUPS. (SEE TABLE 8.2)
SLAB - 12" X 12" GRID
#4 EACH WAY FOR SPANS UP TO 12'
#5 EACH WAY FOR SPANS 12' AND GREATER
ENTIRE BUILDDECK ROOF TO BE POURED AT ONE TIME.
NO CONSTRUCTION JOINTS IN BUILDDECK ROOF.
4" MINIMUM CONCRETE CAP.
BEAM AND GRID STEEL SHOULD BEND DOWN INTO WALL CAVITY PRIOR TO POUR. PRE-BENT REBAR WITH ADEQUATE SPLICE LENGTH RECOMMENDED.

STIRRUPS:
#3 REBAR BENT AS SHOWN.
STIRRUPS ARE PLACED STARTING AT 5" FROM THE INSIDE FACE OF THE CONCRETE CORE OF THE ICF WALL, AND SPACED 5"O.C. UNTIL THE END DISTANCE AS SPECIFIED IN THE BUILDDECK TABLE BOTH BEAM REINFORCEMENT BARS.

WALL REINFORCEMENT BY HEIGHT:
#4 @ 12" VERTICAL - BB/BL600 10'
#5 @ 6" VERTICAL - BB/BL600 12' & 14'
#4 @ 12" VERTICAL - BB/BL800 10'
#5 @ 12" VERTICAL - BB/BL800 12' & 14'
#5 @ 6" VERTICAL - BB/BL800 16'
#5 @ 12" VERTICAL - BLI000 TO 16'
#5 @ 6" VERTICAL - BLI000 18'
#4 @ 12" VERTICAL - BLI200 TO 14'
#5 @ 12" VERTICAL - BLI200 16' & 18'
#5 @ 6" VERTICAL - BLI200 20'

#4 @ 16" HORIZONTAL - BB/BL600
#4 @ 16" HORIZONTAL - BB/BL800
#4 @ 16" HORIZONTAL - BLI000
#4 @ 16" HORIZONTAL - BLI200

SAFE ROOM DESIGN LOADS (PER FEMA 320)
WIND SPEED - 250MPH (BASIC WIND SPEED OR ULTIMATE)
EXPOSURE CATEGORY - C
INTERNAL PRESSURE - ±0.55
SEISMIC DESIGN - CONSULT LOCAL ENGINEER
MISSILE IMPACT:
VERTICAL SURFACE - 15# 2X4 @ 100MPH
HORIZONTAL SURFACE - 15# 2X4 @ 67MPH

REBAR CONCRETE COVERAGE PROTECTION:
CONCRETE PLACED AGAINST EARTH - 3"
CONCRETE PLACED IN REMOVABLE FORMS - 1-1/2"
CONCRETE IN ICF FORMS - 3/4" (PCA100 - 2.5.1)

MAXIMUM DIMENSIONS WITH THIS DOCUMENT:
MAXIMUM WALL LENGTH - 40' INTERIOR DIMENSION.
MAXIMUM WALL HEIGHT - 6" FLAT WALL - 14' (ABOVE GRADE)
MAXIMUM WALL HEIGHT - 8" FLAT WALL - 16' (ABOVE GRADE)
MAXIMUM WALL HEIGHT - 10" FLAT WALL - 18' (ABOVE GRADE)
MAXIMUM WALL HEIGHT - 12" FLAT WALL - 20' (ABOVE GRADE)

SIGNAGE:
1. INSTALL A PLAQUE, SIGN OR OTHER MARKING TO CLEARLY IDENTIFY: 250 MPH, 3 SEC GUST SAFE ROOM DESIGN WIND SPEED MISSILE IMPACT RESISTANCE RATING FOR:
   1.1. 15LB 2X4 TRAVELLING HORIZONTALLY AT 100 MPH
   1.2. 15LB 2X4 TRAVELLING VERTICALLY AT 67 MPH
2. NAME OF SHELTER MANUFACTURER OR BUILDER.
3. THE SIGN SHALL BE MOUNTED ON THE INSIDE WALL OF THE SAFE ROOM IN A PROMINENT LOCATION 60" ABOVE THE FLOOR.

SEE FEMA 361 AND ICC-500 FOR ADDITIONAL REQUIREMENTS FOR LARGER OR COMMUNITY SAFE ROOMS.

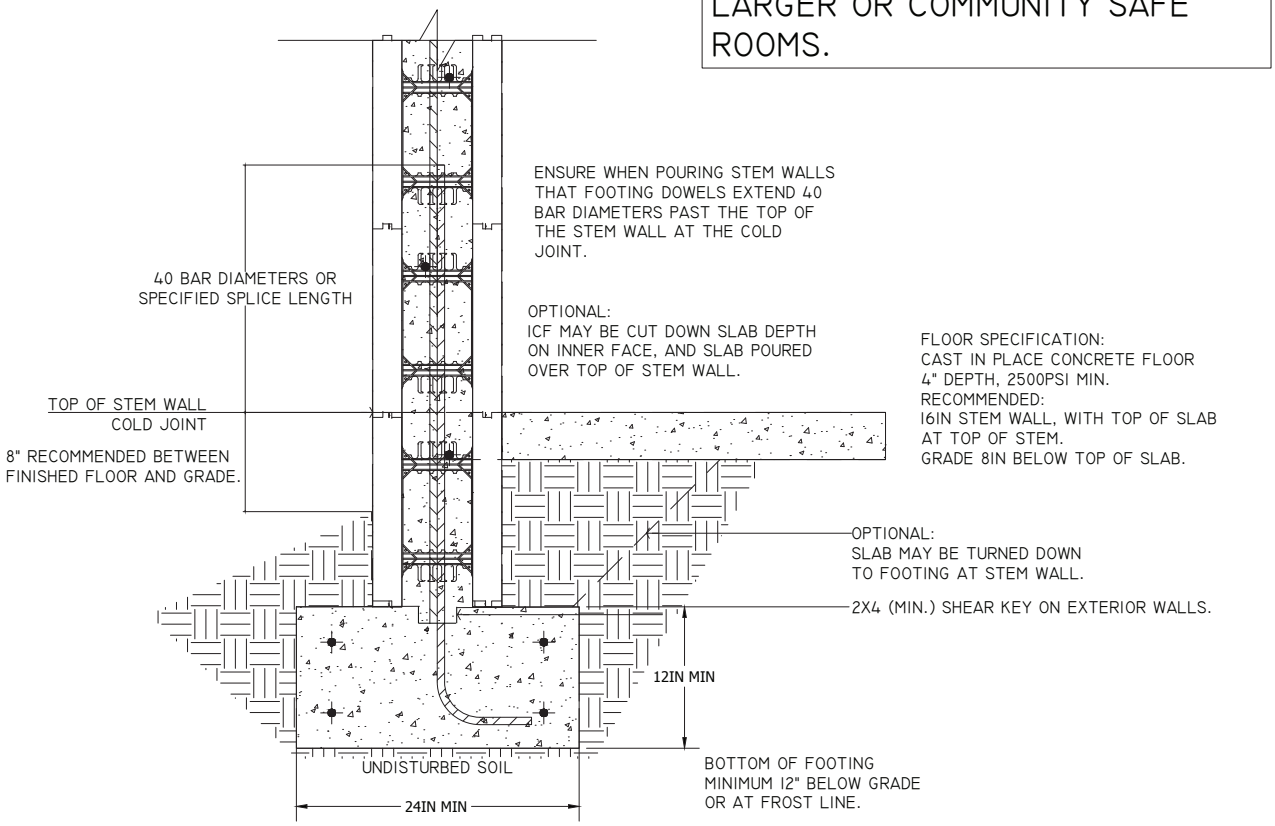
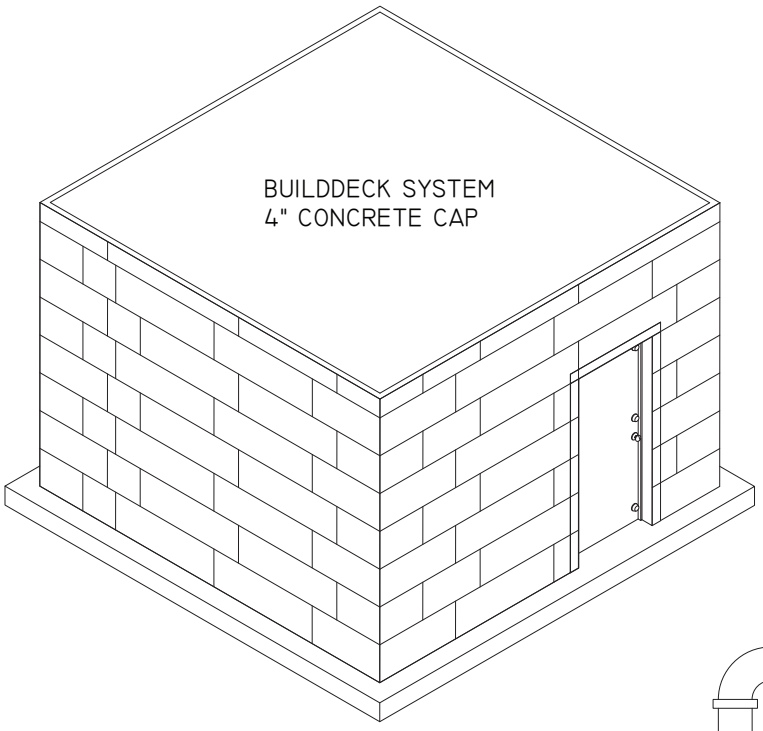
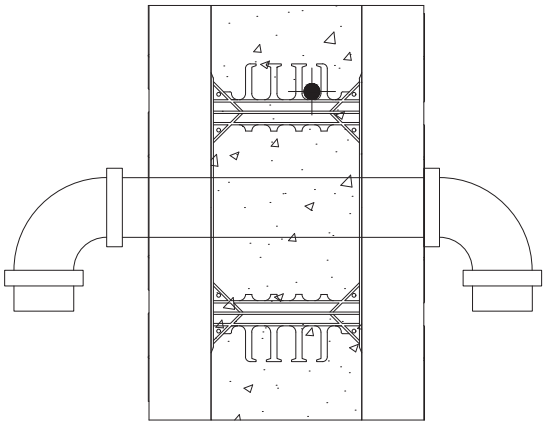
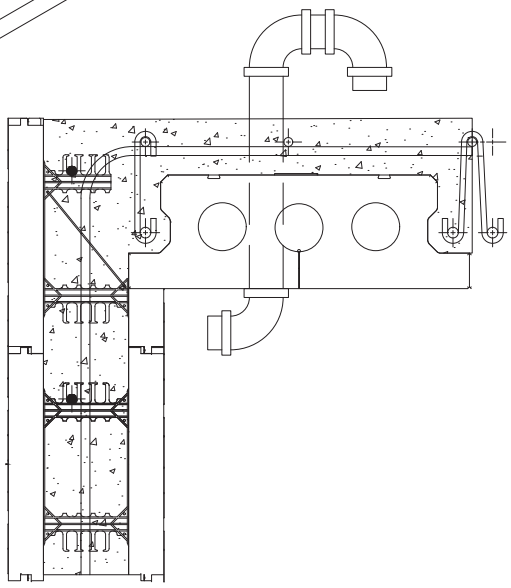


FIGURE 8.2 EXTERIOR WALL (STEM OR FROST WALL)







WALL VENT

ROOF VENT

VENTING AREA REQUIRED		
	VENTING AREA (PER OCCUPANT)	
SHELTER TYPE	TORNADO	HURRICANE
RESIDENTIAL	2IN²	4IN²
COMMERCIAL (≤ 50)	5IN²	8IN²
COMMERCIAL (> 50)	6IN²	12IN²
ATMOSPHERIC PRESSURE CHANGE (APC) VENTING IS RECOMMENDED AT A RATE OF 1 FT² PER 1000 FT³ FOR TORNADO SHELTERS AND COMBINATIONS SHELTERS.		
ASSUMES VENTS DISTRIBUTED EQUALLY BETWEEN UPPER AND LOWER PORTION OF THE SAFE ROOM. WHEN VENTS ARE INSTALLED EXCLUSIVELY IN THE UPPER PORTION, AREA MUST BE DOUBLED. VENT SPECIFIED AS 2" DIAMETER PIPE WITH ELBOWS INSTALLED FACING DOWN. SEE VENTING DETAIL.		

RECOMMENDED VENTING:
2" DIAMETER PIPE. ELBOWS FACING DOWN. INNER FACE OF ELBOW FLUSH WITH INNER FACE OF WALL ON INTERIOR OF SAFE ROOM. SEE VENTILATION TABLE FOR VOLUMES BY OCCUPANCY.

REBAR SPLICE LENGTHS PER FEMA 320	
#4	21
#5	24
#6	29
#7	45
#8	54

FIGURE 8.3 SAFE ROOM VENTILATION

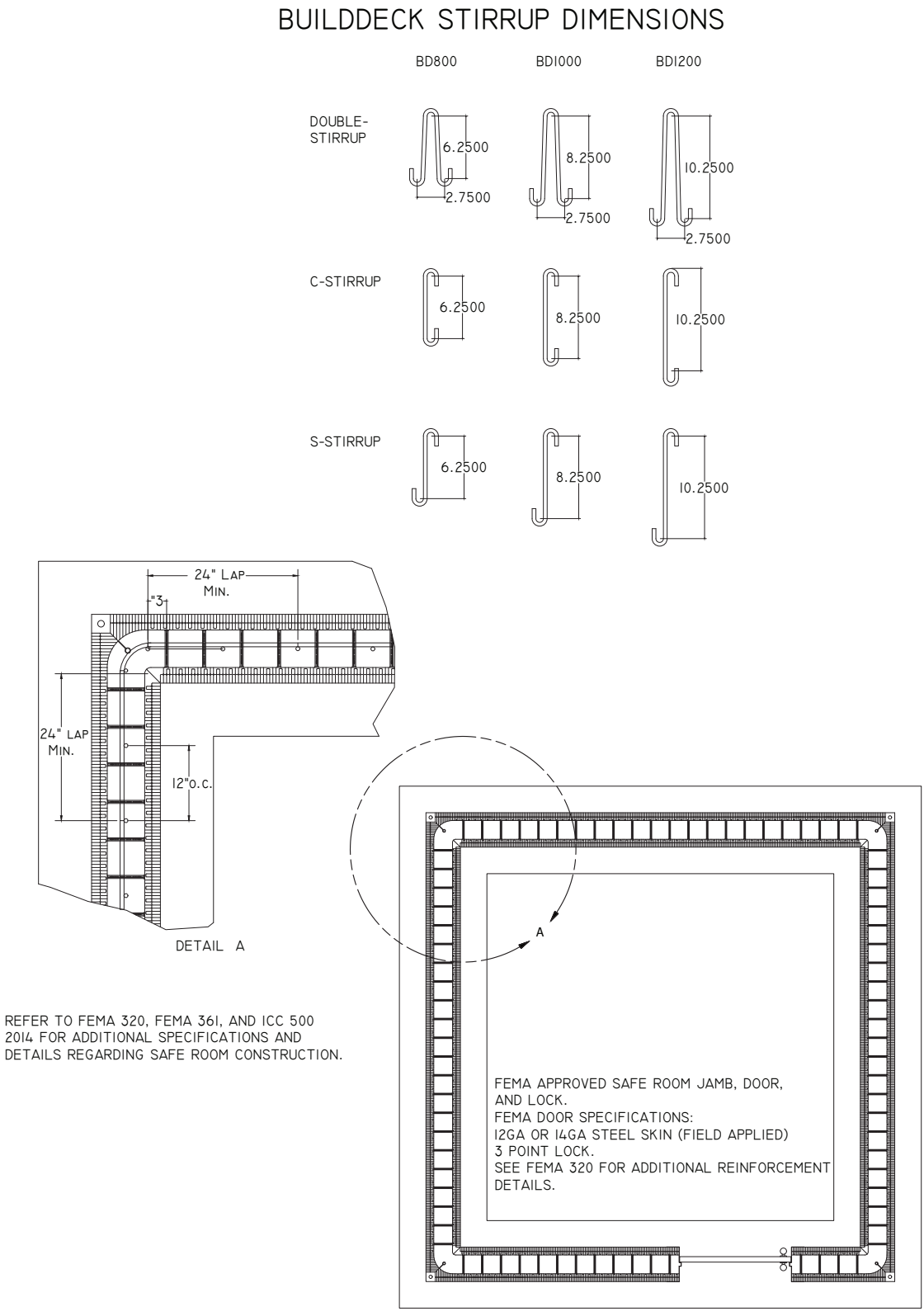


FIGURE 8.4 SAFE ROOM REINFORCEMENT AND STIRRUPS

VENTING AREA REQUIRED

SHELTER TYPE	VENTING ARE (PER OCCUPANT)	
	TORNADO	HURRICANE
Residential	2 in^2	4 in^2
Commercial (≤ 50 Occupants)	5 in^2	8 in^2
Commercial (>50 Occupants)	6 in^2	12 in^2
Atmospheric Pressure Change (APC) venting is recommended at a rate of 1-ft^2 per 1000-ft^3 for tornado shelters and combination shelters.		
Assumes vents distributed equally between upper and lower portion of the safe room. When vents are installed exclusively in the upper portion, area must be doubled. Vent specified as 2" diameter pipe with elbows installed facing down. See venting detail.		

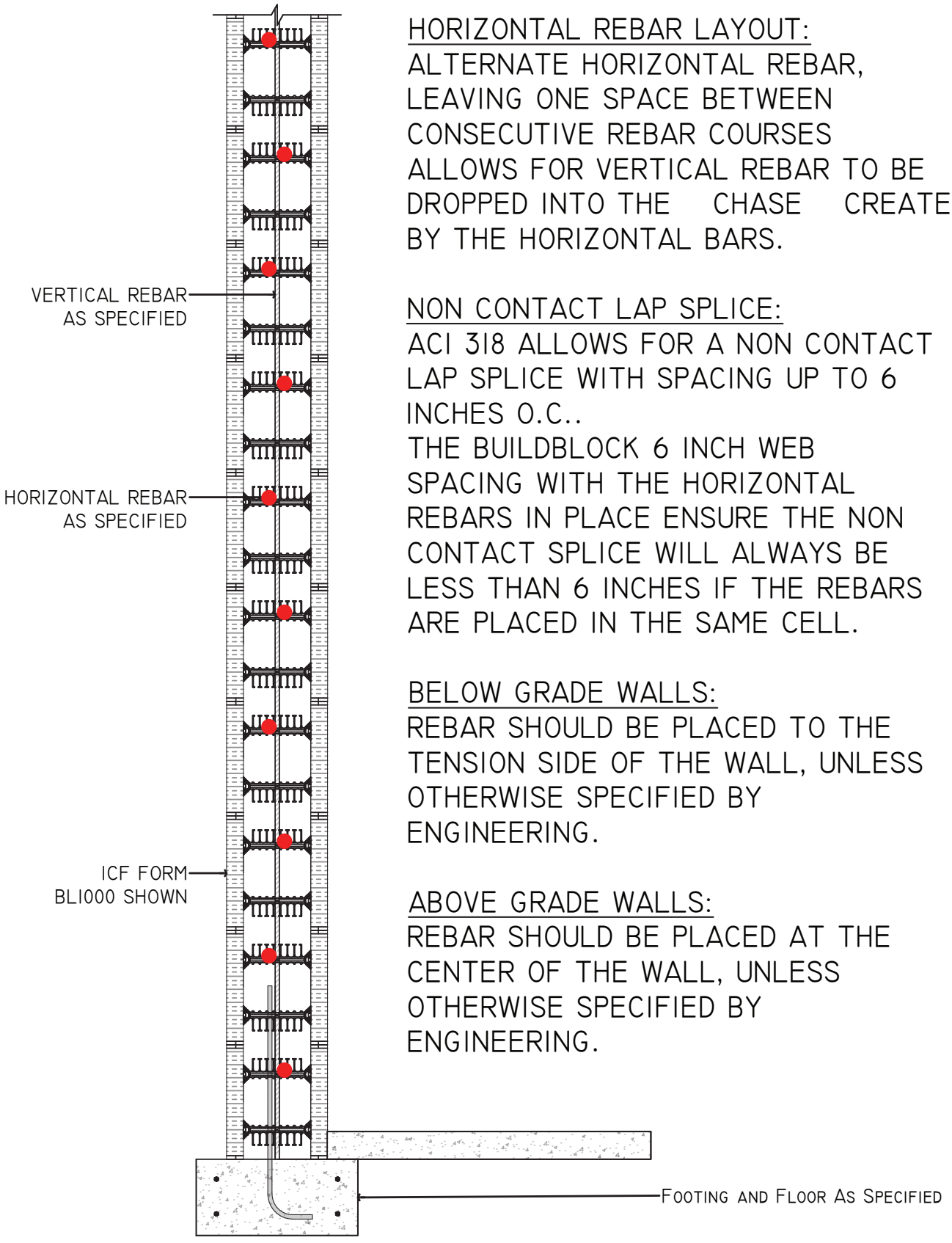
OCCUPANT DENSITY - RESIDENTIAL SHELTERS

TYPE OF SHELTER	MINIMUM REQUIRED USABLE SHELTER FLOOR AREA IN SQUARE FEET PER OCCUPANT
TORNADO	
One and Two Family Dwelling	3
Other Residential	5
HURRICANE	
One and Two Family Dwelling	7
Other Residential	10

OCCUPANT DENSITY - COMMUNITY SHELTERS

TYPE OF SHELTER	MINIMUM REQUIRED USABLE SHELTER FLOOR AREA IN SQUARE FEET PER OCCUPANT
TORNADO	
Standing or Seated	5
Wheelchair	10
Bedridden	30
HURRICANE	
Standing or Seated	20
Wheelchair	20
Bedridden	40

9.1 RECOMMENDED REBAR LAYOUT



HORIZONTAL REBAR LAYOUT:
ALTERNATE HORIZONTAL REBAR, LEAVING ONE SPACE BETWEEN CONSECUTIVE REBAR COURSES ALLOWS FOR VERTICAL REBAR TO BE DROPPED INTO THE CHASE CREATED BY THE HORIZONTAL BARS.

NON CONTACT LAP SPLICE:
ACI 318 ALLOWS FOR A NON CONTACT LAP SPLICE WITH SPACING UP TO 6 INCHES O.C..
THE BUILDBLOCK 6 INCH WEB SPACING WITH THE HORIZONTAL REBARS IN PLACE ENSURE THE NON CONTACT SPLICE WILL ALWAYS BE LESS THAN 6 INCHES IF THE REBARS ARE PLACED IN THE SAME CELL.

BELOW GRADE WALLS:
REBAR SHOULD BE PLACED TO THE TENSION SIDE OF THE WALL, UNLESS OTHERWISE SPECIFIED BY ENGINEERING.

ABOVE GRADE WALLS:
REBAR SHOULD BE PLACED AT THE CENTER OF THE WALL, UNLESS OTHERWISE SPECIFIED BY ENGINEERING.

9.2 TYPICAL FROST WALL LAYOUT

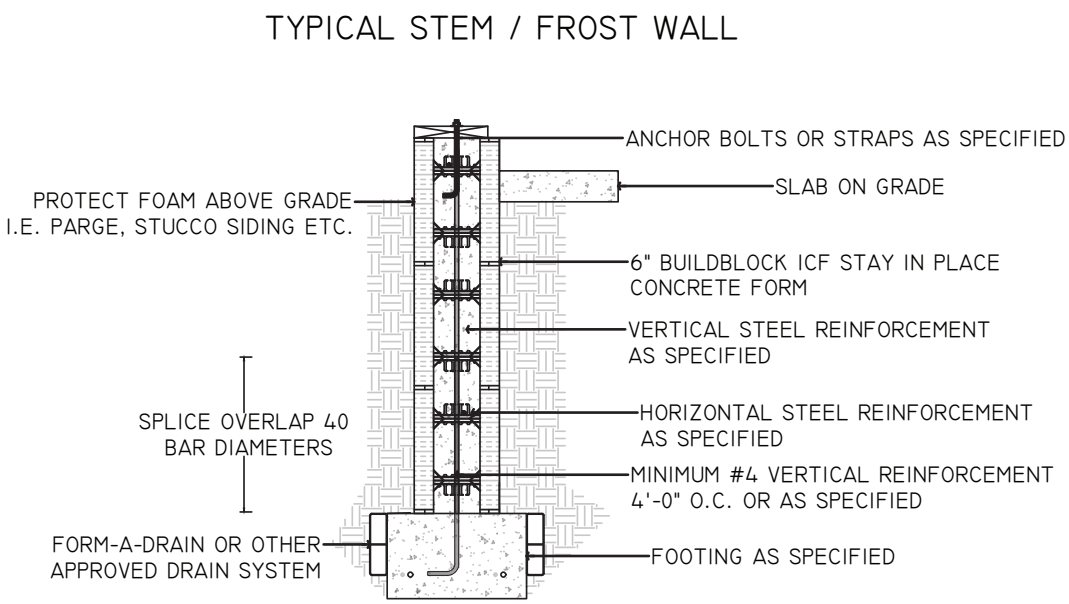


FIGURE 5.0.2 TYPICAL BUILDBLOCK CRAWLSPACE WALL SECTION CUT THROUGH FLAT WALL OR VERTICAL CORE OF SCREEN GRID WALL.

9.3 TYPICAL CRAWLSPACE LAYOUT

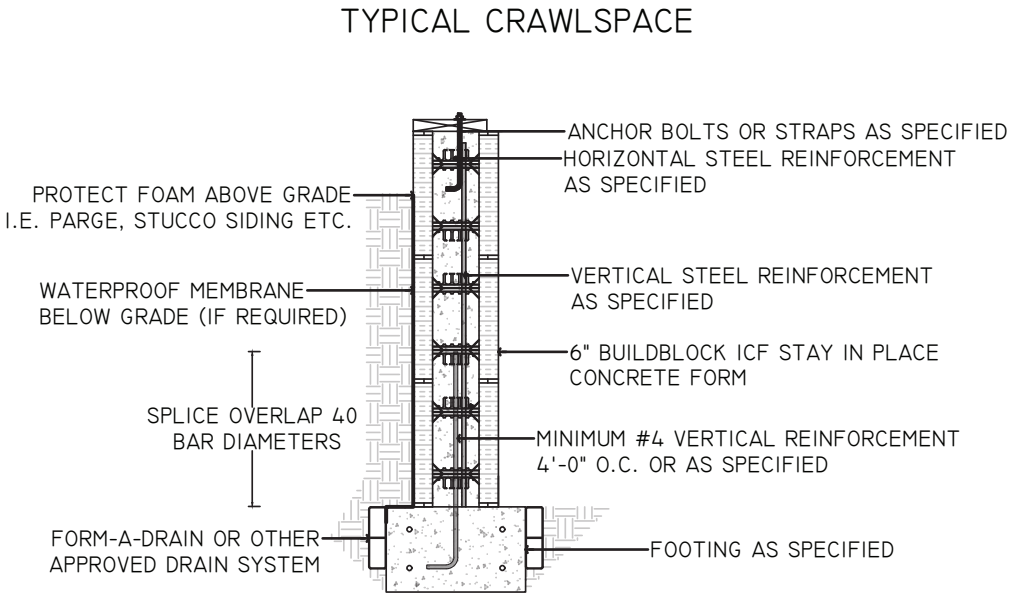
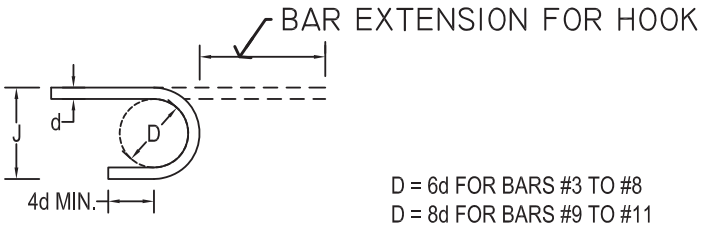


FIGURE 5.0.1 TYPICAL BUILDBLOCK CRAWLSPACE WALL SECTION CUT THROUGH FLAT WALL OR VERTICAL CORE OF SCREEN GRID WALL.

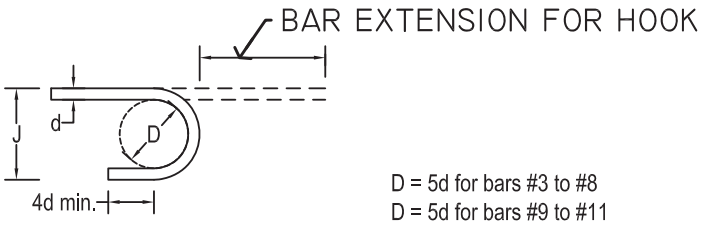
9.4 STIRRUP HOOK BENDING DIMENSIONS

RECOMMENDED SIZES 180° HOOKS



D = 6d FOR BARS #3 TO #8
D = 8d FOR BARS #9 TO #11
J = D+2d

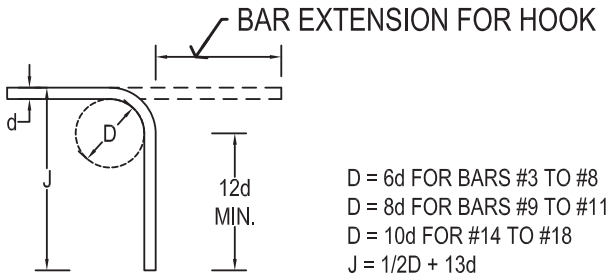
MINIMUM SIZES 180° HOOKS



D = 5d for bars #3 to #8
D = 5d for bars #9 to #11
J = D+2D

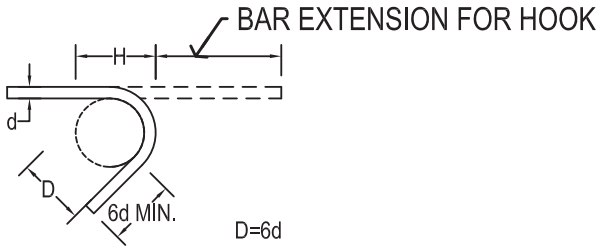
NOTE: MIN SIZE HOOKS TO BE USED ONLY FOR SPECIAL CONDITIONS

RECOMMENDED SIZES 90° HOOKS



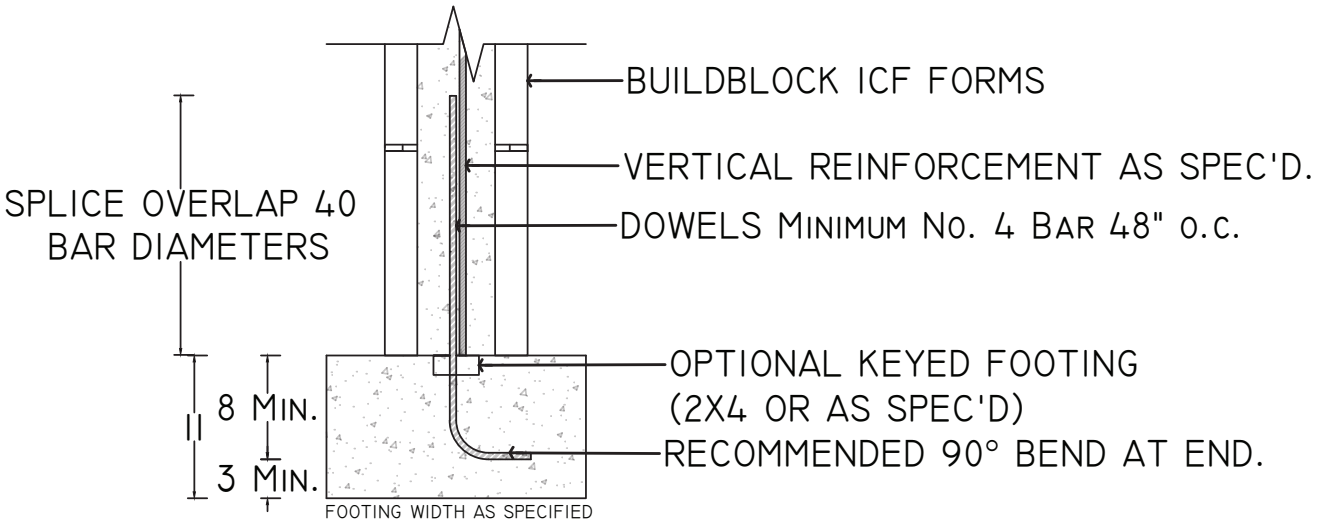
D = 6d FOR BARS #3 TO #8
D = 8d FOR BARS #9 TO #11
D = 10d FOR #14 TO #18
J = 1/2D + 13d

RECOMMENDED SIZES 135° HOOKS

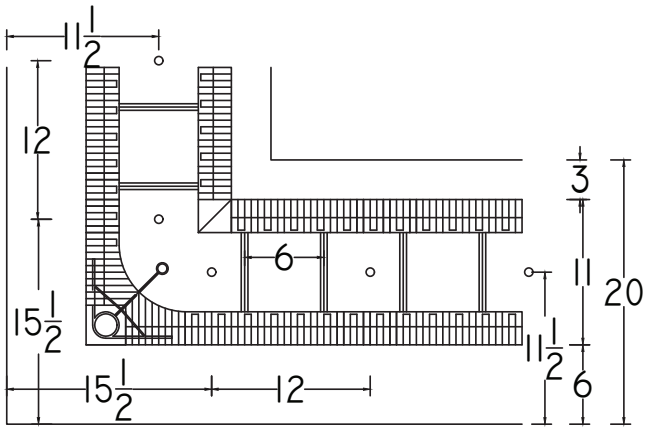


NOTE: STIRRUP HOOKS MAY BE BENT TO THE DIAMETER OF THE SUPPORTING BARS.

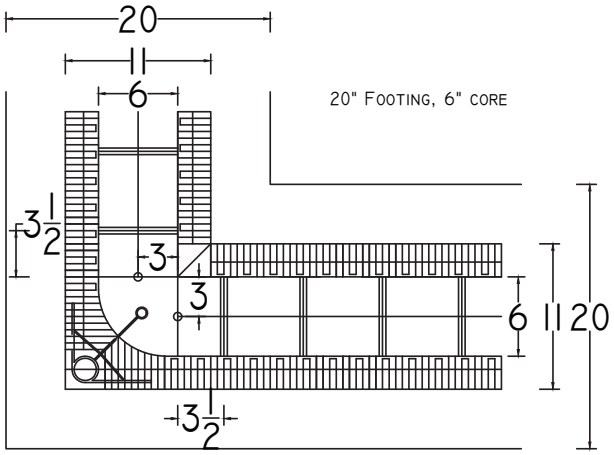
9.5 FOOTING CONNECTION



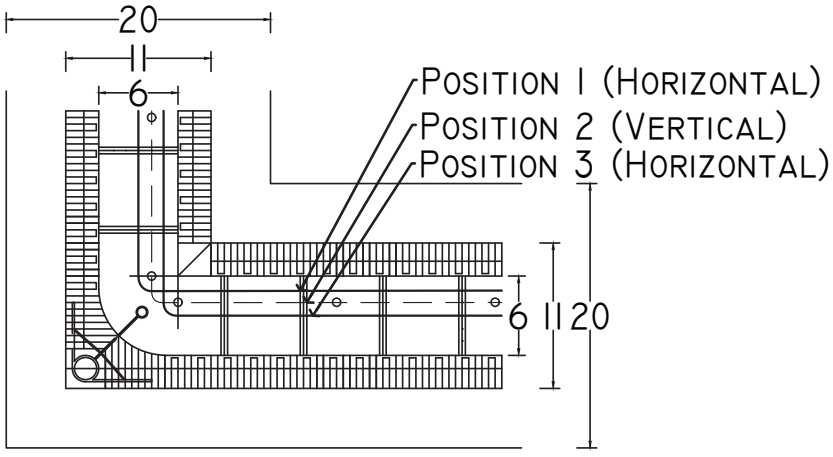
9.6 REBAR PLACEMENT AT CORNERS



20" FOOTING, 6" CORE
ALIGNED USING FOOTING AS BRICK LEDGE (ABOVE GRADE)



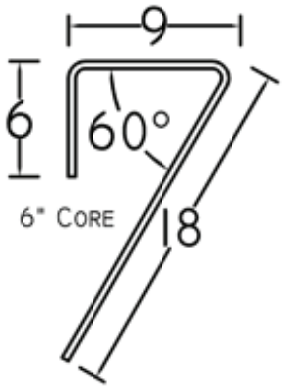
20" FOOTING, 6" CORE
ALIGNED CENTER OF FOOTING (ABOVE GRADE)



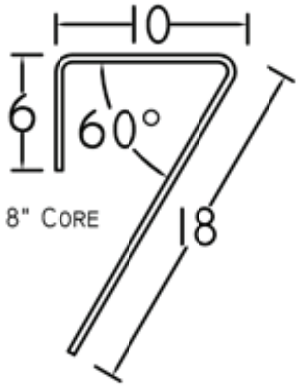
20" FOOTING, 6" CORE
ALIGNED TENSION SIDE CENTER OF FOOTING (BELOW GRADE - TENSION SIDE)

9.7 BRICK LEDGE REINFORCEMENT

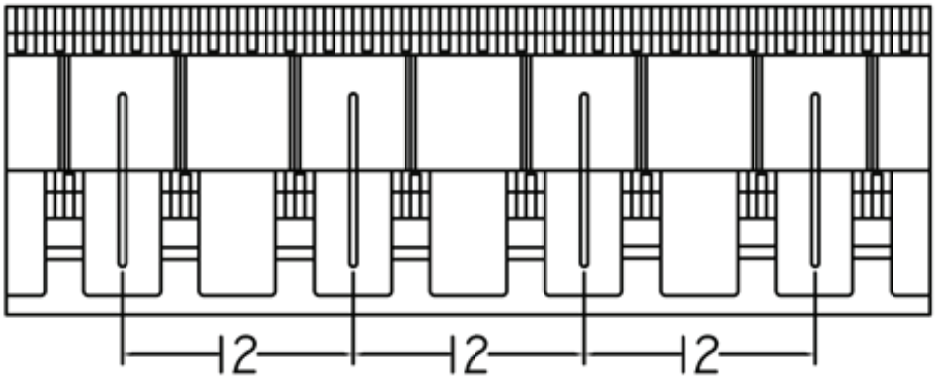
BRICK LEDGE STIRRUP



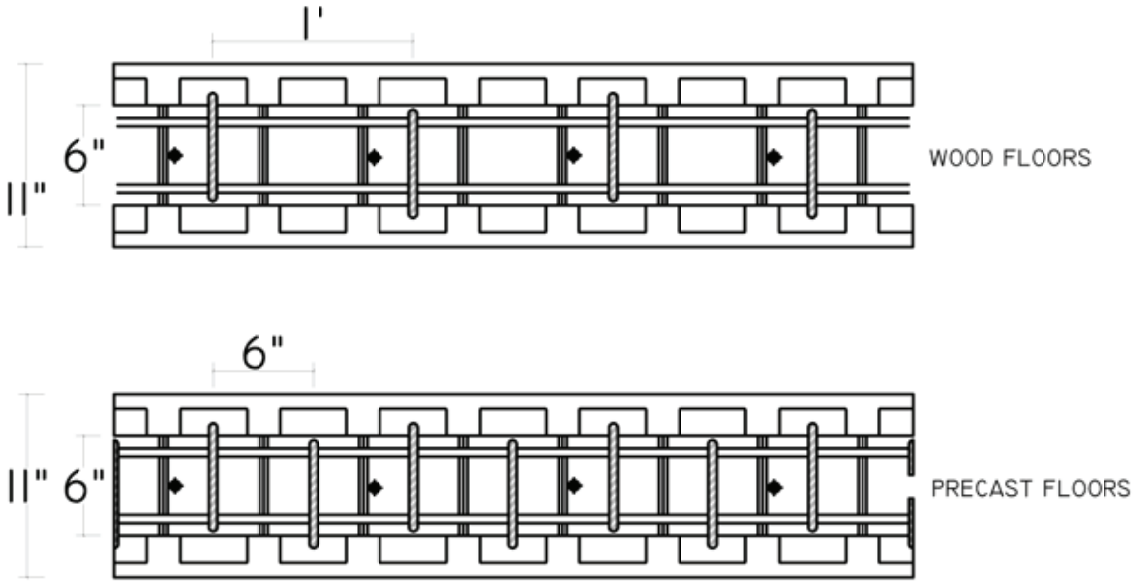
TYPICAL VENEER WEIGHT		
HEIGHT	3-1/2" BRICK	4" STONE
	~40PSF	~54PSF
8	320	432
9	360	486
10	400	540
12	480	648
16	640	864
18	720	972
20	800	1080
24	960	1296
30	1200	1620



BRICKLEDGE STIRRUP SPACING:
VENEER < 1000LB/FT @ 18"O.C.
VENEER < 1500LB/FT @ 12"O.C.
VENEER > 1500LB/FT DESIGN REQUIRED



9.7.2 TAPER TOP REINFORCEMENT

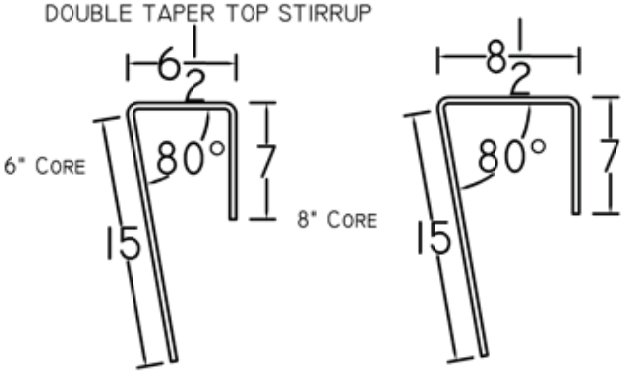


WOOD FLOORS 32' (9.75M) SPAN	
DEAD	15 PSF (0.72 KPA)
LIVE	40 PSF (1.9 KPA)

PRECAST FLOORS 32' (9.75M) SPAN	
DEAD	75 PSF (3.6 KPA)
LIVE	50 PSF (2.4 KPA)

PRECAST FLOORS 24' (7.3M) SPAN	
DEAD	75 PSF (3.6 KPA)
LIVE	100 PSF (4.8 KPA)

DOUBLE TAPER TOP STIRRUP



IMPERIAL REBAR - #3 GRADE 60, #4 GRADE 40
METRIC REBAR - 10M GRADE 400

NOTES:
75 PSF DEAD LOAD = 6" HOLLOW CORE SLAB + 2" TOPPING
WOOD FLOORS INSTALL STIRRUPS IN ALTERNATING DIRECTIONS @ 12" O.C.
PRECAST FLOORS INSTALL STIRRUPS IN ALTERNATING DIRECTIONS @ 6" O.C.

9.8 REBAR CONVERSION TABLE

REBAR SUBSTITUTIONS AND EQUIVALENT CROSS SECTIONAL AREA (HORIZONTAL REBAR)			
REBAR SIZE	**REBAR DIAMETER "d"**	**# OF REBAR**	**CROSS SECTIONAL AREA "A"**
#3	3/8"	1	0.11
		2	0.22
#4	1/2"	1	0.2
		2	0.4
#5	5/8"	1	0.31
		2	0.62
#6	3/4"	1	0.44
		2	0.88
#7	7/8"	1	0.6
		2	1.2
#8	1"	1	0.79
		2	1.58
The rebar substitution must have same or greater cross-sectional area, "A" as the rebar it's replacing.			

Often it is useful to have conversions for rebar to allow adjustments to be made for either spacings or rebar size. The PCA-100 has an excellent table (Table 2.3) to allow for adjusting the spacings based on alternative rebar sizes. Other times the bar size only is necessary, in the instance of lintels. The above chart provides an easy means to calculate Equivalent Cross Sectional Area to allow for on site rebar substitution. Cross Sectional Area refers to the area of the rebar when cut. This area is used to determine the rebar requirements for reinforcing a wall, slab or deck, and is in a ratio to the gross area of concrete

Different sized rebar may be used to achieve the appropriate Cross Sectional Area. E.G. 1-#6 and 1-#4 to equal 2-#5 rebar.

*Note: Vertical steel reinforcement should only be specified as a single bar, and the chart above should not be used to adjust vertical steel reinforcement from a single bar to 2 smaller bars. In the case of reinforcement beside windows, 2 bars are specified, and may be up-sized to a single bar if desired.

9.9 REBAR SUBSTITUTION TABLE

REBAR SUBSTITUTIONS		
SPECIFIED REINFORCEMENT	**UP-SIZE**	**DOWNSIZE**
1-#3		
2-#3	*1-#5*	
1-#4		*2-#3*
2-#4	*1-#6*	
1-#5		*1-#4 + 1-#3*
2-#5	*1-#7*	
1-#6		*1-#5 + 1-#4*
2-#6		
1-#7		*2-#5*
2-#7		
1-#8		*1-#6 + 1-#4*
2-#8		

10.0 REFERENCES

BUILDBLOCK ENGINEERING MANUAL REFERENCES

[1] Prescriptive Method for Insulating Concrete Forms in Residential Construction-2nd Edition, prepared for the U.S. Department of Housing and Urban Development, Portland Cement Association, and the National Association of Home Builders, by the NAHB Research Center, Inc., Upper Marlboro, Maryland. January, 2002.

[2] Building Code Requirements for Structural Concrete (ACI 318), American Concrete Institute, Detroit, Michigan. 2019.

[3] Structural Design of Insulating Concrete Form Walls in Residential Construction, prepared by NAHB Research Center, Inc., for the Portland Cement Association, Skokie, Illinois. 1998.

[4] Minimum Design Loads for Buildings and Other Structures (ASCE 7-16), American Society of Civil Engineers, New York, New York. 2016.

[5] ASTM C 31/C 31M-18b Standard Practice for Making and Curing Concrete Test Specimens in the Field, American Society for Testing and Materials (ASTM), West Conshohocken, Pennsylvania. 2018.

[6] ASTM C 94-17 Standard Specification for Ready-Mixed Concrete, American Society for Testing and Materials (ASTM), West Conshohocken, Pennsylvania.

[7] ASTM A 615 / A 615 M-15 Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement, American Society for Testing and Materials (ASTM), West Conshohocken, Pennsylvania.

[8] ASTM A 706 / A 706 M-16 Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement, American Society for Testing and Materials (ASTM), West Conshohocken, Pennsylvania.

[9] International Residential Code (IRC), International Code Council, Inc., Falls Church, Virginia. 2021.

[10] International Building Code, International Code Council, Falls Church, Virginia, 2021.

[11] PCA 100-2017, Prescriptive Design of Exterior Concrete Walls for One- and Two-Family Dwellings, Portland Cement Association, 5420 Old Skokie Rd., Skokie, Illinois; 2012.

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To harmoniously use the extraordinary gifts and talents of our distributors and dealers to fulfill the goals and dreams of millions of people who want to build better structures as reflected by our motto: "Build it once. Build it for life."

To manufacture one of the most affordable and highest quality Insulating Concrete Forms available in the world today.

To build greatness by providing the resources and services needed for building successful ICF businesses and sustainable ICF structures.

To build an enduring, profitable company while conducting business with Godly character, fairness and integrity.

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We envision a world where BuildBlock ICF technology delivers energy-efficient, safe, healthy, comfortable and sustainable ICF homes and buildings to millions of people worldwide through the uncompromising integrity of BuildBlock's team of distributors, dealers and customers.

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INTEGRITY – We strive to balance the best interests of our distributors, dealers, customers, employees, and investors in an environment of Godly character and honesty.

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The day for building your walls will come, the day for extending your boundaries.
Micah 7:11

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