

FEMA P-320 SAFE ROOM CONSTRUCTION PLANS

TAKING SHELTER FROM THE STORM: BUILDING A SAFE ROOM IN YOUR HOME OR SMALL BUSINESS *

DRAWING #	SHEET TITLE
SR0.0	INDEX SHEET
SR0.1	GENERAL NOTES
SR0.2	GENERAL NOTES
SR0.3	TABLES
SR1.0	CMU SAFE ROOM PLANS AND DETAILS
SR1.1	CONCRETE SAFE ROOM PLANS AND DETAILS
SR1.2	ICF SAFE ROOM PLANS AND DETAILS
SR1.3	WOOD FRAME SAFE ROOM PLANS AND DETAILS
SR1.4	WOOD / CMU INFILL FRAME SAFE ROOM AND DETAILS
SR1.5	DETAILS FOR SAFE ROOMS THAT USE BASEMENT WALLS
SR2.1	SHEATHING REQUIREMENTS & WOOD FRAME SAFE ROOM WITH STEEL SHEATHING
SR2.2	EXHAUST / VENTILATION DETAILS

LIMIT OF LIABILITY

THE DESIGNS IN THIS BOOKLET ARE BASED ON EXTENSIVE RESEARCH OF THE CAUSES AND EFFECTS OF WINDSTORM DAMAGE TO BUILDINGS. SAFE ROOMS DESIGNED AND BUILT TO THESE STANDARDS SHOULD PROVIDE A HIGH DEGREE OF OCCUPANT PROTECTION DURING EXTREME WINDSTORMS (TORNADOES AND HURRICANES). ANY SUBSTITUTION OF EITHER MATERIALS OR DESIGN CONCEPTS MAY DECREASE THE LEVEL OF OCCUPANT PROTECTION AND/OR INCREASE THE POSSIBILITY OF PERSONAL INJURY DURING A SEVERE WIND EVENT.

BECAUSE IT IS NOT POSSIBLE TO PREDICT OR TEST ALL CONDITIONS THAT MAY OCCUR DURING SEVERE WINDSTORMS OR CONTROL THE QUALITY OF CONSTRUCTION AMONG OTHER THINGS, THE DESIGNER DOES NOT WARRANT THE DESIGN.

THE DESIGNER NEITHER MANUFACTURES NOR SELLS SAFE ROOMS BUILT FROM THESE DESIGNS. THE DESIGNERS HAVE NOT MADE AND DO NOT MAKE ANY REPRESENTATION, WARRANTY, OR COVENANT, EXPRESS OR IMPLIED, WITH RESPECT TO THE DESIGN, CONDITION, QUALITY, DURABILITY, OPERATION, FITNESS FOR USE, OR SUITABILITY OF THE SAFE ROOM IN ANY RESPECT WHATSOEVER. THE DESIGNERS SHALL NOT BE OBLIGATED OR LIABLE FOR ACTUAL, INCIDENTAL, CONSEQUENTIAL, OR OTHER DAMAGES OF OR TO USERS OF THE SAFE ROOM, OR ANY OTHER PERSON OR ENTITY ARISING OUT OF OR IN CONNECTION WITH THE USE, CONDITION, AND/OR PERFORMANCE OF THE SAFE ROOM BUILT FROM THIS DESIGN OR FROM THE MAINTENANCE THEREOF.

* SAFE ROOMS FOR SMALL BUSINESSES OR RESIDENTIAL USE WITH MORE THAN 16 OCCUPANTS ARE COMMUNITY SAFE ROOMS THAT HAVE ADDITIONAL REQUIREMENTS THAT THESE CONSTRUCTION PLANS DO NOT PROVIDE FOR. SEE SECTION 4.2 OF FEMA P-320 FOR FURTHER DETAILS.

FEMA P-320 (2014)

SHEET TITLE:

INDEX SHEET

DRAWING NO:

SR0.0

Sheet: 1 of 12

DATE:

DECEMBER 2014

REVISIONS

--	--	--

Copyright © 2014

GENERAL NOTES

- THE CONSTRUCTION DRAWINGS REPRESENT THE FINISHED STRUCTURE. THEY DO NOT INCLUDE CONSTRUCTION MEANS AND METHODS. CONTRACTOR SHALL PROVIDE ALL MEASURES NECESSARY TO PROTECT THE STRUCTURE DURING CONSTRUCTION. SUCH MEASURES SHALL INCLUDE BUT ARE NOT LIMITED TO BRACING, SHORING FOR CONSTRUCTION LOADS, TEMPORARY STRUCTURES, AND PARTIALLY COMPLETED WORK.
- IF THERE IS A CONFLICT AMONG THE GENERAL NOTES, SPECIFICATIONS, AND PLANS, THE MORE STRINGENT CRITERIA SHALL APPLY.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL EXCAVATION PROCEDURES INCLUDING SHORING AND PROTECTION OF ADJACENT PROPERTY, STRUCTURES, STREETS, AND UTILITIES IN ACCORDANCE WITH THE LOCAL BUILDING DEPARTMENT. ALL WORK OR CONSTRUCTION SHALL COMPLY WITH ALL APPLICABLE BUILDING CODES, REGULATIONS, AND SAFETY REQUIREMENTS.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFICATION AND COORDINATION OF ALL DIMENSIONS, CONDITIONS AND ELEVATIONS.
- OPTIONS ARE FOR CONTRACTORS CONVENIENCE. IF AN OPTION IS USED, THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL NECESSARY CHANGES AND SHALL COORDINATE ALL DETAILS.
- DETAILS AND NOTES SHALL APPLY, THOUGH NOT NECESSARILY AT A SPECIFIC LOCATION ON PLANS. WHERE NO DETAILS ARE SHOWN, CONSTRUCTION SHALL CONFORM TO SIMILAR WORK ON THE PROJECT. DETAILS MAY ONLY SHOW ONE SIDE OF CONNECTION OR MAY OMIT INFORMATION FOR CLARITY. WHERE DISCREPANCIES OCCUR IN THESE DRAWINGS, NOTES AND DETAILS ON DRAWINGS SHALL TAKE PRECEDENCE OVER GENERAL STRUCTURAL NOTES AND TYPICAL DETAILS.
- NOT ALL OPENINGS ARE SHOWN IN THESE DRAWINGS. ESTABLISH AND VERIFY ALL OPENINGS AND INSERTS FOR MECHANICAL, PLUMBING, AND ELECTRICAL WITH APPROPRIATE TRADES, DRAWINGS, AND SUBCONTRACTORS PRIOR TO CONSTRUCTION. OPENINGS MAY REQUIRE ADDITIONAL REINFORCING OR SUPPORTS AS SHOWN ON TYPICAL DETAILS. OPENINGS NEED TO BE PROTECTED PER ICC 500 SECTIONS 310.1 AND 306.3.
- COMPLETE INSPECTION REQUIREMENTS SHALL BE AS DIRECTED BY THE LOCAL BUILDING DEPARTMENT.
- THE CONSTRUCTION DRAWINGS SHOULD NOT BE SCALED. DIMENSIONS APPLY.
- FOLLOW MANUFACTURER'S RECOMMENDATIONS FOR INSTALLING OF UPLIFT/SHEAR RESISTANCE CONNECTORS.
- TO ENSURE THE SAFE ROOM PROVIDES THE DESIRED LEVEL OF PROTECTION, A PROFESSIONAL ENGINEER OR ARCHITECT SHOULD BE CONSULTED FOR ANY DESIGN CONDITION FOUND TO BE DIFFERENT FROM THOSE REPRESENTED BY THESE PLANS.
- TO OBTAIN AN EQUIVALENT LEVEL OF PROTECTION, SAFE ROOM DESIGNS NOT MEETING THE SPECIFIC REQUIREMENTS OF THE DESIGNS IN THESE PLANS SHOULD BE DESIGNED TO MEET THE FEMA SAFE ROOM CRITERIA SET FORTH IN THE 2015 FEMA P-361 "*DESIGN AND CONSTRUCTION GUIDANCE FOR COMMUNITY SAFE ROOMS*."
- FOR ALL CONSTRUCTION, USE ONLY SCREWS AND HARDWARE THAT HAVE BEEN EVALUATED THROUGH AN ANSI-APPROVED PRODUCT CERTIFICATION BODY SUCH AS IAPMO-OES OR ICC-ES.
- VENTILATION IS TO BE PROVIDED PER PLAN DETAILS. VERIFY SIZE REQUIREMENTS BASED ON SAFE ROOM SIZE AND ICC 500.
- MAXIMUM WALL HEIGHT FOR SAFE ROOM SHALL BE 8'-0".
- REFER TO LOCALLY ADOPTED BUILDING CODE FOR EXTERIOR SAFE ROOM WEATHER PROTECTION REQUIREMENTS.
- FOR COMMUNITY SAFE ROOMS SEE 2014 ICC 500 AND 2015 FEMA P-361 FOR ADDITIONAL DESIGN REQUIREMENTS.

SLAB ON GRADE GENERAL NOTES:

- 4" (MINIMUM) SLAB ON GRADE REINFORCED WITH WWR 6X6 W2.9XW2.9 (IN SHEETS) OR #4 BARS AT 12" OC EACH WAY. LOCATE REINFORCING IN TOP THIRD OF SLAB. PROVIDE BOLSTERS, CHAIRS, OR OTHER MEANS APPROVED IN WRITING BY THE ENGINEER TO PROPERLY LOCATE REINFORCING.
- SLAB ON GRADE INSIDE THE BUILDING STRUCTURE SHALL BE SUPPORTED ON A 6" DRAINAGE COURSE. DRAINAGE COURSE SHALL BE AS FOLLOWS: COURSE OF CLEAN WASHED GRANULAR MATERIAL PLACED TO CUT OFF UPWARD CAPILLARY FLOW OF GROUND WATER, OR TO PROVIDE A STABLE BASE FOR PIPES OR OTHER STRUCTURES. MATERIAL SHALL BE WASHED, EVENLY GRADED MIXTURE OF CLEAN CRUSHED STONE, OR CRUSHED OR UNCRUSHED GRAVEL, ASTM D 448, COARSE AGGREGATE GRADING SIZE 57, WITH 100 PERCENT PASSING A 1-1/2 INCH SIEVE AND NOT MORE THAN 5 PERCENT PASSING A NO. 8 SIEVE.
- CONSULT WITH LOCAL CODE OFFICIAL FOR VAPOR RETARDER RECOMMENDATIONS.
- PROVIDE JOINT FILLER AT THE INTERFACE OF ALL WALL AND SLAB JOINTS.
- ALL EXPANSIVE CLAYS WITHIN 24" OF FLOOR SLABS SHALL BE REMOVED. ALL FILL BELOW FLOOR SLABS SHALL BE PROPERLY COMPACTED AND SUBGRADE BROUGHT TO A TRUE AND LEVEL PLANE BEFORE PLACEMENT OF ANY CONCRETE.

CONCRETE NOTES

- REINFORCING BAR DETAILING, FABRICATING, AND PLACING SHALL CONFORM TO THE "ACI STANDARD: DETAILS AND DETAILING OF CONCRETE REINFORCEMENT" (ACI 315) AND THE "MANUAL OF ENGINEERING AND PLACING DRAWINGS FOR REINFORCED CONCRETE STRUCTURES" (ACI 315R) BY THE AMERICAN CONCRETE INSTITUTE. THE MOST CURRENT EDITIONS OF CONCRETE REINFORCING STEEL INSTITUTE'S "REINFORCING BAR DETAILING" AND "PLACING REINFORCING BARS" MAY ALSO BE USED.
- REINFORCING STEEL SHALL CONFORM TO THE REQUIREMENTS OF ASTM A615. REINFORCING SHALL BE GRADE 60 (FY=60 KSI) DEFORMED BARS FOR ALL BARS UNLESS NOTED OTHERWISE ON PLANS OR DETAILS. ALL REINFORCING TO BE WELDED SHALL BE ASTM A706, GRADE 60 LOW ALLOY WELDABLE STEEL.
- WELDING OF REINFORCING BARS, METAL INSERTS, AND CONNECTIONS SHALL CONFORM TO AMERICAN WELDING SOCIETY'S AWS D1.4 – STRUCTURAL WELDING CODE, AND SHALL BE MADE ONLY AT LOCATIONS SHOWN ON PLANS OR DETAILS.
- ALL REINFORCING SHALL BE BENT COLD. BARS SHALL NOT BE STRAIGHTENED AND RE-BENT. FIELD BENDING OF REBAR SHALL NOT BE ALLOWED UNLESS SPECIFICALLY NOTED OTHERWISE.
- REINFORCING BAR SPACING SHOWN ON PLANS ARE AT MAXIMUM ON CENTERS. ALL BARS SHALL BE DETAILED AND PLACED WITHIN 1/2" TOLERANCE IN ANY DIRECTION. SECURELY TIE ALL BARS IN LOCATION BEFORE PLACING CONCRETE.
- REINFORCING BAR CLEAR COVER REQUIREMENTS:
 - CONCRETE PLACED AGAINST EARTH – 3"
 - CONCRETE PLACED IN FORMS – 1.5"
- WELDED WIRE REINFORCING SHALL CONFORM TO THE REQUIREMENTS OF ASTM A1064. LAPS IN WELDED WIRE REINFORCING SHALL BE MADE SUCH THAT THE OVERLAP, MEASURED BETWEEN OUTERMOST CROSS WIRE OF EACH SHEET, IS NOT LESS THAN THE SPACING OF CROSS WIRES PLUS 2 INCHES.
- MECHANICAL SPLICE COUPLERS, FLANGE COUPLERS, THREADED COUPLERS, ETC. SHALL HAVE CURRENT ANSI-APPROVED PRODUCT CERTIFICATION BODY SUCH AS IAPMO-OES OR ICC-ES APPROVAL AND SHALL BE CAPABLE OF DEVELOPING 125% OF THE STRENGTH OF THE BAR.
- PROVIDE BAR SUPPORTS: BOLSTERS, CHAIRS, SPACERS, AND OTHER DEVICES FOR SPACING, SUPPORTING, AND FASTENING REINFORCING BARS AND WELDED WIRE REINFORCEMENT IN PLACE. MANUFACTURE BAR SUPPORTS FROM STEEL WIRE, PLASTIC, OR PRECAST CONCRETE ACCORDING TO CRSI's "MANUAL OF STANDARD PRACTICE."
- PROVIDE TEMPORARY SHORING AND BRACING OF ALL STRUCTURAL AND MISCELLANEOUS ELEMENTS UNTIL CONCRETE HAS OBTAINED 80% OF DESIGN STRENGTH.
- WHEN PLACING CONCRETE IN HOT WEATHER, REFER TO ACI 305R. WHEN PLACING CONCRETE IN COLD WEATHER, REFER TO ACI 306.1.
- ALL BELOW GRADE CONSTRUCTION JOINTS SHALL HAVE A CONTINUOUS WATERSTOP CAST INTEGRALLY INTO THE JOINT.
- WHERE FOOTINGS, WALLS, OR OTHER STRUCTURAL ELEMENTS INTERSECT, CORNER, OR TEE, PROVIDE CORNER BARS WITH REQUIRED LAP LENGTHS TO PROVIDE CONTINUITY OF HORIZONTAL STEEL REINFORCING UNO.
- PROVIDE MINIMUM 3" COVER FOR ANCHOR BOLTS AND LOCATE HORIZONTAL REINFORCEMENT TO THE OUTSIDE FOR ANCHOR BOLT CONTAINMENT UNO.
- FOLLOW ALL MANUFACTURER'S INSTALLATION RECOMMENDATIONS WHERE DOWELS, BOLTS, OR INSERTS ARE CALLED TO BE ANCHORED TO CAST IN PLACE CONCRETE ELEMENTS USING EPOXY ADHESIVES OR MECHANICAL ANCHORAGE.
- FLY ASH MAY BE USED AS A ONE TO ONE REPLACEMENT UP TO 20% FOR THE TOTAL CEMENT CONTENT AS LONG AS THE AMBIENT TEMPERATURE IS ABOVE 50 DEGREES FAHRENHEIT. FLY ASH SHALL BE CLASS C CONFORMING TO ASTM C 618.
- ALL CONCRETE EXPOSED TO FREEZING SHALL BE AIR ENTRAINED. AIR CONTENT OF FRESH CONCRETE SHALL BE 5-7%.
- NO LIME SAND FINE AGGREGATE MAY BE USED IN CONCRETE EXPOSED TO WEATHER, VIEW, OR IN HORIZONTAL APPLICATIONS.
- DO NOT USE AIR ENTRAINED CONCRETE FOR FLOORS WITH A TROWELED FINISH. AT SUCH LOCATIONS ENTRAPPED AIR CONTENT SHALL NOT EXCEED 3%.
- CONCRETE FOR FOUNDATION WALLS, FOOTINGS, AND INTERIOR SLABS ON GRADE SHALL HAVE A 28-DAY COMPRESSIVE STRENGTH OF 3,000 PSI WITH A SLUMP OF 4" ± 1". THE MAXIMUM WATER TO CEMENT RATIO SHALL BE 0.45 BY WEIGHT.
- CONCRETE FOR CAST-IN-PLACE WALL SHALL HAVE A 28-DAY COMPRESSIVE STRENGTH OF 4,000 PSI WITH A SLUMP OF 4" ± 1". THE MAXIMUM WATER TO CEMENT RATIO SHALL BE 0.45 BY WEIGHT.
- IF ADDITIONAL FLOWABILITY IS REQUIRED FOR PLACEMENT OF ANY CONCRETE MIX, A WATER-REDUCING ADDITIVE CONFORMING TO ASTM C494, TYPE A, D, E, OR F SHALL BE USED. NO ADDITIONAL WATER MAY BE ADDED TO THE MIX AT THE SITE. SLUMP FOR CONCRETE CONTAINING WATER-REDUCING OR HIGH-RANGE WATER-REDUCING ADMIXTURE SHALL NOT EXCEED 8" AFTER ADMIXTURE IS INCORPORATED INTO CONCRETE WITH A 2"-4" SLUMP.

ABBREVIATION LEGEND

AB	ANCHOR BOLT
ACI	AMERICAN CONCRETE INSTITUTE
AISC	AMERICAN INSTITUTE OF STEEL CONSTRUCTION
AISI	AMERICAN IRON AND STEEL INSTITUTE
AWS	AMERICAN WELDING SOCIETY
BO	BOTTOM OF
BRG	BEARING
BTM	BOTTOM
CIP	CAST IN PLACE CONCRETE WALL
CMU	CONCRETE MASONRY UNIT
CONC	CONCRETE
CONN	CONNECTION
CONT	CONTINUOUS
DIA	DIAMETER
DBL	DOUBLE
EL	ELEVATION
EQ	EQUAL
EW	EACH WAY
FND	FOUNDATION
FF	FINISHED FLOOR
FTG	FOOTING
GA	GAGE
GYP	GYPSUM
HORIZ	HORIZONTAL
ICF	INSULATED CONCRETE FORMS
INFO	INFORMATION
KSI	KIPS PER SQUARE INCH
L	LENGTH
LB	POUNDS
LONG	LONGITUDINAL
MAX	MAXIMUM
MEP	MECHANICAL, ELECTRICAL, PLUMBING
MFR	MANUFACTURER
MIN	MINIMUM
MISC	MISCELLANEOUS
ML	MASONRY LINTEL
MTL	METAL
NTS	NOT TO SCALE
OC	ON CENTER
PCF	POUNDS PER CUBIC FOOT
PLF	POUNDS PER LINEAR FOOT
PSF	POUNDS PER SQUARE FOOT
PSI	POUNDS PER SQUARE INCH
PT	PRESSURE TREATED
RE	REFER TO
REINF	REINFORCING
SIM	SIMILAR
SF	SQUARE FOOT
SFRM	SAFE ROOM
SOG	SLAB ON GRADE
SPEC	SPECIFICATIONS
T	THICKNESS
T&B	TOP AND BOTTOM
TO	TOP OF
TOC	TOP OF CONCRETE ELEVATION
TOF	TOP OF FOOTING ELEVATION
TOW	TOP OF WALL ELEVATION
TYP	TYPICAL
UNO	UNLESS NOTED OTHERWISE
W	WIDTH
W/	WITH
WWR	WELDED WIRE REINFORCING

FEMA P-320 (2014)

SHEET TITLE: GENERAL NOTES

DRAWING NO: SR0.1 Sheet: 2 of 12

DATE: DECEMBER 2014

REVISIONS

COLD-FORM (LIGHT GAUGE) SHEATHING NOTES

- YIELD STRENGTH FOR METAL IS 36 KSI MINIMUM
- IN HURRICANE-PRONE REGIONS, ALL METAL SHOULD BE G60 GALVANIZED BY THE MANUFACTURER.
- SAFE ROOM W/ STEEL SHEATHING COVERED W/ GYP. BOARD FINISH OR OTHERWISE SEPARATED FROM CONTACT BY SAFE ROOM OCCUPANTS NEED NOT BE GROUNDED.
- SAFE ROOM W/ STEEL SHEATHING UNCOVERED AND AVAILABLE FOR CONTACT BY SAFE ROOM OCCUPANTS MUST BE GROUNDED AT A SINGLE LOCATION W/ COPPER WIRE AND GROUND ROD TO MEET NATIONAL ELECTRIC CODE AND LOCAL REQUIREMENTS.

DOOR NOTES

- THE SELECTED DOOR SHALL MEET THE DESIGN CRITERIA OF 2015 FEMA P-361 AND 2014 ICC-500. ALL DOORS SHALL BE A TESTED ASSEMBLY AND INSTALLED PER MANUFACTURES RECOMMENDATIONS.
- FOR WOOD FRAMED SAFE ROOM, DOOR MUST BE PLACED ON LONGEST WALL.
- FOR SMALL BUSINESS APPLICATIONS, DOORS ARE REQUIRED TO BE ADA ACCESSIBLE WITH A MINIMUM WIDTH OF 3'-0".

DESIGN CRITERIA

FEMA P-320

1. DESIGN CODES

· RISK CATEGORY
- IRC 2012 / IBC 2012 / FEMA P-361 3RD,2015 /ICC 500-2014 IV
2. GRAVITY LOADS
- A. TYPICAL ROOF DEAD LOAD
COLLATERAL LOAD

SELF WEIGHT
5 PSF
- B. LIVE LOADS
TYPICAL ROOF LIVE LOAD (LR)

100 PSF MIN
- C. ROOF SNOW LOAD

- CONSULT LOCAL PROFESSIONAL ENGINEER FOR THE DESIGN OF SNOW LOADS WHEN SNOW LOADS COULD EXCEED THE SPECIFIED ROOF LIVE LOAD.
3. LATERAL LOADS
- A. WIND LOADS

WIND SPEED
WIND IMPORTANCE FACTOR (I)
EXPOSURE CATEGORY
DIRECTIONALITY FACTOR (Kd)
TOPOGRAPHIC FACTOR (Kzt)
INTERNAL PRESSURE (GCpi)

250 MPH
1.0
C
1.0
1.0
±0.55
- B. SEISMIC LOADS

- IN AREAS OF HIGH OR MODERATE SEISMIC DESIGN, CONSULT A LOCAL DESIGN PROFESSIONAL. SEE SECTION 4.2 OF P-320 FOR MORE INFORMATION.
4. MISSILE IMPACT CRITERIA
- VERTICAL SURFACES

15 POUND 2x4 AT 100MPH
- HORIZONTAL SURFACES

15 POUND 2x4 AT 67MPH

MASONRY GENERAL NOTES

- COMPRESSIVE STRENGTH OF CONCRETE MASONRY CONSTRUCTION (CMU) SHALL BE AS FOLLOWS: MASONRY STRENGTH NOT SPECIFICALLY NOTED IN PLAN SHALL BE *f**m* = 1500 PSI MINIMUM.
- CONCRETE MASONRY SHALL BE HOLLOW LOAD-BEARING CONCRETE MASONRY UNITS CONFORMING TO ASTM C90,. ALL UNITS SHALL BE PLACED IN RUNNING BOND CONSTRUCTION WITH ALL VERTICAL CELLS IN ALIGNMENT EXCEPT AT DRY STACKED INFILL LOCATIONS.
- MORTAR SHALL CONFORM TO REQUIREMENTS OF TYPE M OR S.
- REINFORCING STEEL SHALL CONFORM TO THE REQUIREMENTS OF ASTM A615. REINFORCING SHALL BE GRADE 60 (FY=60 KSI) DEFORMED BARS FOR ALL BARS UNLESS NOTED OTHERWISE ON PLANS OR DETAILS. ALL REINFORCING TO BE WELDED SHALL BE ASTM A706, GRADE 60 LOW ALLOY WELDABLE STEEL.
- WELDING OF REINFORCING BARS, METAL INSERTS, AND CONNECTIONS SHALL CONFORM TO AMERICAN WELDING SOCIETY'S AWS D1.4 – STRUCTURAL WELDING CODE, AND SHALL BE MADE ONLY AT LOCATIONS SHOWN ON PLANS OR DETAILS.
- ALL REINFORCING SHALL BE BENT COLD. BARS SHALL NOT BE STRAIGHTENED AND RE-BENT. FIELD BENDING OF REBAR SHALL NOT BE ALLOWED UNLESS SPECIFICALLY NOTED OTHERWISE.
- REINFORCING BAR SPACING SHOWN ON PLANS ARE AT MAXIMUM ON CENTERS. ALL BARS SHALL BE DETAILED AND PLACED WITHIN 1/2" TOLERANCE PERPENDICULAR TO THE WALL AND WITHIN 2" TOLERANCE PARALLEL TO THE WALL. SUPPORT ALL REINFORCEMENT TO PREVENT DISPLACEMENT CAUSED BY CONSTRUCTION LOADS OR BY PLACEMENT OF GROUT AND MORTAR BEYOND ALLOWABLE TOLERANCES.
- MASONRY GROUT SHALL BE IN ACCORDANCE WITH ASTM C476. GROUT EXCEPT FOR SELF-CONSOLIDATING GROUT SHALL HAVE A SLUMP BETWEEN 8 AND 11" WHEN MEASURED IN ACCORDANCE WITH ASTM C143. ALL CELLS IN CONCRETE MASONRY UNITS SHALL BE SOLID GROUTED. EXCEPTION: DRY-STACKED MASONRY FOR WOOD-FRAME INFILL OPTION.
- REFERENCE MASONRY DEVELOPMENT AND SPLICE TABLE FOR REINFORCING BAR LAP LENGTHS IN MASONRY CONSTRUCTION.
- MINIMUM VERTICAL WALL REINFORCING SHALL BE AS INDICATED IN THE PLANS AND SHALL BE FULL HEIGHT IN CENTER OF GROUTED CELL AT WALL INTERSECTIONS, CORNERS AND DOOR JAMBS.
- MINIMUM HORIZONTAL WALL REINFORCING SHALL INCLUDE A BOND BEAM AT THE TOP OF THE WALL WITH A MINIMUM OF 1 NO.4 BAR CONTINUOUS AROUND PERIMETER FOR 6" MASONRY WALLS AND 1 NO. 5 CONTINUOUS AROUND THE PERIMETER FOR 8" MASONRY WALLS. PROVIDE BENT BARS PER TYPICAL DETAILS TO MATCH AND LAP WITH HORIZONTAL BOND BEAM REINFORCING AT CORNERS AND WALL INTERSECTIONS TO MAINTAIN CONTINUITY OF BOND BEAM REINFORCEMENT.
- MINIMUM MASONRY LINTEL SHALL BE AS INDICATED IN THE PLANS. ALL LINTEL REINFORCING SHALL EXTEND 2 FEET PAST JAMBS UNLESS NOTED OTHERWISE ON PLANS OR DETAILS.
- MASONRY VENEER SHALL BE ATTACHED TO SUPPORTING WALL FRAMING WITH 3/16" DIA. WALL TIES OR DOVETAIL-TYPE METAL TIES OF EQUIVALENT STIFFNESS EMBEDDED INTO HORIZONTAL MORTAR JOINTS. MAXIMUM VERTICAL SPACING OF TIES SHALL BE 16". MAX HORIZONTAL SPACING SHALL BE 24". TIES IN ALTERNATE COURSES SHALL BE STAGGERED. PROVIDE 9 GA. WIRE REINFORCING IN HORIZONTAL MORTAR JOINTS AT 16" O.C. ENGAGE 9 GA. WIRE WITH WALL ANCHOR TIES.
- LOOSE ANGLE BRICK LINTELS SHALL BE SPECIFIED BY OTHERS.
- RETAINING WALLS, BASEMENT WALLS, ETC., SHALL BE ADEQUATELY WATERPROOFED AND DRAINED AS SPECIFIED BY OTHERS.
- WHERE VERTICAL REINFORCING INTERSECTS HORIZONTAL REINFORCING, BOTH SHALL BE CONTINUOUS.
- MAXIMUM HEIGHT FOR GROUT POUR SHALL NOT EXCEED 64" UNLESS A CLEANOUT IS PROVIDED AT THE BOTTOM OF EACH CELL CONTAINING REINFORCEMENT OR AT A MAXIMUM HORIZONTAL SPACING OF 32" WHICHEVER IS LESS.
- FOLLOW ALL MANUFACTURER'S INSTALLATION RECOMMENDATIONS WHERE DOWELS, BOLTS, OR INSERTS ARE CALLED TO BE ANCHORED TO CAST IN PLACE CONCRETE ELEMENTS USING EPOXY ADHESIVES OR MECHANICAL ANCHORAGE.

INSULATED CONCRETE FORMS GENERAL NOTES

- ICF SYSTEM UTILIZED SHALL BE FLAT PANEL SYSTEM PROVIDING CONSISTENT WALL THICKNESS ACROSS THE ENTIRE WALL. DO NOT USE WAFFLE, SCREEN, POST AND BEAM ETC. ICF SYSTEMS.
- EXTREME CARE SHOULD BE TAKEN WHEN VIBRATING THE CONCRETE INSIDE THE PERMANENT ICF FORMS TO ASSURE CONSOLIDATION OF CONCRETE AND TO ELIMINATE VOIDS IN THE WALL. LIKEWISE, CARE SHOULD BE TAKEN NOT TO OVER-VIBRATE CONCRETE THUS SEGREGATING AGGREGATE.
- REFERENCE ICF MANUFACTURE FOR MAXIMUM POUR HEIGHTS.
- CONCRETE FOR ICF WALLS SHALL HAVE A 28-DAY COMPRESSIVE STRENGTH OF 4,000 PSI WITH A SLUMP OF 6"+/-1" PER MANUFACTURE RECOMMENDATIONS. THE MAXIMUM WATER TO CEMENT RATIO SHALL BE 0.45 BY WEIGHT.

GENERAL WOOD FRAMING NOTES

- WOOD FRAMING LUMBER TO HAVE MODULUS OF ELASTICITY = 1,200,000 PSI MIN. AND Fb = 850 PSI. MIN. FOR NORMAL DURATION LOADING. EXAMPLES OF ACCEPTABLE GRADE AND SPECIES OF FRAMING LUMBER INCLUDE #2 AND BETTER SOUTHERN PINE, DOUGLAS FIR, HEM-FIR, AND SPRUCE-PINE-FIR.
- PLYWOOD SHOULD BE RATED SHEATHING SPAN RATING 32/16, MIN. 23/32 THICKNESS.
- NAILS SHALL BE COMMON WIRE NAILS AS SPECIFIED ON THE PLANS.
- FOLLOW MANUFACTURER'S RECOMMENDATIONS FOR INSTALLATION OF UPLIFT/SHEAR RESISTANCE CONNECTORS.
- ALL PLYWOOD JOINTS SHOULD BE SOLIDLY BLOCKED w/ 2x6.
- WALL AND CEILING PENETRATIONS THROUGH THE MISSILE PROTECTION SHEATHING SHALL BE MINIMIZED.
- DO NOT DRILL THROUGH WALL STUDS OR TOP AND BOTTOM PLATES FOR MEP SUPPLY LINES OR VENTS. INSTALL MEP SUPPLY LINES AND VENTS IN PLUMBING CHASE.
- ALL WOOD FRAMING SHALL BE FREE OF LARGE KNOTS, WARPS, SPLITS, OR DEFECTS.
- WHERE CALLED FOR ON THE PLANS TO USE FRAMING ANCHORS USE GALVANIZED OR CORROSION-RESISTANT EQUIVALENT STEEL FRAMING ANCHORS.
- ALL LUMBER IN CONTACT WITH CONCRETE OR MASONRY SHALL BE TREATED AND SHALL COMPLY WITH APPLICABLE REQUIREMENTS OF AWPA STANDARD U1, USE CATEGORY UC3B.
- AT OPENINGS PROVIDE FOUR (4) 2X TRIMMER STUDS AT EACH SIDE OF OPENING.
- SHEATHING MAY BE INSTALLED ON INSIDE OR OUTSIDE FACE. SINGLE LAYER TO BE INSTALLED ON OPPOSITE FACE.

FOUNDATION NOTES

- ALL FOOTINGS SHALL BEAR ON AND BE FORMED BY CLEAN, UNDISTURBED, VIRGIN, NON-ORGANIC SOIL OR CONTROLLED ENGINEERED FILL WITH A MINIMUM NET BEARING CAPACITY OF 1500 PSF.
- EXTERIOR FOOTINGS SHALL BEAR AT OR BELOW MINIMUM BEARING DEPTH PER THE LOCAL BUILDING OFFICIAL. MINIMUM BEARING DEPTH IS 30" BELOW ADJACENT FINISHED GRADE.
- STANDARD PROCEDURES OF FROST PROTECTION FOR FOUNDATIONS AND EXCAVATIONS SHALL BE EMPLOYED FOR WINTER CONSTRUCTION. BACKFILLING OF EXCAVATIONS SHALL BE DONE AS SOON AS POSSIBLE TO PROTECT FOUNDATIONS FROM FROST.
- ALL SOIL BELOW SLABS AND FOOTINGS SHALL BE PROPERLY COMPACTED AND SUBGRADE BROUGHT TO A TRUE AND LEVEL PLANE BEFORE PLACING CONCRETE.
- FOUNDATION WALLS SHALL HAVE TEMPORARY BRACING BEFORE BACKFILL IS PLACED AGAINST THEM. TEMPORARY BRACING SHALL NOT BE REMOVED UNTIL WALL IS PERMANENTLY BRACED.
- FOUNDATION PENETRATIONS SHALL BE SUBJECT TO APPROVAL BY A PROFESSIONAL ENGINEER OR ARCHITECT. PENETRATIONS SHALL BE THROUGH THE FOUNDATION STEMWALL OR WITH A MINIMUM OF 6" COVER BELOW FOOTING.
- IN AREA OF THE BUILDING, EXISTING ORGANIC MATERIAL, UNSUITABLE SOIL, ABANDONED FOOTINGS, AND ANY OTHER EXISTING UNSUITABLE MATERIALS SHALL BE REMOVED.
- DRAINAGE FILL SHALL BE A FREE-DRAINING GRANULAR MATERIAL. USE #57 STONE OR APPROVED EQUAL. REFER TO ASTM D448 FOR GRADATION.
- EXCAVATION FOR FOOTINGS SHALL BE CUT TO ACCURATE SIZE AND DIMENSIONS AS SHOWN ON PLANS. ALL LOOSE MATERIAL BELOW FOOTINGS SHALL BE REMOVED AND THE SURFACE BROUGHT TO A REASONABLE TRUE AND LEVEL PLANE BEFORE PLACING CONCRETE.
- WHEN INSTALLATION AND FOUNDATION REQUIREMENTS ARE ADDRESSED BY A LOCAL DESIGN PROFESSIONAL, THESE DESIGNS SHALL EXCEED THE DESIGN REQUIREMENTS SET FORTH IN THE ICC-500 FOR RESIDENTIAL SHELTERS FOR BOTH TORNADO AND HURRICANE HAZARDS.

FEMA P-320 (2014)		
SHEET TITLE: GENERAL NOTES		
DRAWING NO: SR0.2		Sheet: 3 of 12
DATE: DECEMBER 2014		
REVISIONS		
Copyright © 2014		

CONCRETE DEVELOPMENT AND SPLICE							
LAP SPLICE LENGTHS (INCHES)							
BAR SIZE	TENSION (CLASS B SPLICE)						COMPRESSION
	f'c=3000 psi		f'c=4000 psi		f'c=5000 psi		3000, 4000 & 5000 psi
	TOP	OTHER	TOP	OTHER	TOP	OTHER	
3	21	16	21	16	21	16	12
4	23	17	21	16	21	16	15
5	28	21	24	18	23	17	19
6	34	26	29	22	26	20	23
7	52	40	45	34	41	31	26
8	62	47	54	41	49	37	30
DEVELOPMENT LENGTHS (INCHES)							
BAR SIZE	TENSION (CLASS B SPLICE)						COMPRESSION
	f'c=3000 psi		f'c=4000 psi		f'c=5000 psi		3000, 4000 & 5000 psi
	TOP	OTHER	TOP	OTHER	TOP	OTHER	
3	25	17	22	15	19	13	8
4	33	22	29	19	26	17	11
5	42	28	36	24	32	22	14
6	50	33	43	29	39	26	16
7	72	48	63	42	56	37	19
8	82	55	71	47	64	42	22
NOTES:							
1. TOP BARS ARE HORIZONTAL REINFORCEMENT PLACED SO THAT MORE THAN 12" OF FRESH CONCRETE IS CAST BELOW THE REINFORCEMENT.							
2. LAP SPLICE LENGTHS ARE BASED ON BARS SPACED AT 4 BAR DIAMETERS OR MORE ON CENTER. NOTIFY ENGINEER IF SPACING IS LESS THAN 4 BAR DIAMETERS.							

6

CONCRETE DEVELOPMENT AND SPLICE TABLE

SR0.3

ROOF DESIGN OPTIONS					
MATERIAL	SPAN	8 FT	≤ 10 FT	≤ 12 FT	≤ 14 FT
CONCRETE	CONCRETE THICKNESS	4"	6"	6"	6"
	REINFORCEMENT	#4 BAR EW AT 10" OC	#5 BAR EW AT 12" OC	#5 BAR EW AT 6" OC	#5 BAR EW AT 6" OC
WOOD	JOIST(S)	(2) 2x6 AT 12" OC	(2) 2x8 AT 12" OC	(2) 2x10 AT 12" OC	(2) 2x10 AT 12" OC
NOTES:					
1. WOOD FRAMED SAFE ROOMS CAN ONLY USE WOOD FRAMED ROOF DESIGNS					
2. WHEN USING WOOD ROOF WITH CONCRETE, CMU, OR ICF WALLS, SHEATHING MUST BE INSTALLED ON INTERIOR OF CEILING AS SHOWN ON DETAIL 9/SR1.0					

3

ROOF DESIGN OPTIONS

SR0.3

WALL REINFORCEMENT SCHEDULE					
WALL TYPE	WALL REINFORCEMENT		OPENING REINFORCEMENT		NOTES
	VERTICAL	HORIZONTAL	VERTICAL (JAMB)	HORIZONTAL (HEADER)	
6" CMU	(1) #5 BAR AT 16" OC	REINFORCEMENT PER GENERAL NOTES	(1) #5 BAR PER CELL OVER 2'-0" *	16" BOND BEAM w/ (1) #5 BAR TOP AND BTM	3
8" CMU	(1) #5 BAR AT 40" OC	REINFORCEMENT PER GENERAL NOTES	(1) #5 BAR PER CELL OVER 2'-0" *	16" BOND BEAM w/ (1) #5 BAR TOP AND BTM	2
6" CONCRETE	#4 BAR AT 12" OC	#4 BAR AT 12" OC	(3) #5 BAR AT 6" OC *	(1) #5 BAR TOP AND BTM	2
4" ICF	#4 BAR AT 12" OC	#4 BAR AT 12" OC	(3) #5 BAR AT 6" OC *	(1) #5 BAR TOP AND BTM	1,2
6" ICF	#4 BAR AT 12" OC	#4 BAR AT 12" OC	(3) #5 BAR AT 6" OC *	(1) #5 BAR TOP AND BTM	1,2
NOTES:					
1. ICF WALL THICKNESS REFERS TO THE CONCRETE THICKNESS OF THE ICF WALL, NOT THE TOTAL THICKNESS OF THE WALL.					
2. REFERENCE SPLICE TABLE FOR EXTENSION OF HEADER REINFORCEMENT PAST OPENING.					
3. 6" CMU WALLS CAN ONLY BE USED ON SAFE ROOMS 8'-0"x8'-0" OR SMALLER					
* AT 1'-4" WALL END, THIRD BAR MAY BE SET IN ADJACENT WALL					

1

WALL REINFORCEMENT SCHEDULE

SR0.3

MASONRY DEVELOPMENT AND SPLICE LENGTHS		
BAR SIZE	TENSION / COMPRESSION	
	6" MASONRY	8" MASONRY
3	12	12
4	20	15
5	32	23
6	54	43

5

MASONRY DEVELOPMENT & SPLICE LENGTHS

SR0.3

FOOTING SCHEDULE			
WALL TYPE	ROOF TYPE	FOOTING SIZE	REINFORCEMENT
WOOD FRAME	WOOD	4'-0" x 1'-6" x CONT	(5) #5 BAR x CONT LONG. AND #5 BAR x 3'-6" TRANS AT 12" OC
WOOD / CMU INFILL	WOOD	3'-0" x 1'-3" x CONT	(4) #5 BAR x CONT LONG. AND #5 BAR x 2'-6" TRANS AT 12" OC
6" CMU	WOOD OR CONCRETE	2'-3" x 1'-0" x CONT	(4) #5 BAR x CONT LONG. AND #5 BAR x 1'-9" TRANS AT 12" OC
8" CMU	WOOD OR CONCRETE	2'-0" x 1'-0" x CONT	(3) #5 BAR x CONT LONG. AND #5 BAR x 1'-6" TRANS AT 12" OC
CONCRETE	WOOD	2'-3" x 1'-3" x CONT	(4) #5 BAR x CONT LONG. AND #5 BAR x 1'-9" TRANS AT 12" OC
	CONCRETE	2'-0" x 1'-0" x CONT	(3) #5 BAR x CONT LONG. AND #5 BAR x 1'-6" TRANS AT 12" OC
ICF	WOOD	2'-3" x 1'-3" x CONT	(4) #5 BAR x CONT LONG. AND #5 BAR x 1'-9" TRANS AT 12" OC
	CONCRETE	2'-0" x 1'-0" x CONT	(3) #5 BAR x CONT LONG. AND #5 BAR x 1'-6" TRANS AT 12" OC

2

FOOTING SCHEDULE

SR0.3

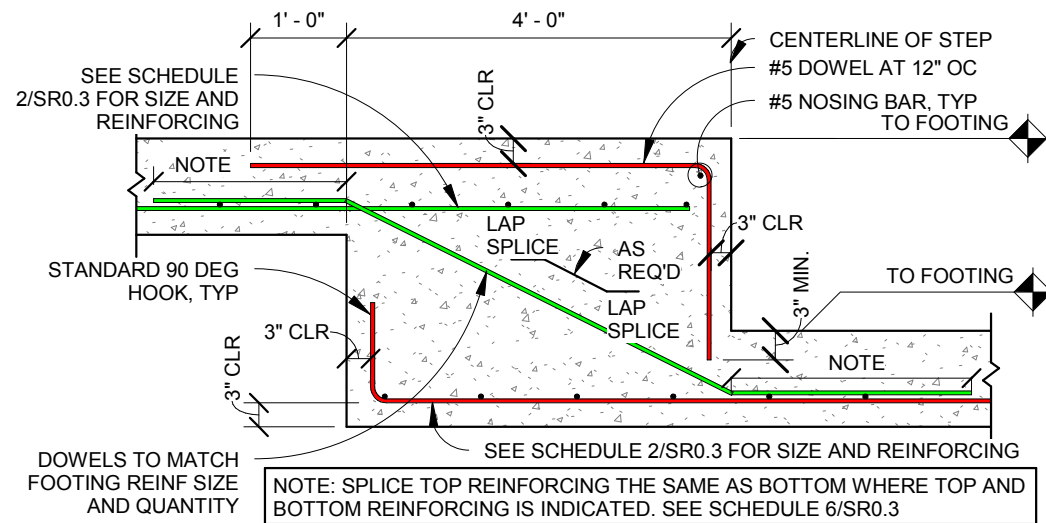
WOOD CONSTRUCTION CONNECTOR SCHEDULE			
LOCATION	REQUIRED UPLIFT CAPACITY (LBS)	SIMPSON STRONG-TIE	UNITED STEEL PRODUCTS
A	800	HGA10	HGA10
B	1,850	SSTB16 AND BPS 5/8-6*	STB16 **
C	1,500	2-MTS12	2-MTW12
D	1,500	HETA16	HTA16
E	800	HGAM10	HGAM10
F	1,500	LGT2	LUGT2
G	1,700	2-SP6	2-SPT6
H	1,700	HETA 16 OR PAI23	2-HTA12
J	4,500	HDU8-SDS2.5	PHD8
NOTES:			
* THE PLATE WASHER SHALL BE CENTERED ON THE BOTTOM PLATE WITH A STANDARD CUT WASHER BETWEEN THE PLATE WASHER AND NUT. WHEN IN CONTACT WITH PRESERVATIVE TREATED PLATE, IT IS RECOMMENDED TO INSTALL HOT-DIPPED GALVANIZED (HDG) FINISH.			
** AT TIME OF PUBLICATION, NO EQUIVALENT USP CONNECTOR AVAILABLE. PLATE WASHER MAY BE FABRICATED FROM 3 GAGE STEEL: 3" LONG x 4 1/2" WIDE			
BECAUSE NOT ALL CONTRACTORS ARE FAMILIAR WITH THE TYPE OF STRUCTURAL CONNECTORS SHOWN IN THESE DRAWINGS, THE NAMES OF TWO COMPANIES THAT MANUFACTURE CONNECTORS HAVE BEEN INCLUDED IN THIS TABLE. THE LIST OF COMPANIES IS NOT, HOWEVER, EXHAUSTIVE. ADDITIONALLY, THIS LIST IS NOT INTENDED TO EXPRESS A PREFERENCE FOR THOSE MANUFACTURERS AND / OR THEIR PRODUCTS BY THE UNITED STATES GOVERNMENT NOR IS IT AN ENDORSEMENT OF THOSE MANUFACTURERS AND / OR THEIR PRODUCTS.			
USE ONLY HARDWARE THAT HAVE BEEN EVALUATED THROUGH AN ANSI-APPROVED PRODUCT CERTIFICATION BODY SUCH AS IAPMO-OES OR ICC-ES.			

4

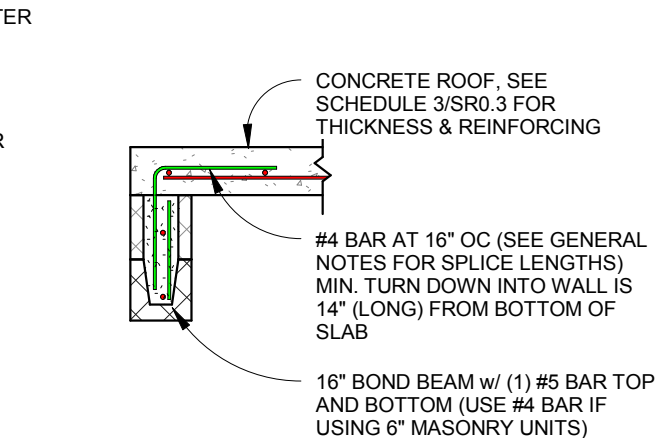
WOOD CONSTRUCTION CONNECTOR SCHEDULE

SR0.3

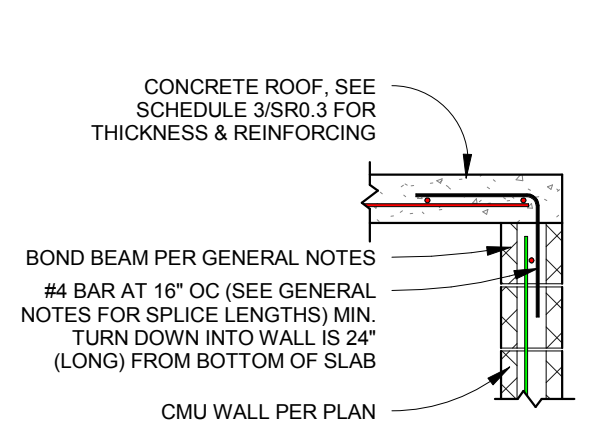
FEMA P-320 (2014)		
SHEET TITLE:		
TABLES		
DRAWING NO: SR0.3		
Sheet: 4 of 12		
DATE: DECEMBER 2014		
REVISIONS		
Copyright © 2014		



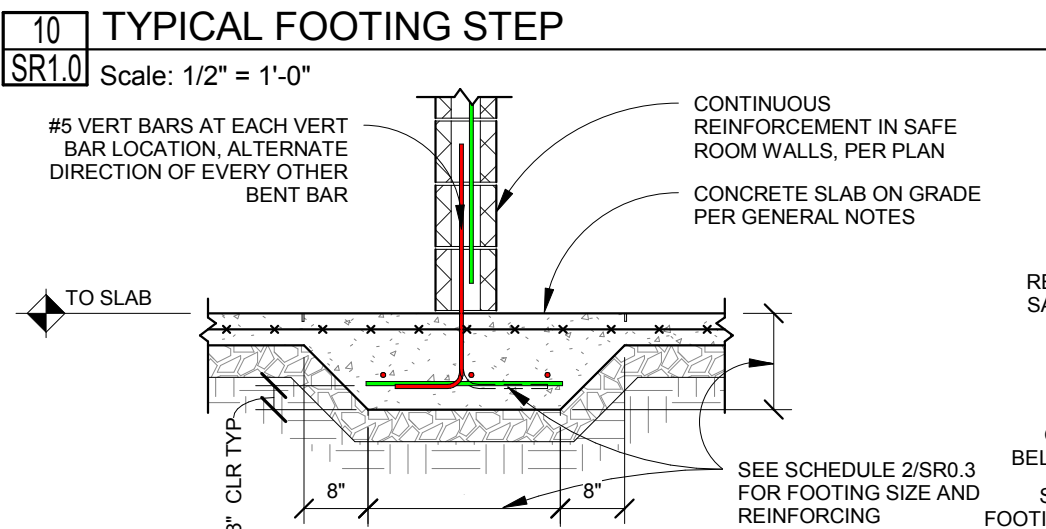
9 ALT WALL/CEILING CONNECTION
 SR1.0 Scale: 1/2" = 1'-0"



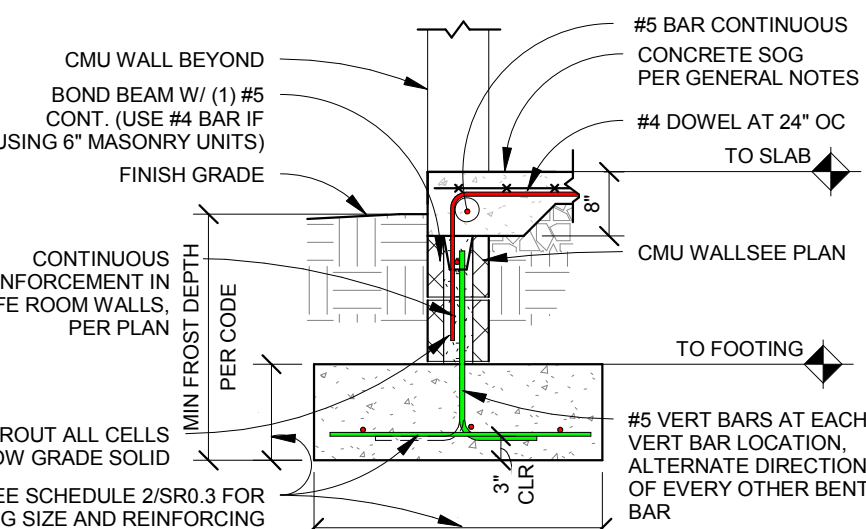
8 CMU SECTION AT DOOR BEAM
 SR1.0 Scale: 1/2" = 1'-0"



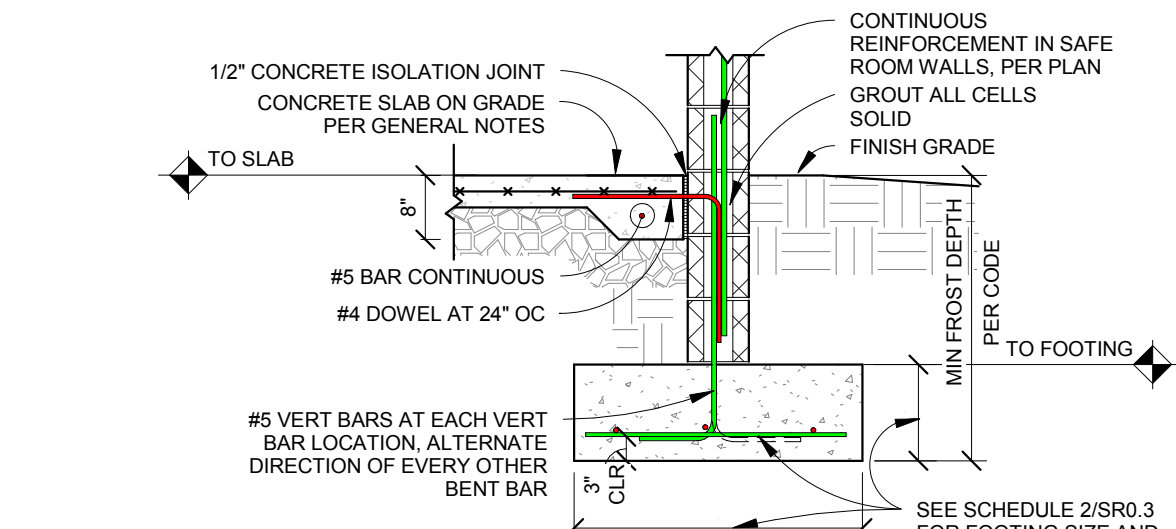
7 CMU SECTION AT TOP
 SR1.0 Scale: 1/2" = 1'-0"



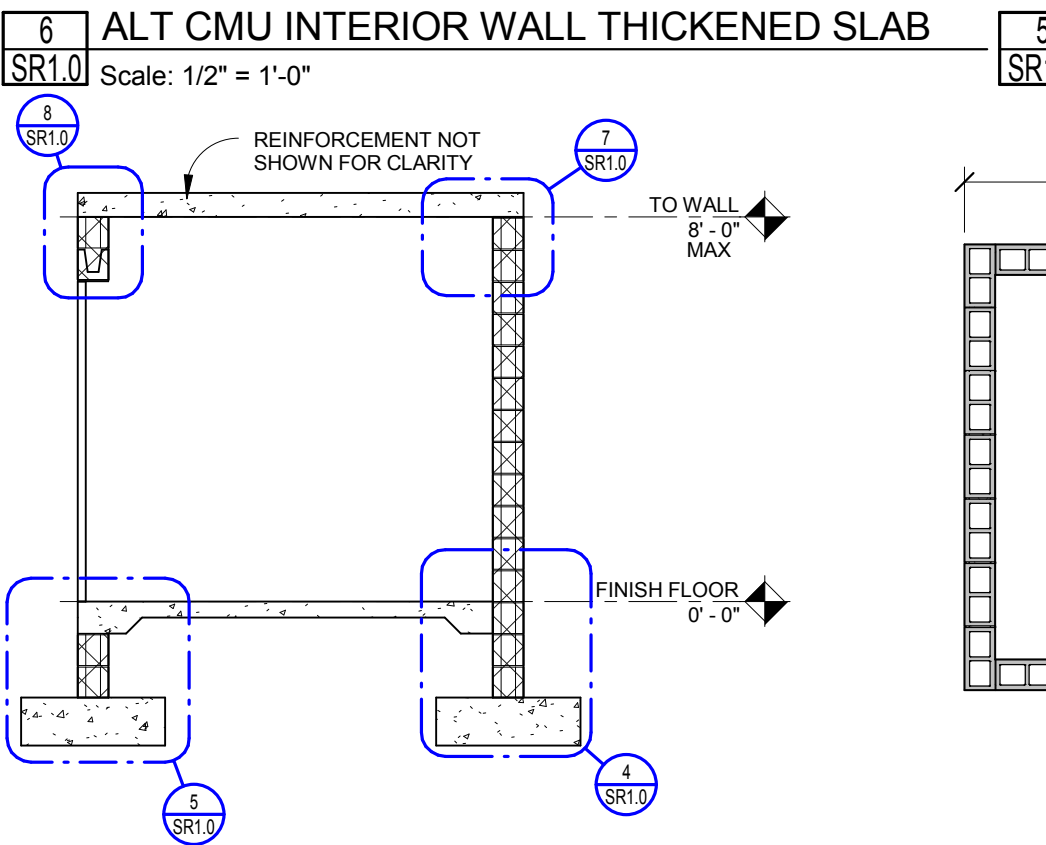
10 TYPICAL FOOTING STEP
 SR1.0 Scale: 1/2" = 1'-0"



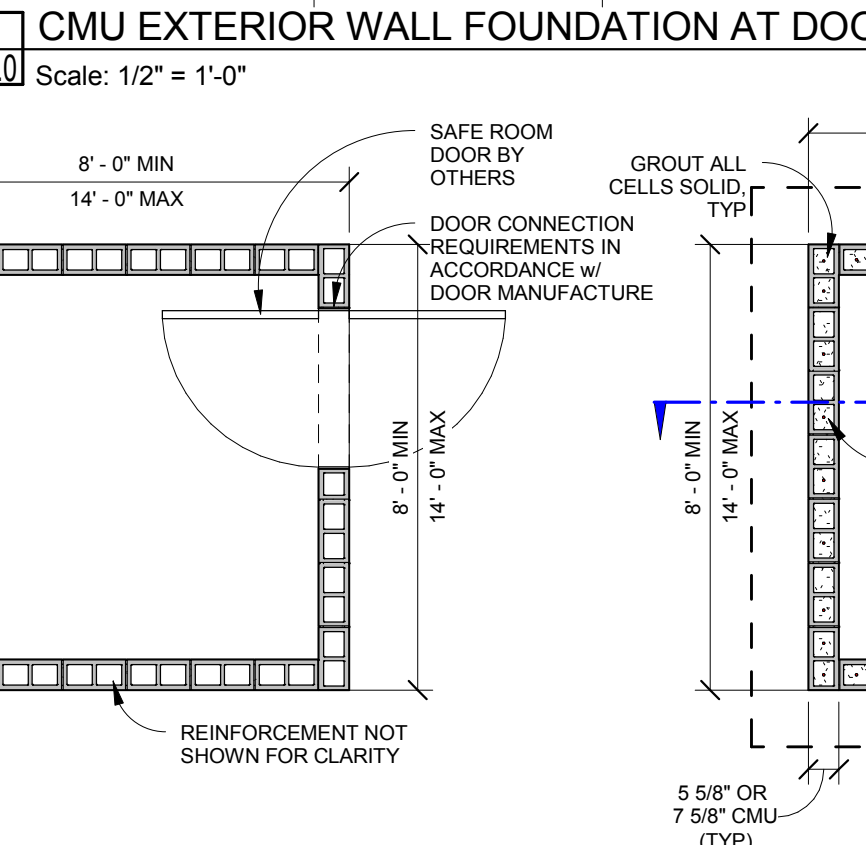
5 CMU EXTERIOR WALL FOUNDATION AT DOOR
 SR1.0 Scale: 1/2" = 1'-0"



4 CMU EXTERIOR WALL FOUNDATION
 SR1.0 Scale: 1/2" = 1'-0"

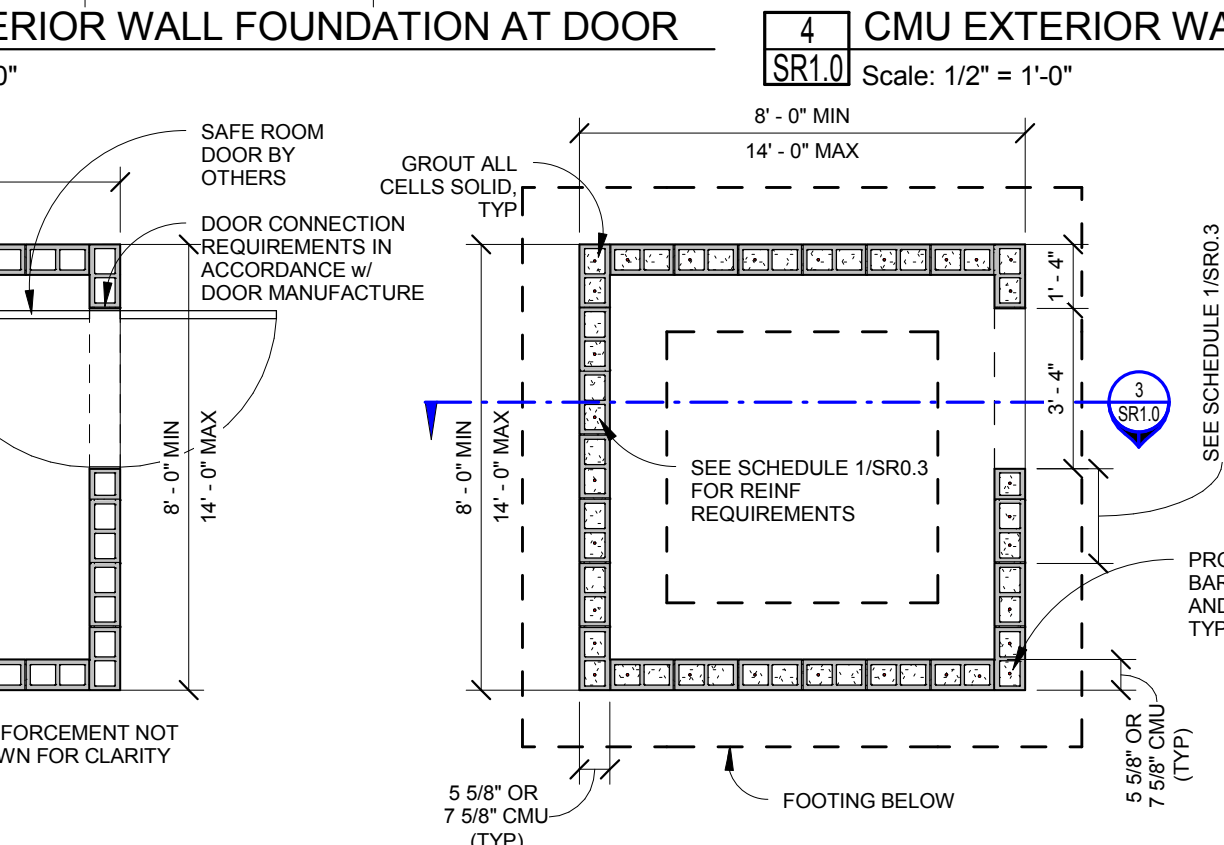


6 ALT CMU INTERIOR WALL THICKENED SLAB
 SR1.0 Scale: 1/2" = 1'-0"



3 CMU CROSS SECTION
 SR1.0 Scale: 1/4" = 1'-0"

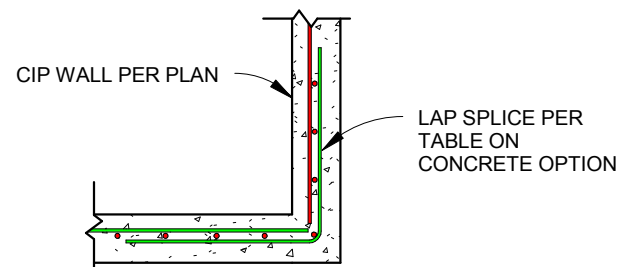
2 CMU FLOOR PLAN
 SR1.0 Scale: 1/4" = 1'-0"



1 CMU FOUNDATION PLAN
 SR1.0 Scale: 1/4" = 1'-0"

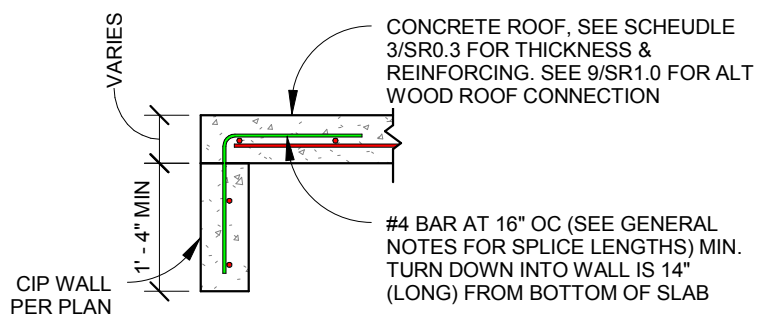
NOTE:
 1. FINISHED FLOOR ELEVATION SHALL BE LESS THAN 5 FT ABOVE LOWEST FINISHED ADJACENT GRADE ELEVATION
 2. SEE SR0.3 FOR SCHEDULES

FEMA P-320 (2014)	
SHEET TITLE: CMU SAFE ROOM PLANS AND DETAILS	
DRAWING NO: SR1.0	Sheet: 5 of 12
DATE: DECEMBER 2014	
REVISIONS	
Copyright © 2014	



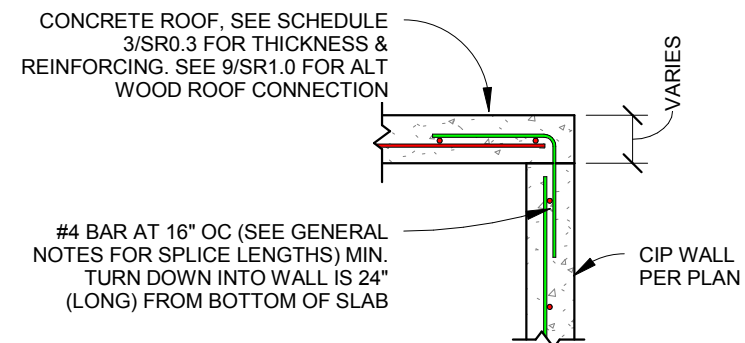
9 CONC SECTION AT CORNER

SR1.1 Scale: 1/2" = 1'-0"



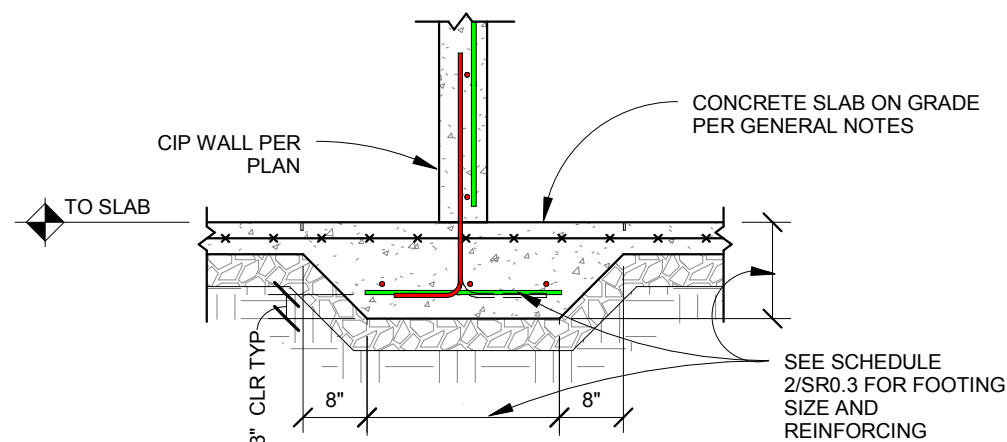
8 CONC SECTION AT DOOR BEAM

SR1.1 Scale: 1/2" = 1'-0"



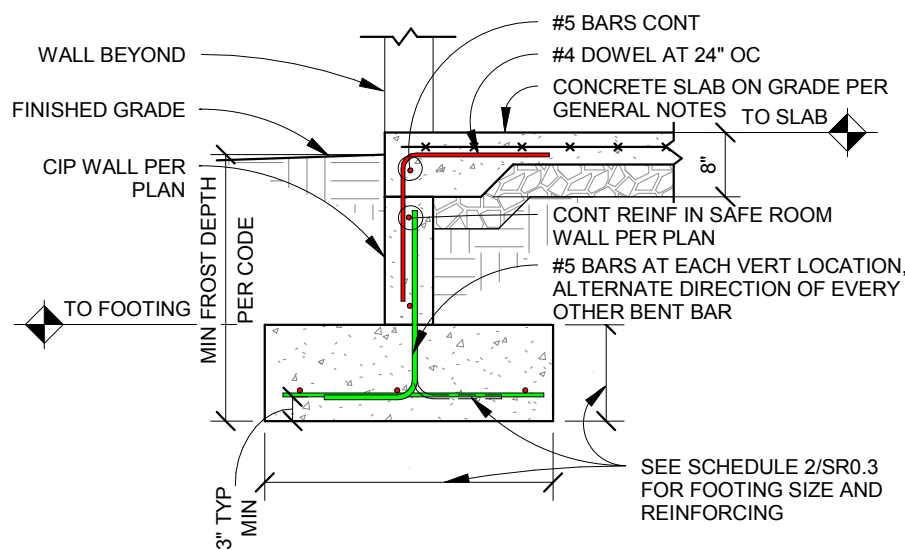
7 CONC SECTION AT TOP

SR1.1 Scale: 1/2" = 1'-0"



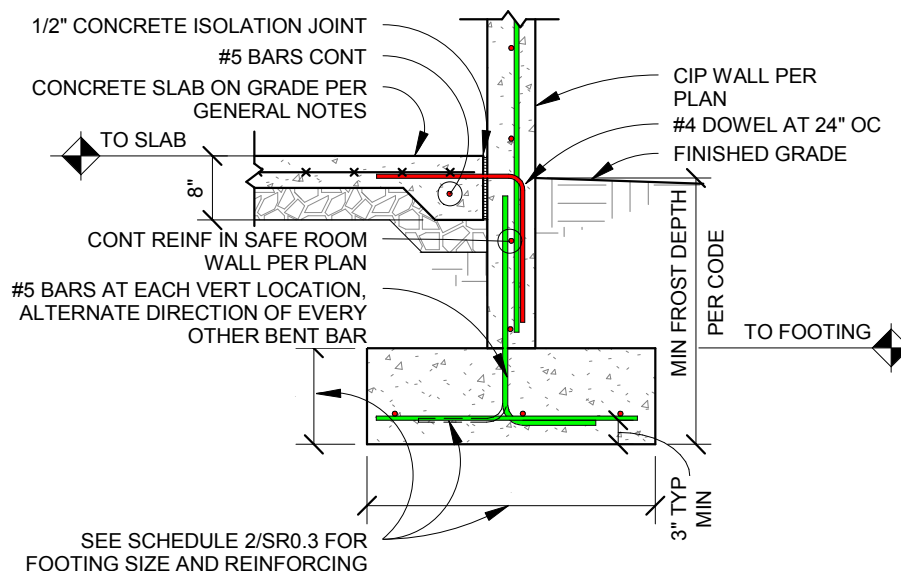
6 ALT CONC INTERIOR WALL THICKENED SLAB

SR1.1 Scale: 1/2" = 1'-0"



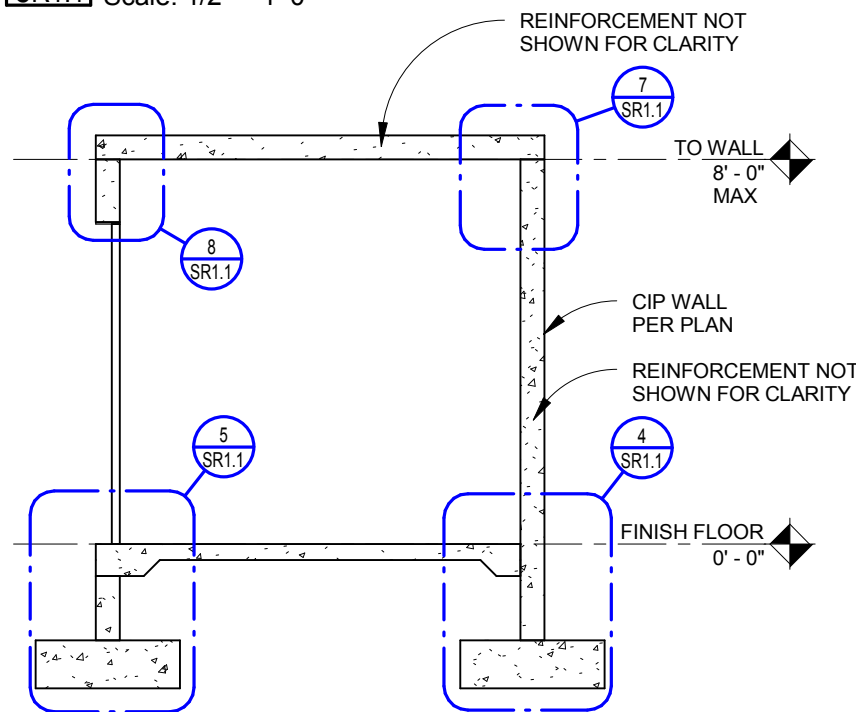
5 CONC EXTERIOR WALL FOUNDATION AT DOOR

SR1.1 Scale: 1/2" = 1'-0"



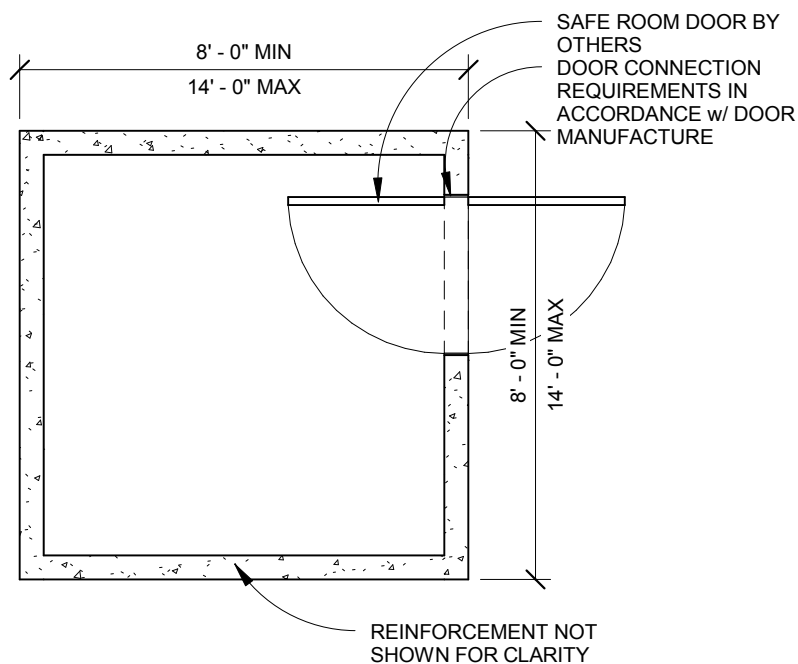
4 CONC EXTERIOR WALL FOUNDATION

SR1.1 Scale: 1/2" = 1'-0"



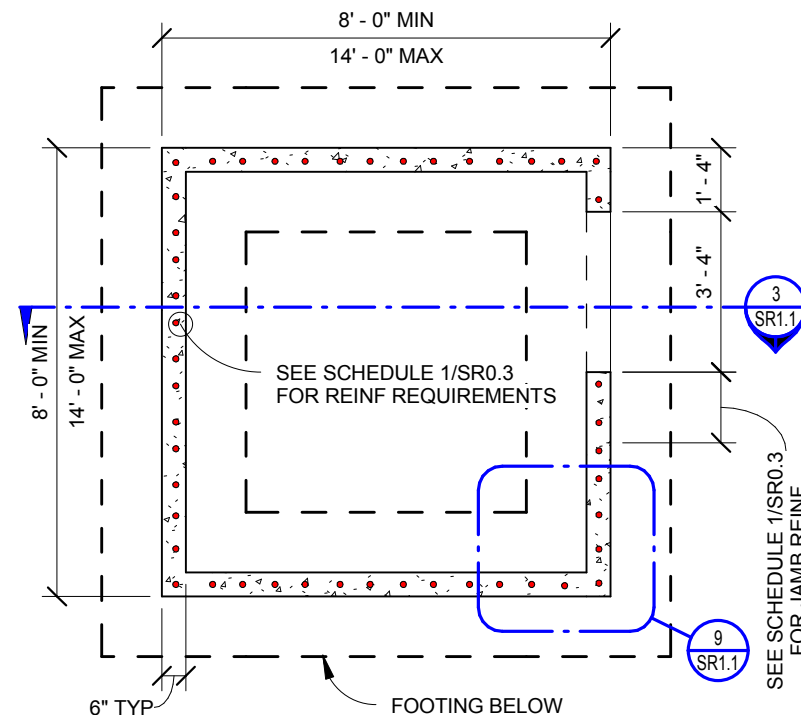
3 CONCRETE CROSS SECTION

SR1.1 Scale: 1/4" = 1'-0"



2 CONCRETE FLOOR PLAN

SR1.1 Scale: 1/4" = 1'-0"

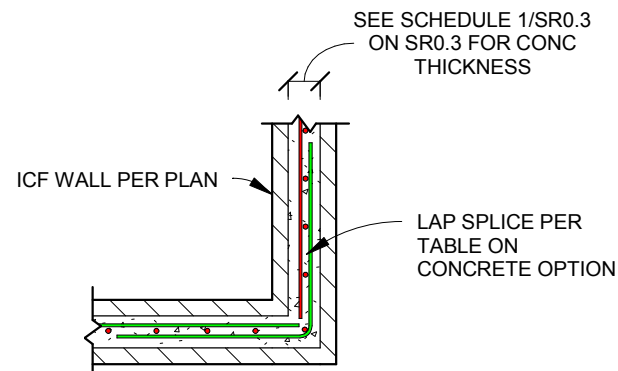


1 CONCRETE FOUNDATION PLAN

SR1.1 Scale: 1/4" = 1'-0"

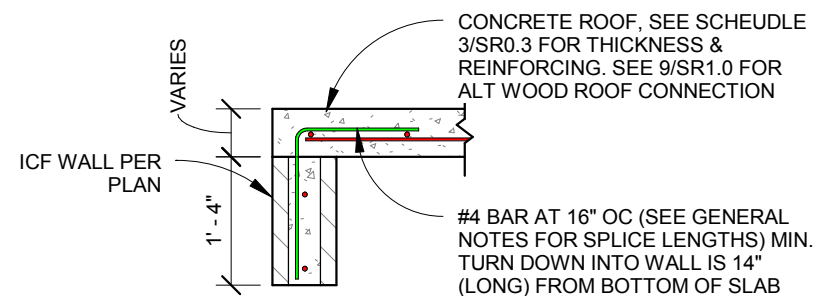
- NOTE:
1. FINISHED FLOOR ELEVATION SHALL BE LESS THAN 5 FT ABOVE LOWEST FINISHED ADJACENT GRADE ELEVATION
 2. SEE SR0.3 FOR SCHEDULES

FEMA P-320 (2014)	
SHEET TITLE: CONCRETE SAFE ROOM PLANS AND DETAILS	
DRAWING NO: SR1.1	Sheet: 6 of 12
DATE: DECEMBER 2014	
REVISIONS	
Copyright © 2014	



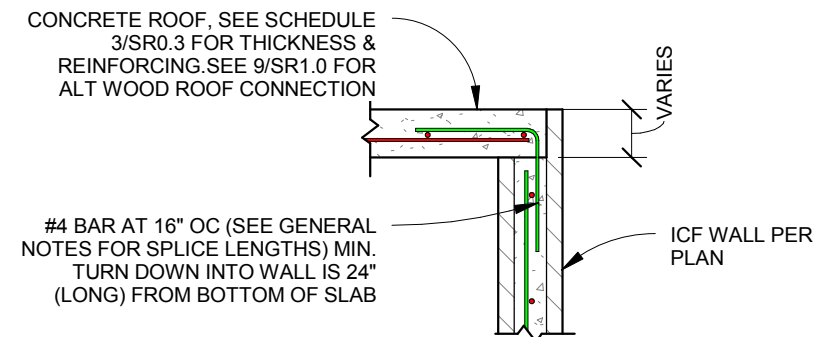
9 ICF CORNER DETAIL

SR1.2 Scale: 1/2" = 1'-0"



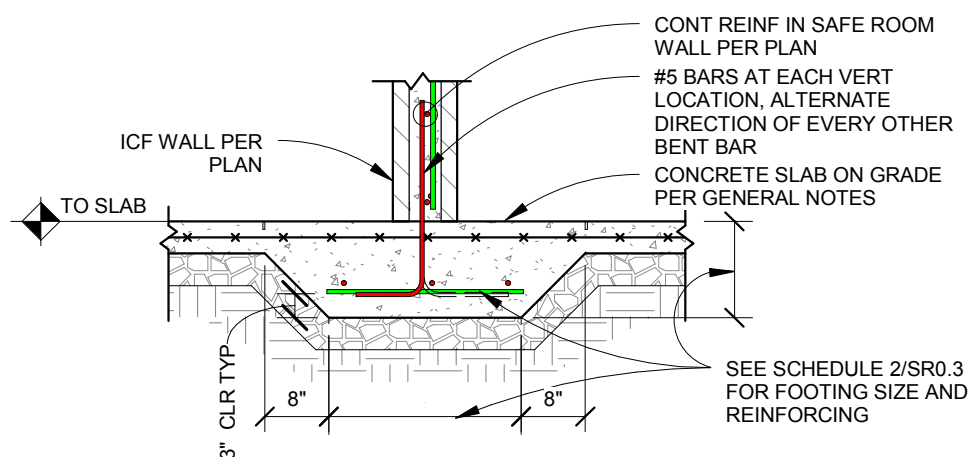
8 ICF SECTION AT DOOR BEAM

SR1.2 Scale: 1/2" = 1'-0"



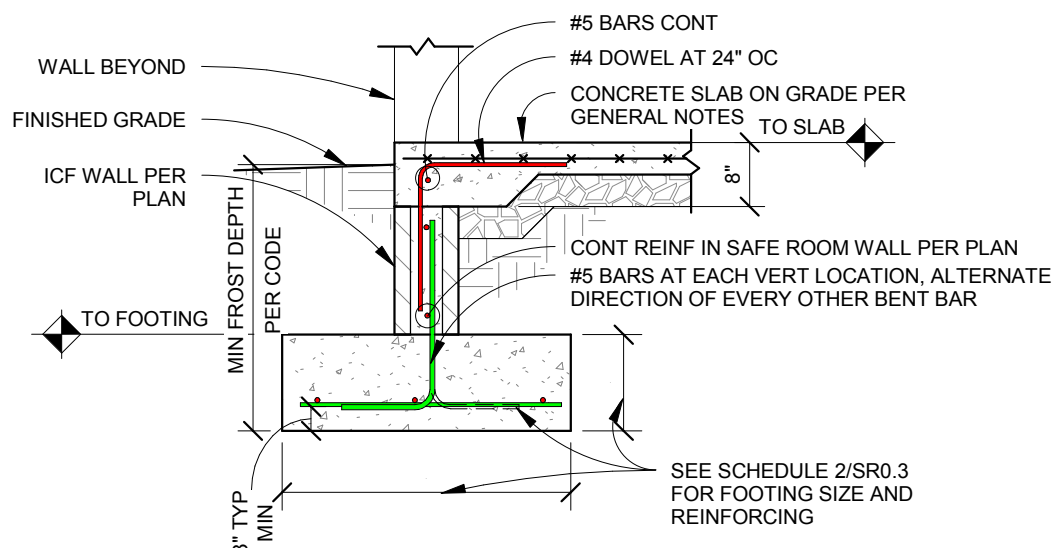
7 ICF SECTION AT TOP

SR1.2 Scale: 1/2" = 1'-0"



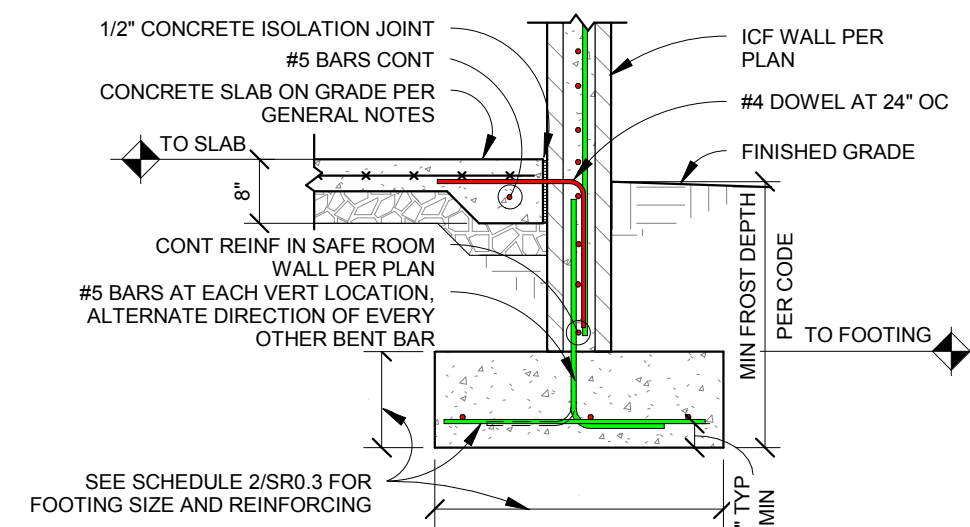
6 ALT ICF INTERIOR WALL THICKENED SLAB

SR1.2 Scale: 1/2" = 1'-0"



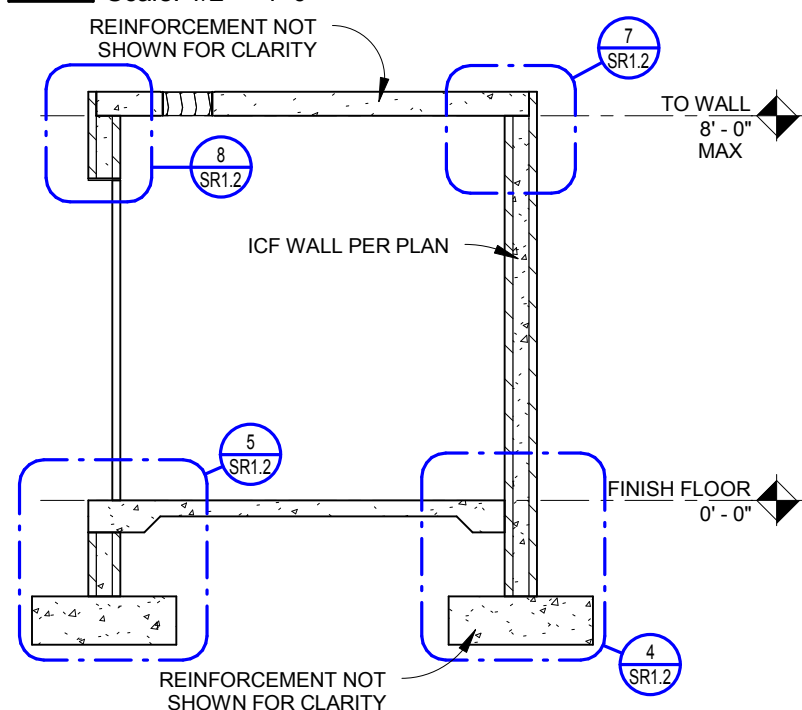
5 ICF EXTERIOR WALL FOUNDATION AT DOOR

SR1.2 Scale: 1/2" = 1'-0"



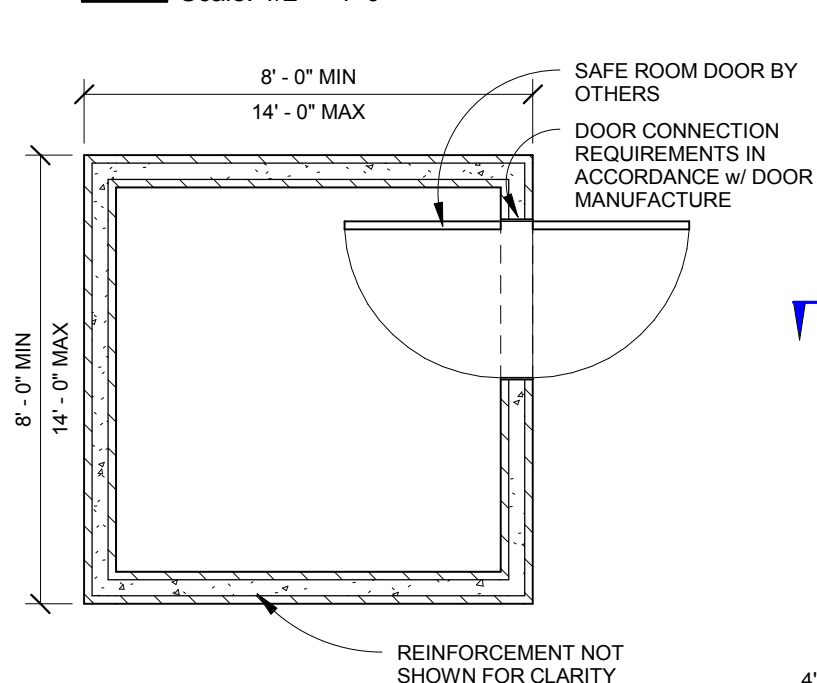
4 ICF EXTERIOR WALL FOUNDATION

SR1.2 Scale: 1/2" = 1'-0"



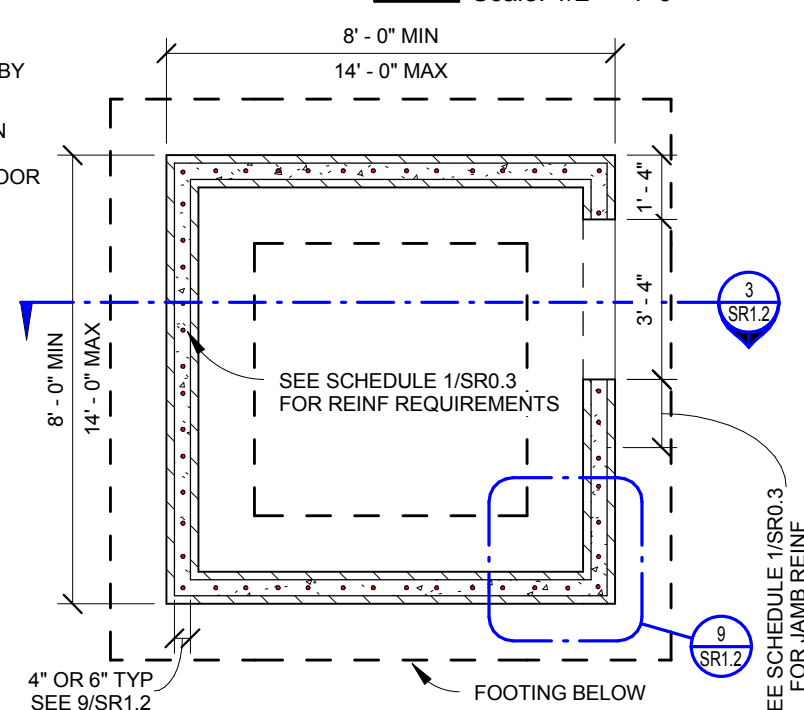
3 ICF CROSS SECTION

SR1.2 Scale: 1/4" = 1'-0"



2 ICF FLOOR PLAN

SR1.2 Scale: 1/4" = 1'-0"

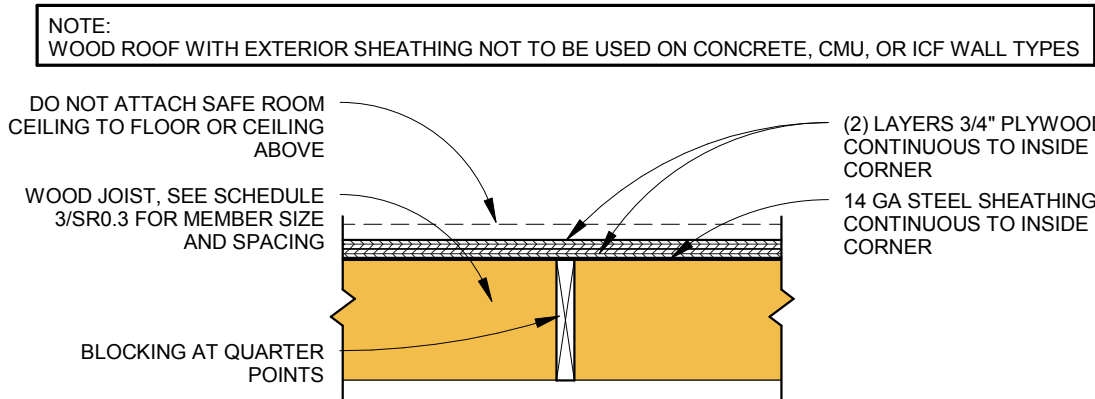


1 ICF FOUNDATION PLAN

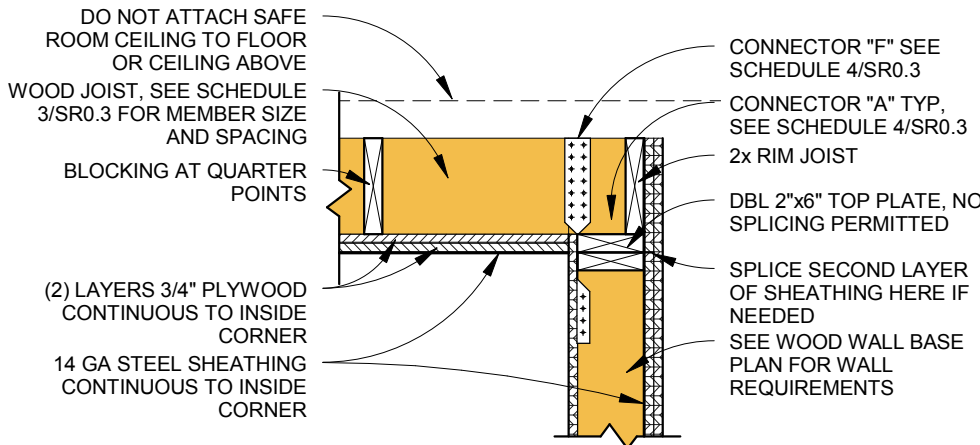
SR1.2 Scale: 1/4" = 1'-0"

- NOTE:
1. FINISHED FLOOR ELEVATION SHALL BE LESS THAN 5 FT ABOVE LOWEST FINISHED ADJACENT GRADE ELEVATION
 2. SEE SR0.3 FOR SCHEDULES

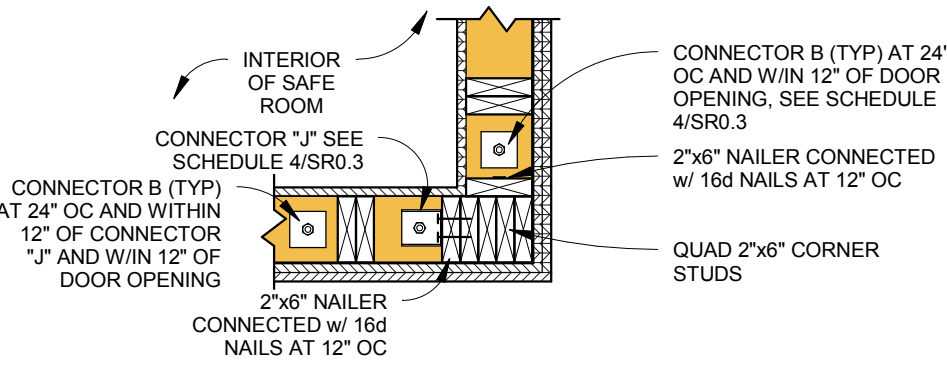
FEMA P-320 (2014)	
SHEET TITLE: ICF SAFE ROOM PLANS AND DETAILS	
DRAWING NO: SR1.2	Sheet: 7 of 12
DATE: DECEMBER 2014	
REVISIONS	
Copyright © 2014	



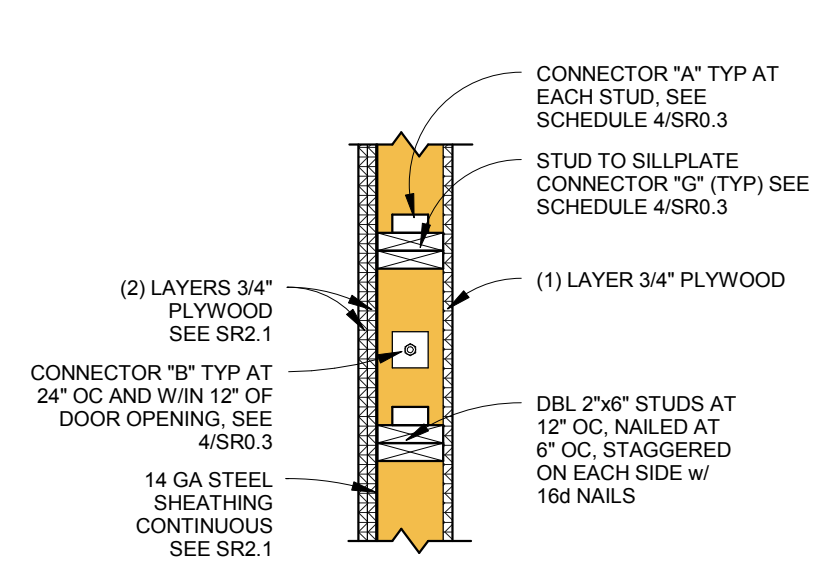
9 WOOD CEILING ALTERNATE (WOOD FRAME SAFE ROOM ONLY)
SR1.3 Scale: 3/4" = 1'-0"



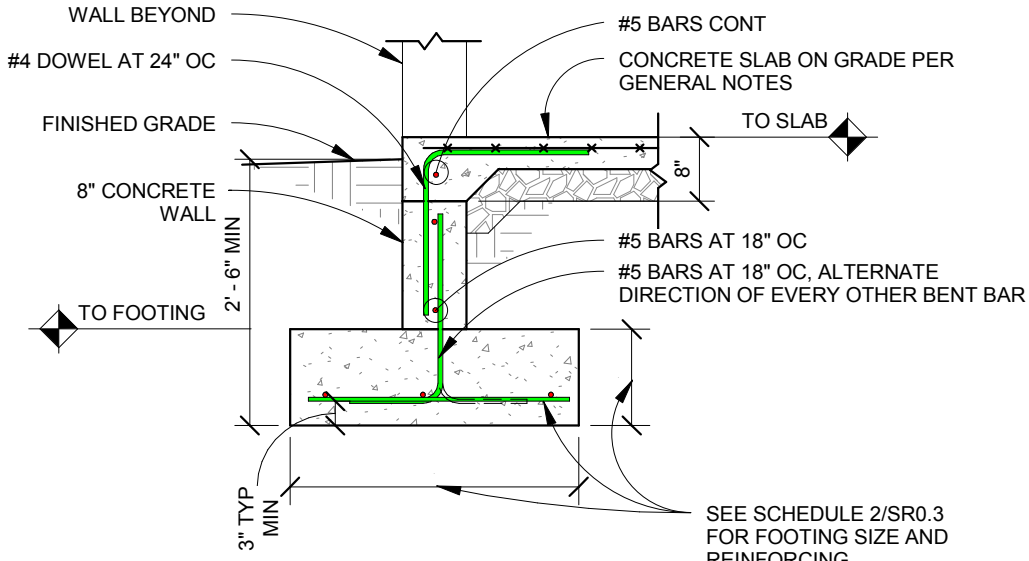
8 WOOD CEILING ATTACHMENT
SR1.3 Scale: 3/4" = 1'-0"



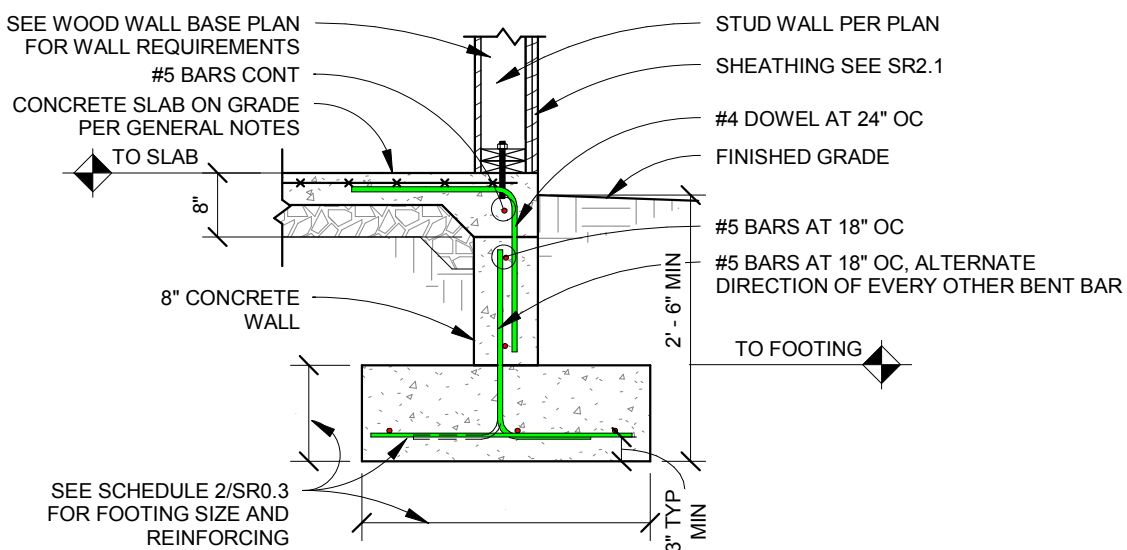
7 WOOD WALL CORNER PLAN
SR1.3 Scale: 3/4" = 1'-0"



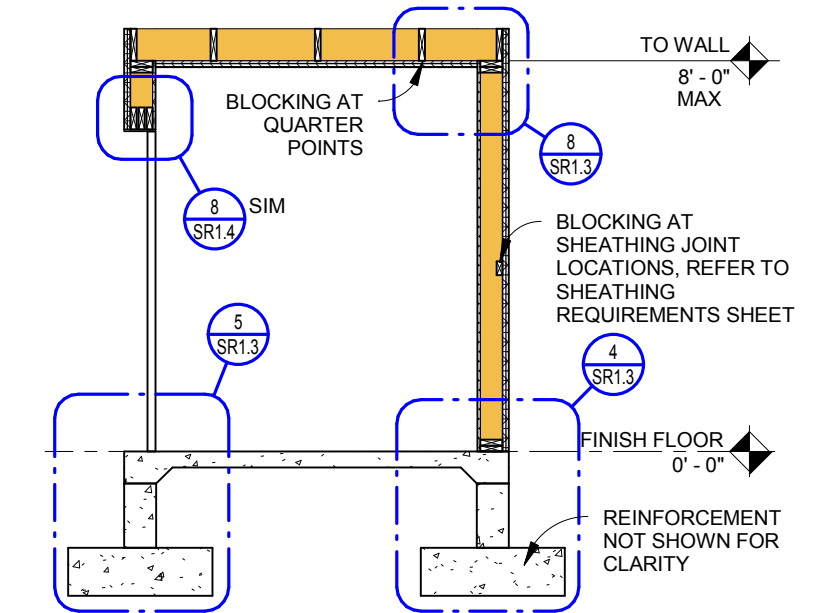
6 WOOD WALL BASE PLAN VIEW
SR1.3 Scale: 3/4" = 1'-0"



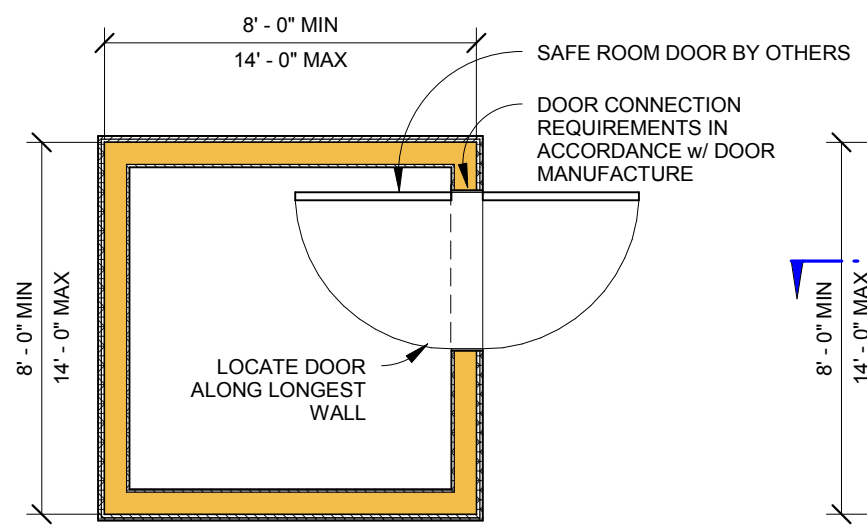
5 WOOD EXTERIOR WALL FOUNDATION AT DOOR
SR1.3 Scale: 1/2" = 1'-0"



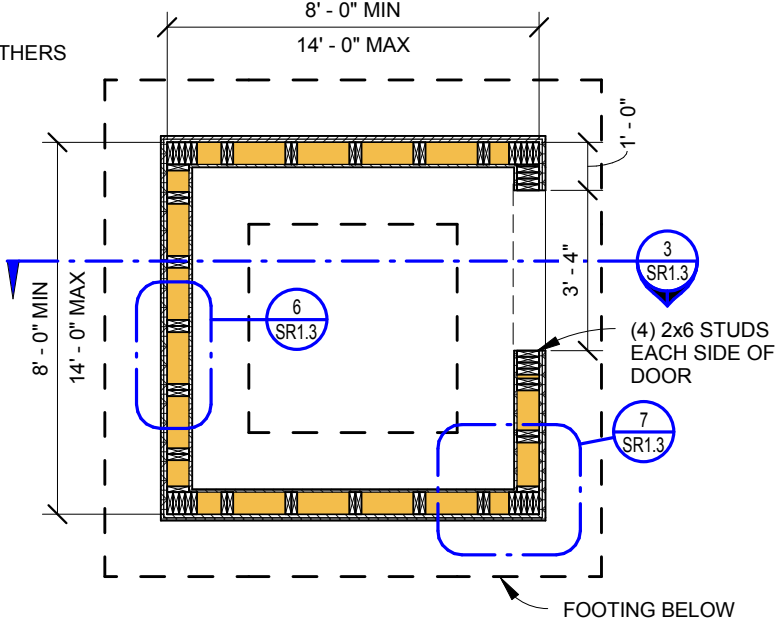
4 WOOD EXTERIOR WALL FOUNDATION
SR1.3 Scale: 1/2" = 1'-0"



3 WOOD CROSS SECTION
SR1.3 Scale: 1/4" = 1'-0"



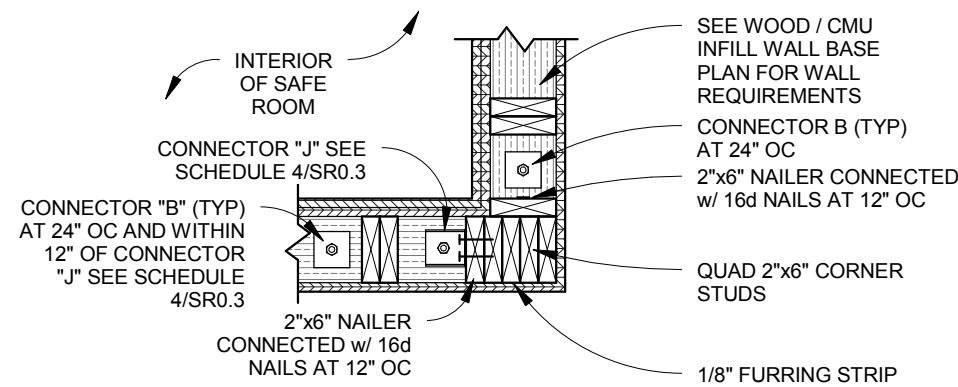
2 WOOD FLOOR PLAN
SR1.3 Scale: 1/4" = 1'-0"



1 WOOD FRAME FOUNDATION PLAN
SR1.3 Scale: 1/4" = 1'-0"

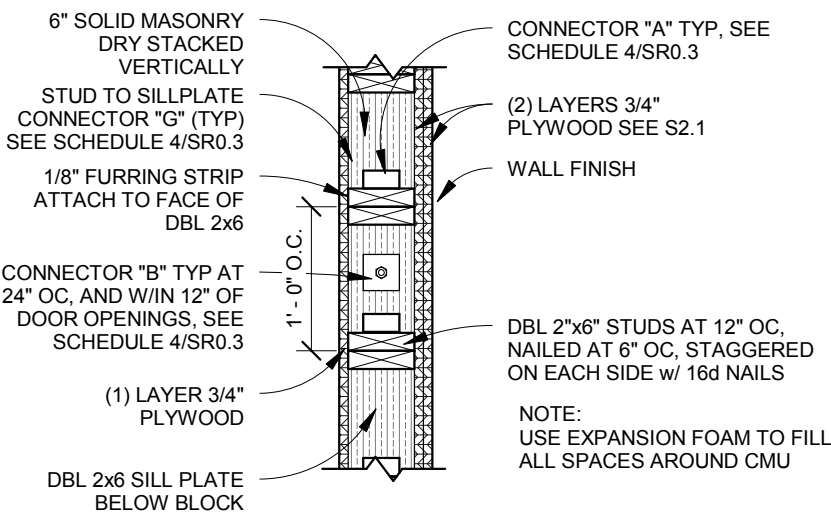
NOTE:
1. FINISHED FLOOR ELEVATION SHALL BE LESS THAN 5 FT ABOVE LOWEST FINISHED ADJACENT GRADE ELEVATION
2. SEE SR0.3 FOR SCHEDULES

FEMA P-320 (2014)		
SHEET TITLE: WOOD FRAME SAFE ROOM PLANS AND DETAILS		
DRAWING NO: SR1.3		Sheet: 8 of 12
DATE: DECEMBER 2014		
REVISIONS		
Copyright © 2014		



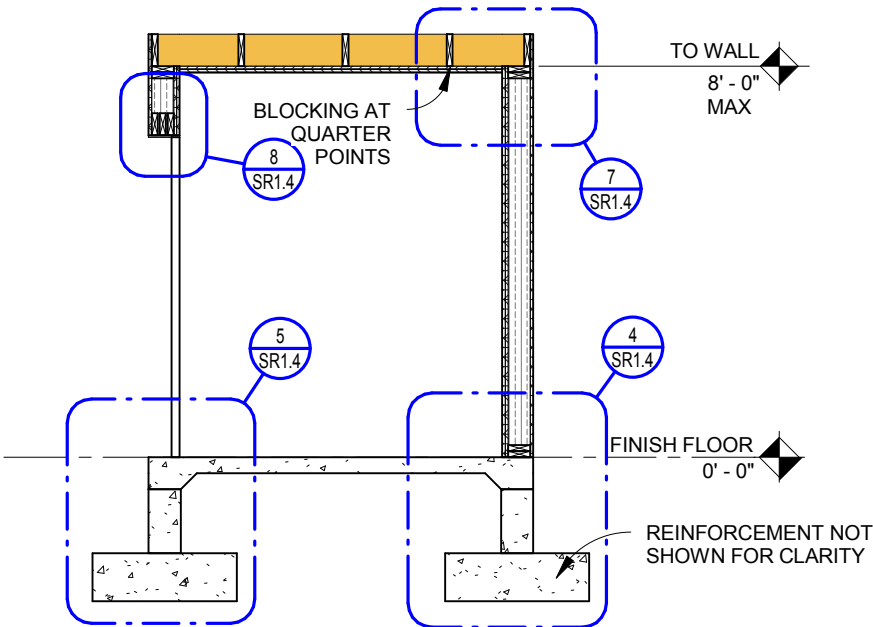
9 WOOD / CMU INFILL CORNER PLAN

SR1.4 Scale: 3/4" = 1'-0"



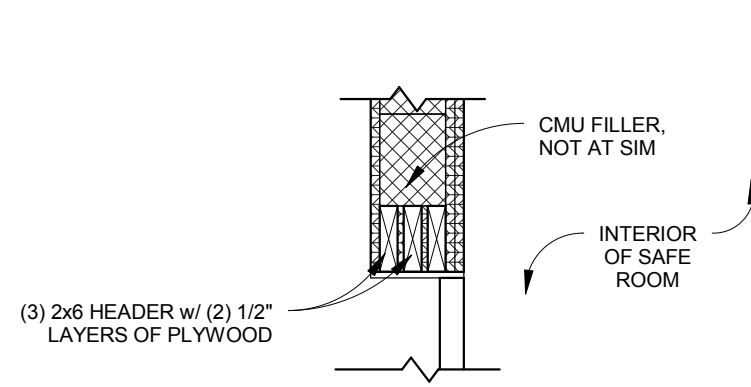
6 WOOD / CMU INFILL BASE PLAN

SR1.4 Scale: 3/4" = 1'-0"



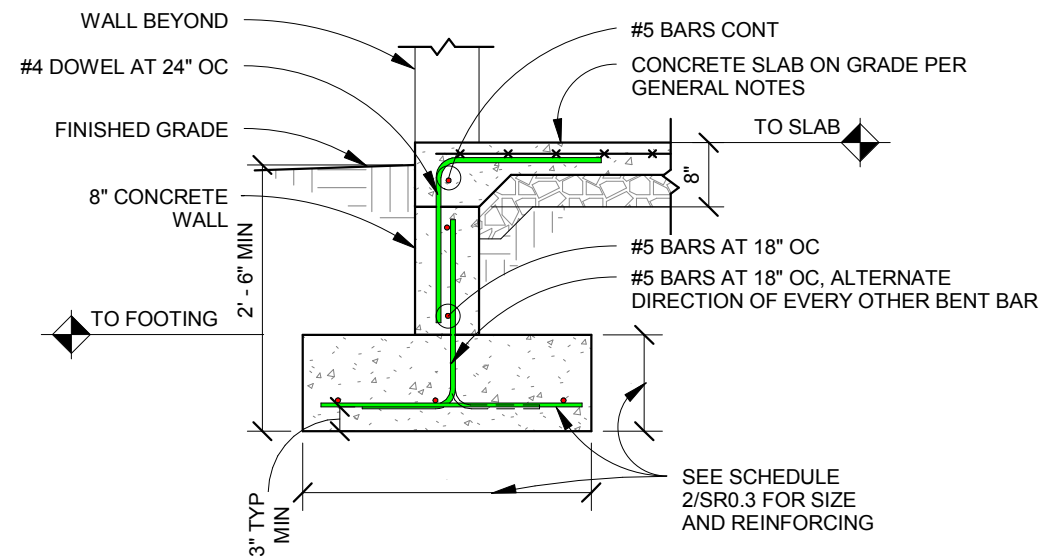
3 WOOD / CMU INFILL CROSS SECTION

SR1.4 Scale: 1/4" = 1'-0"



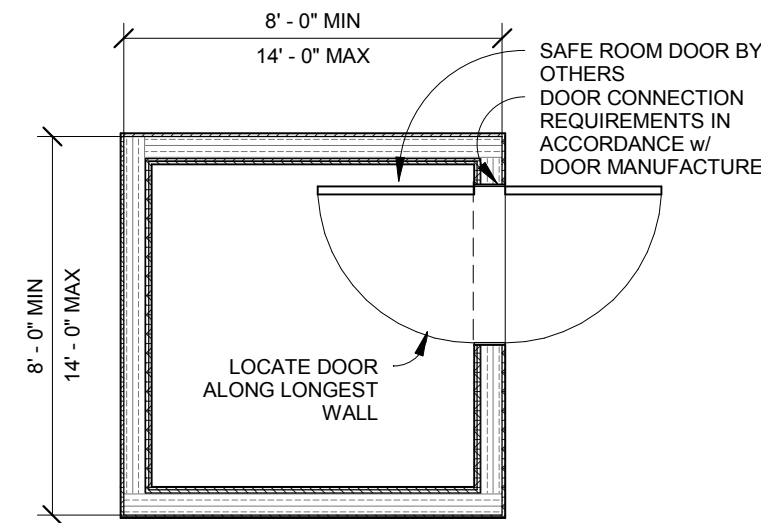
8 WOOD / CMU INFILL DOOR HEAD

SR1.4 Scale: 3/4" = 1'-0"



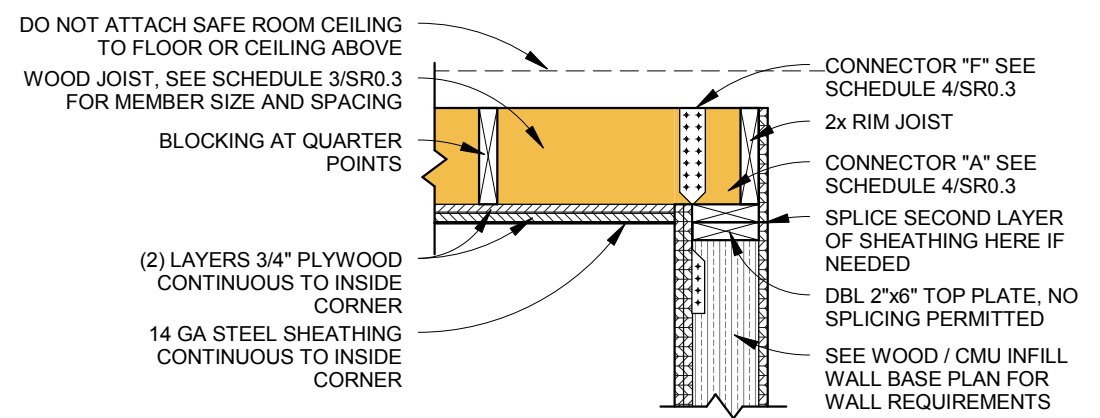
5 WOOD / CMU INFILL EXTERIOR WALL FND AT DOOR

SR1.4 Scale: 1/2" = 1'-0"



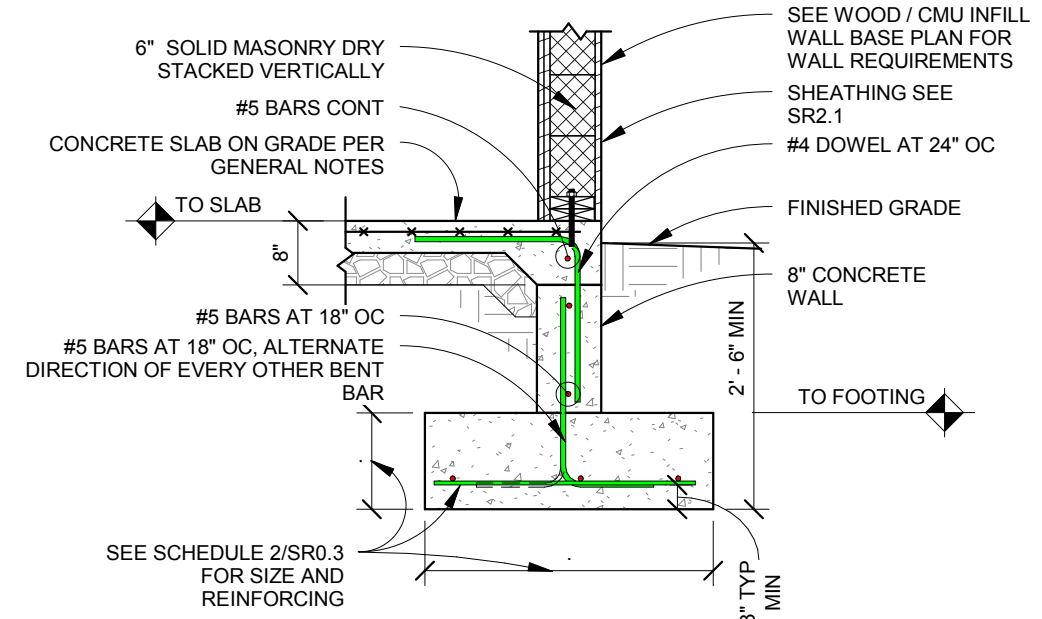
2 WOOD / CMU INFILL FLOOR PLAN

SR1.4 Scale: 1/4" = 1'-0"



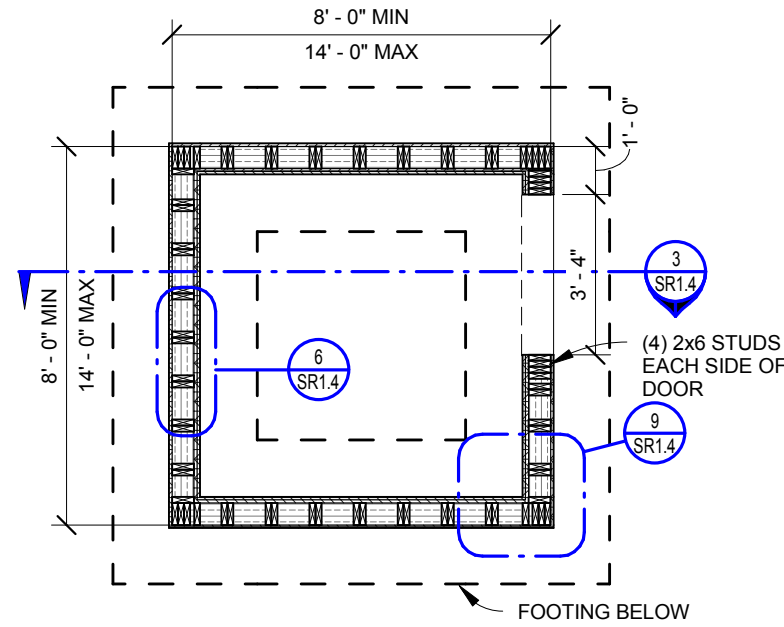
7 WOOD / CMU INFILL CEILING ATTACHMENT

SR1.4 Scale: 3/4" = 1'-0"



4 WOOD / CMU INFILL EXTERIOR WALL FND

SR1.4 Scale: 1/2" = 1'-0"

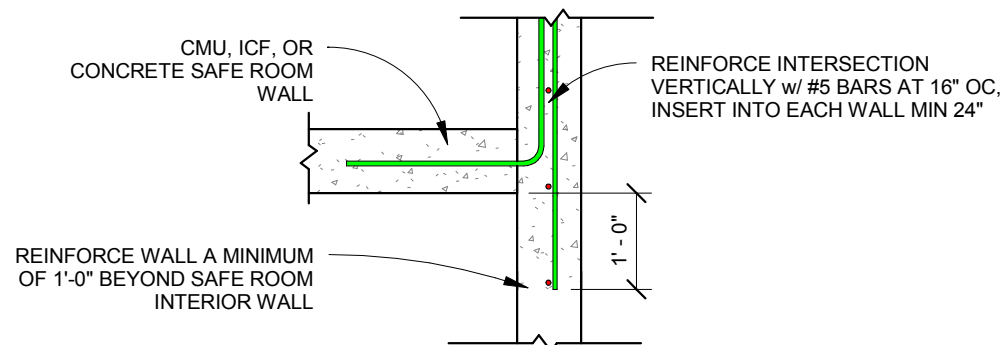


1 WOOD / CMU INFILL FOUNDATION PLAN

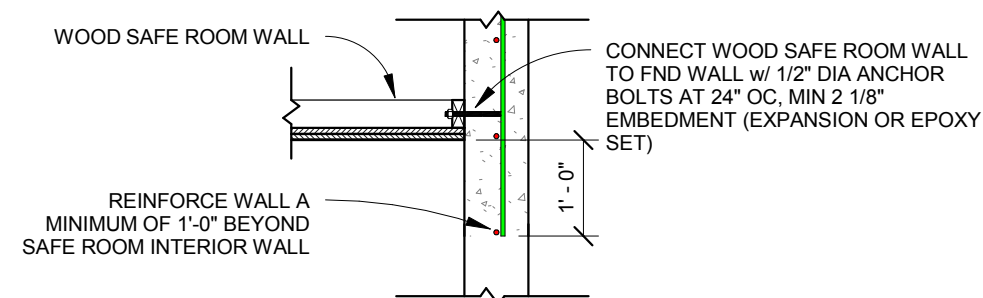
SR1.4 Scale: 1/4" = 1'-0"

NOTE:
1. FINISHED FLOOR ELEVATION SHALL BE LESS THAN 5 FT ABOVE LOWEST FINISHED ADJACENT GRADE ELEVATION
2. SEE SR0.3 FOR SCHEDULES

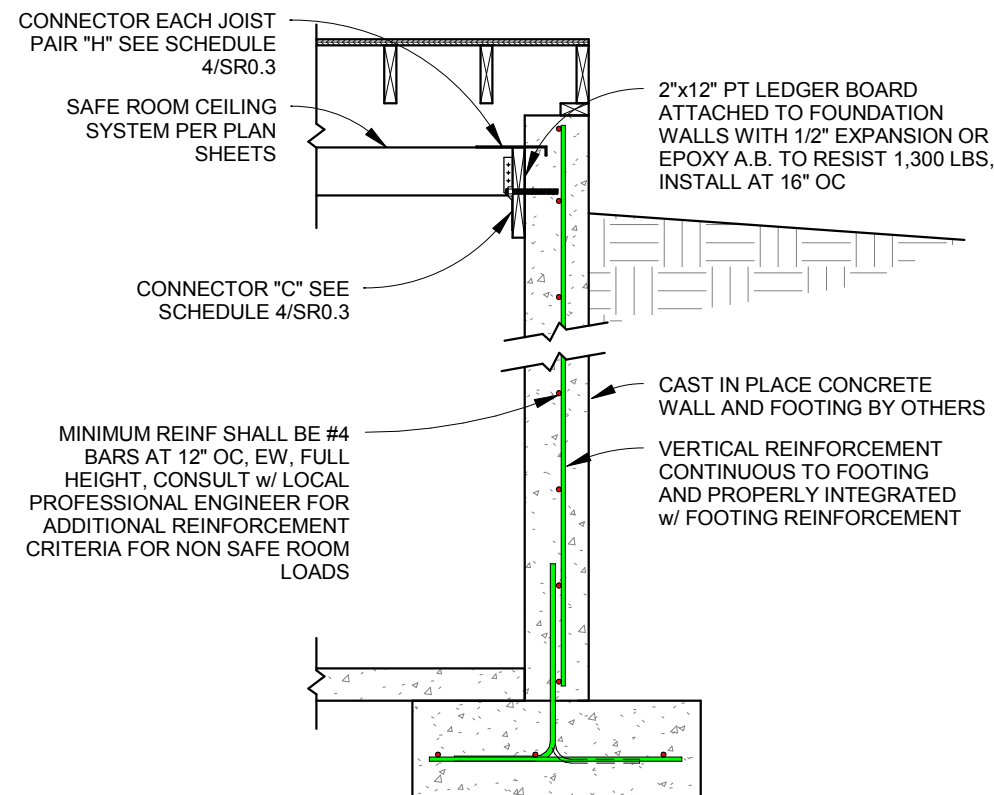
FEMA P-320 (2014)		
SHEET TITLE: WOOD / CMU INFILL FRAME SAFE ROOM AND DETAILS		
DRAWING NO: SR1.4		Sheet: 9 of 12
DATE: DECEMBER 2014		
REVISIONS		
Copyright © 2014		



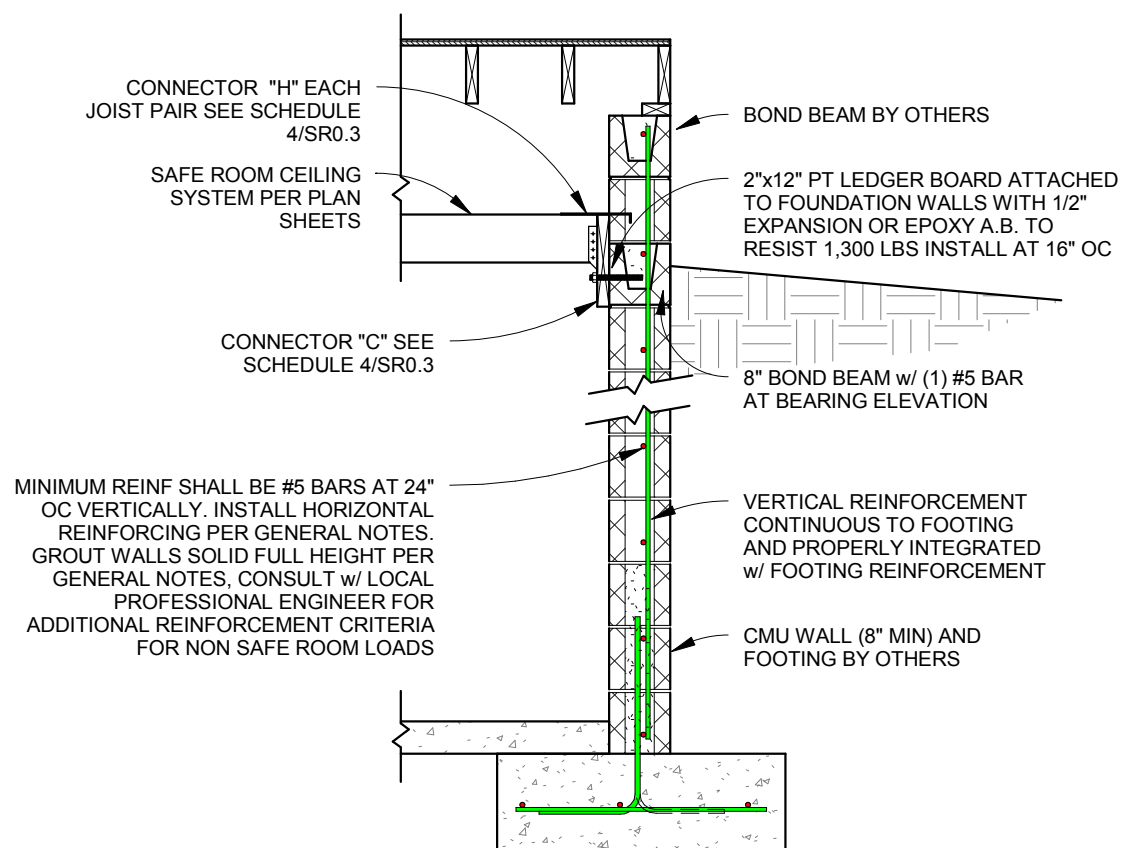
5 **ALTERNATIVE CMU SAFE ROOM TO FOUNDATION WALL**
SR1.5 Scale: 1/2" = 1'-0"



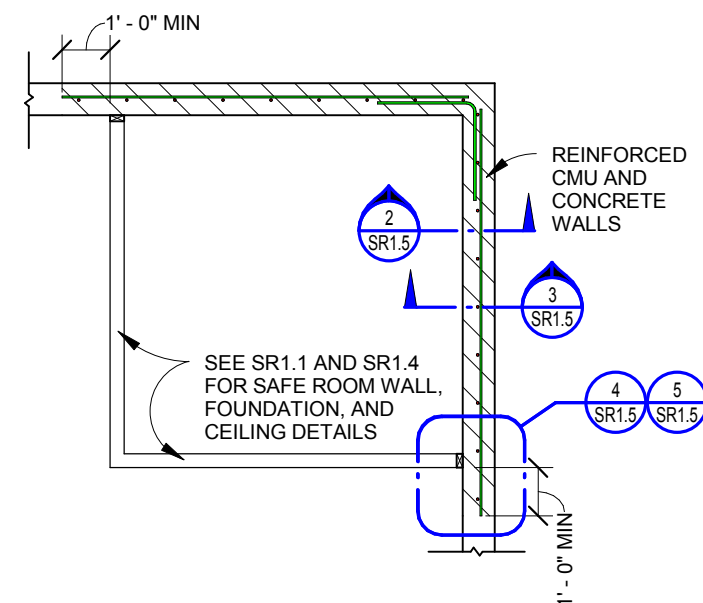
4 **ALTERNATIVE WOOD SAFE ROOM TO FOUNDATION WALL**
SR1.5 Scale: 1/2" = 1'-0"



3 **ALTERNATIVE CIP FOUNDATION ELEVATION**
SR1.5 Scale: 1/2" = 1'-0"

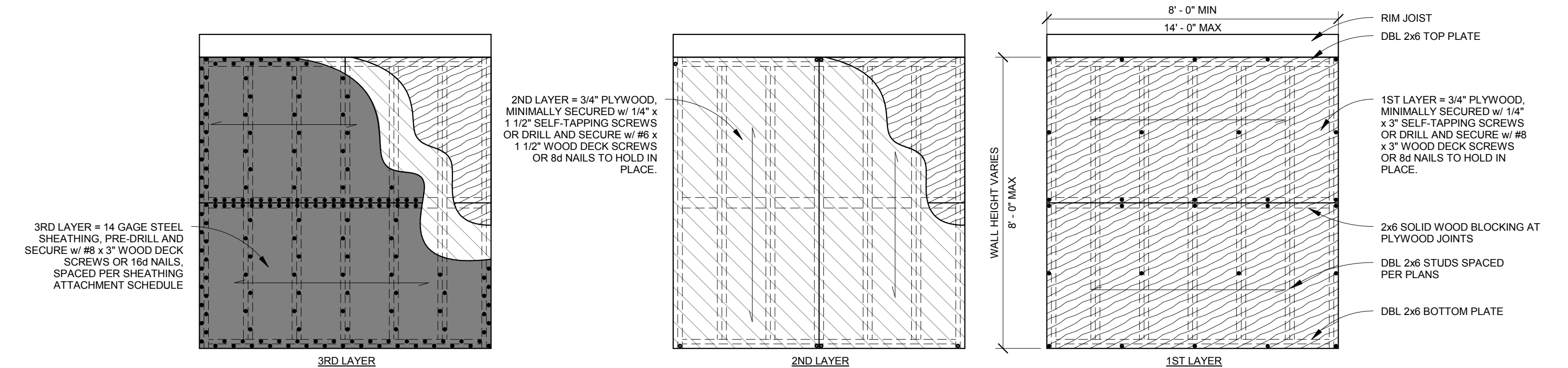


2 **ALTERNATIVE CMU FOUNDATION ELEVATION**
SR1.5 Scale: 1/2" = 1'-0"



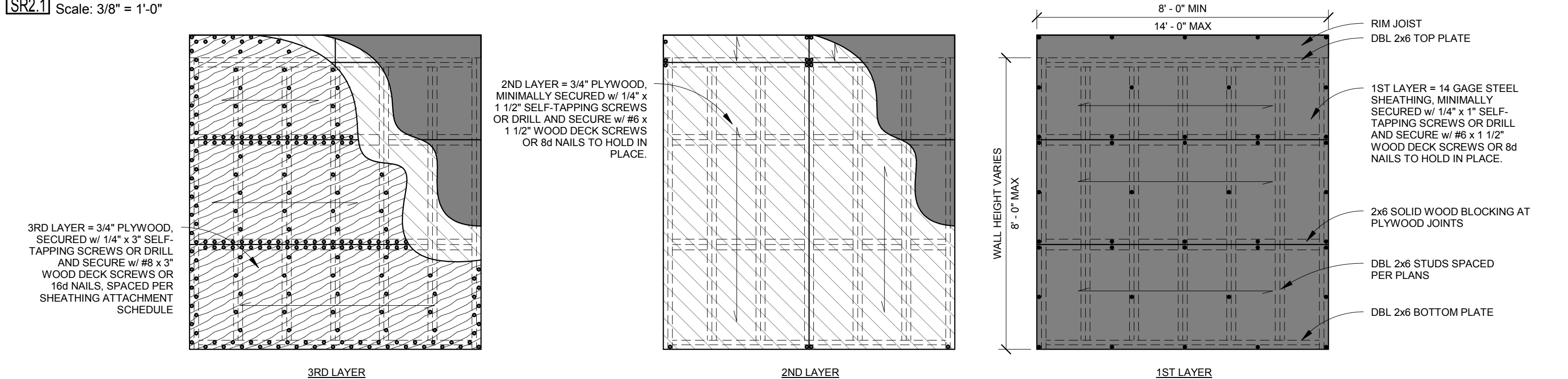
1 **CORNER SAFEROOM PARTIAL PLAN**
SR1.5 Scale: 1/4" = 1'-0"

FEMA P-320 (2014)		
SHEET TITLE: DETAILS FOR SAFE ROOMS THAT USE BASEMENT WALLS		
DRAWING NO: SR1.5		Sheet: 10 of 12
DATE: DECEMBER 2014		
REVISIONS		
Copyright © 2014		



2 PLYWOOD SHEATHING ATTACHMENT PATTERN FOR PROTECTION LAYERS ON INTERIOR OF SAFE ROOM

SR2.1 Scale: 3/8" = 1'-0"



1 PLYWOOD SHEATHING ATTACHMENT PATTERN FOR PROTECTION LAYERS ON EXTERIOR OF SAFE ROOM

SR2.1 Scale: 3/8" = 1'-0"

SHEATHING LEGEND

- 1st LAYER INTERIOR PLYWOOD SHEATHING
3rd LAYER EXTERIOR PLYWOOD SHEATHING
- 2nd LAYER PLYWOOD SHEATHING
- 3rd LAYER INTERIOR STEEL SHEATHING
1st LAYER EXTERIOR STEEL SHEATHING

SHEATHING ATTACHMENT SCHEDULE			
WALL LENGTH	16d NAILS	#8x3" WOOD DECK SCREWS	1/4"x3" SELF TAPPING SCREWS
3'-6" TO 5'-0"	2" OC AT EDGES 6" OC IN FIELD	2" OC AT EDGES 6" OC IN FIELD	3" OC AT EDGES 6" OC IN FIELD
5'-1" TO 7'-0"	3" OC AT EDGES 6" OC IN FIELD	3" OC AT EDGES 6" OC IN FIELD	4" OC AT EDGES 6" OC IN FIELD
7'-1" TO 14'-0"	4" OC AT EDGES 6" OC IN FIELD	4" OC AT EDGES 6" OC IN FIELD	6" OC AT EDGES 6" OC IN FIELD
NOTE: FOR PRE-DRILLED OPTION, ONLY PRE-DRILL THROUGH SHEATHING, DO NOT PRE-DRILL BASE MATERIAL			

- NOTE:
- SHEATHING ATTACHMENT VARIES BASED ON WALL LENGTH, SEE ATTACHMENT SCHEDULE FOR PROPER SPACING.
 - PROTECTION LAYERS ARE TO BE INSTALLED ALTERNATING THE LONG AXIS OF THE MATERIAL FROM HORIZONTAL TO VERTICAL.
 - MINIMUM UNBROKEN WALL LENGTH IS 3' - 6".
 - WITH CMU INFILL OPTION, OMIT STEEL LAYER AND INSTALL 2ND LAYER PER ATTACHMENT OF FINAL LAYER REQUIREMENTS
 - MINIMUM SHEATHING PIECE WIDTH OF 1' - 0". EXCEPTION: SECOND LAYER OF DETAIL 1/SR2.1 MAY REQUIRE UPPER SHEATHING PIECE WIDTH TO BE 7", 8-3/4", OR 10-3/4" DEPENDING ON JOIST DEPTH.
 - SHEATHING MAY BE INSTALLED ON INSIDE OR OUTSIDE FACE. SINGLE LAYER TO BE INSTALLED ON OPPOSITE FACE.

FEMA P-320 (2014)	
SHEET TITLE: SHEATHING REQUIREMENTS & WOOD FRAME SAFE ROOM WITH STEEL SHEATHING	
DRAWING NO: SR2.1	Sheet:11 of 12
DATE: DECEMBER 2014	
REVISIONS	
Copyright © 2014	

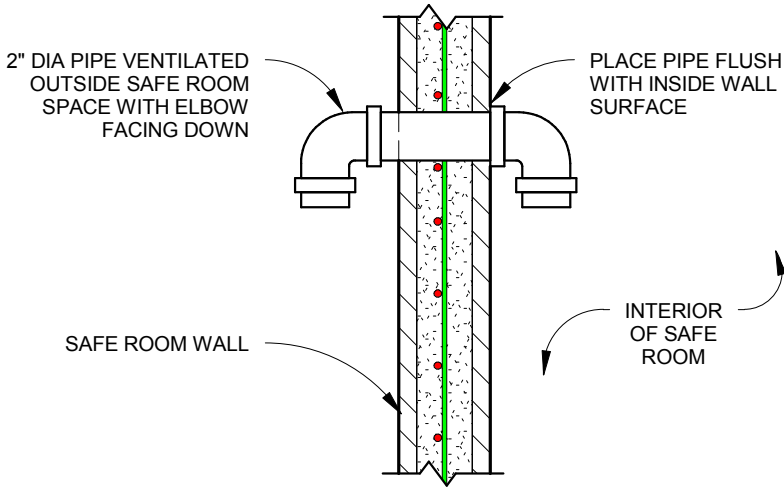
TORNADO RESIDENTIAL SAFE ROOM PASSIVE VENTILATION		
TORNADO SAFE ROOM OCCUPANCY	PASSIVE VENTILATION AREA REQUIRED (INCHES SQUARED)	MINIMUM NUMBER OF PIPE VENTS PER DETAIL 1
1	4*	2
2	4**	2
3	6**	2
4	8**	3
5	10**	4
6	12**	4
7	14**	5
8	16**	6
9	18**	6
10	20**	7
11	22**	8
12	24**	8
13	26**	9
14	28**	9
15	30**	10
16	32**	11
*PER ICC 500 SECTION 702.1 EXCEPTION, AIR INTAKE OPENING(S) MUST BE INSTALLED A MINIMUM OF 72" ABOVE SAFE ROOM FLOOR. WHEN INSTALLED ONLY IN UPPER PORTION, EXCEPTION REQUIRES 4 SQUARE INCHES PER OCCUPANT		
**PASSIVE VENTILATION AREA PER ICC 500 SECTION 702.1 AND ASSUMES AIR INTAKE OPENINGS ARE DISTRIBUTED BETWEEN THE UPPER AND LOWER PORTIONS OF SAFE ROOM AS SPECIFIED THEREIN; AREA AND RESULTING NUMBER OF VENTS REQUIRED MUST BE DOUBLED WHEN AIR INTAKE OPENINGS ARE INSTALLED EXCLUSIVELY IN THE UPPER PORTION AS PROVIDED PER EXCEPTION IN SECTION 702.1.		
CONSULT W/ LOCAL BUILDING OFFICIAL AND REFER TO ICC 500 SECTION 306.3 AND 306.4 FOR OPENING PROTECTIVE REQUIREMENTS		

1

SR2.2

PASSIVE VENTILATION DETAIL FOR EXTERIOR WALL

Scale: 3/4" = 1'-0"



FEMA P-320 (2014)

SHEET TITLE:
EXHAUST / VENTILATION DETAILS

DRAWING NO: SR2.2

Sheet:12 of 12

DATE: DECEMBER 2014

REVISIONS

Copyright © 2014