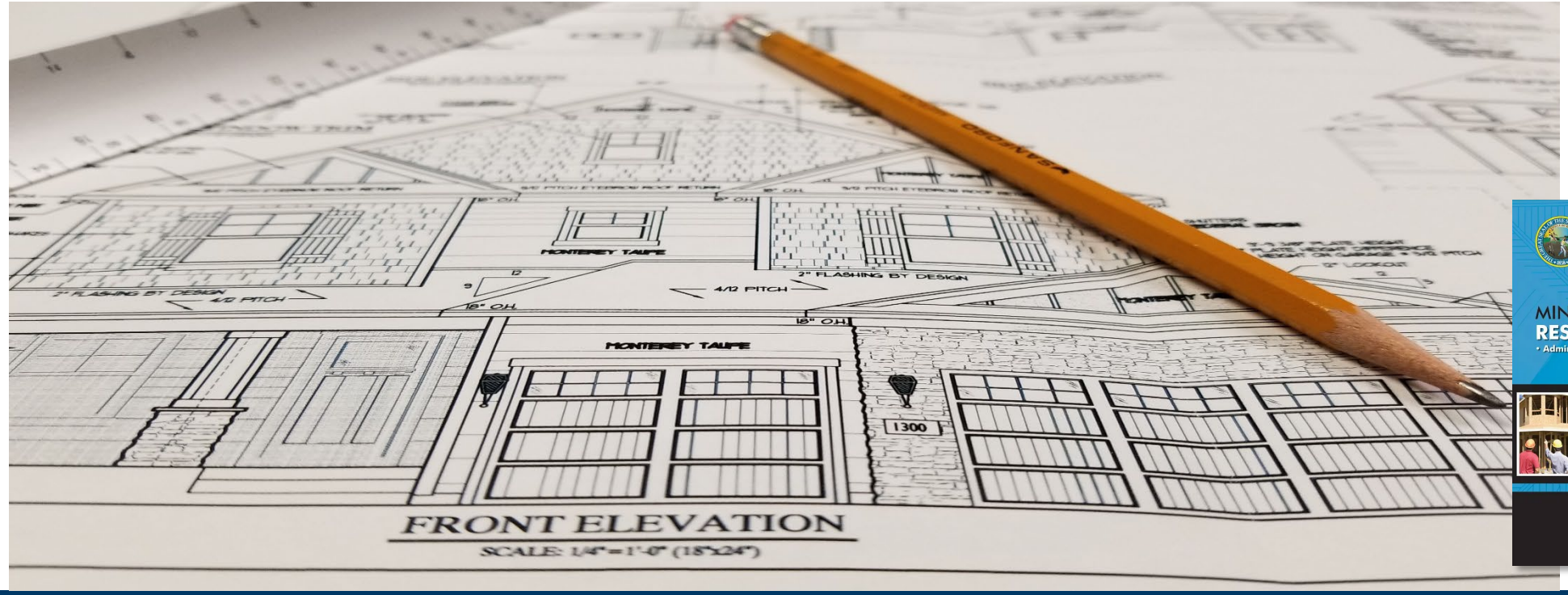
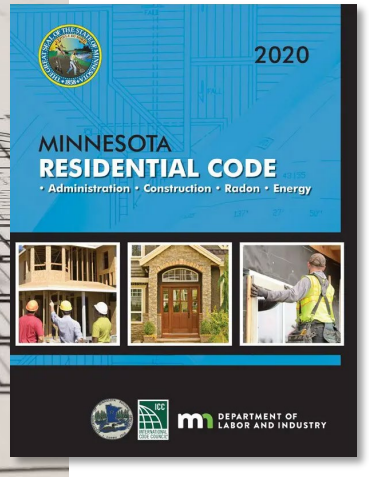




Residential Plan Review

DEPARTMENT OF LABOR AND INDUSTRY
CONSTRUCTION CODES AND LICENSING

Steve Shold – Construction Code Representative
Certified Building Official
ICC Residential Energy Inspector/Plans Examiner
651-284-5312
steve.shold@state.mn.us

Residential Plan Review

Todays program is based on the 2018 International Residential Code with Minnesota amendments – the 2020 MN Residential Code. Some of the content & material is reproduced from the 2018 IRC TM , copyright © 2018, Developed by the International Code Council, Inc.

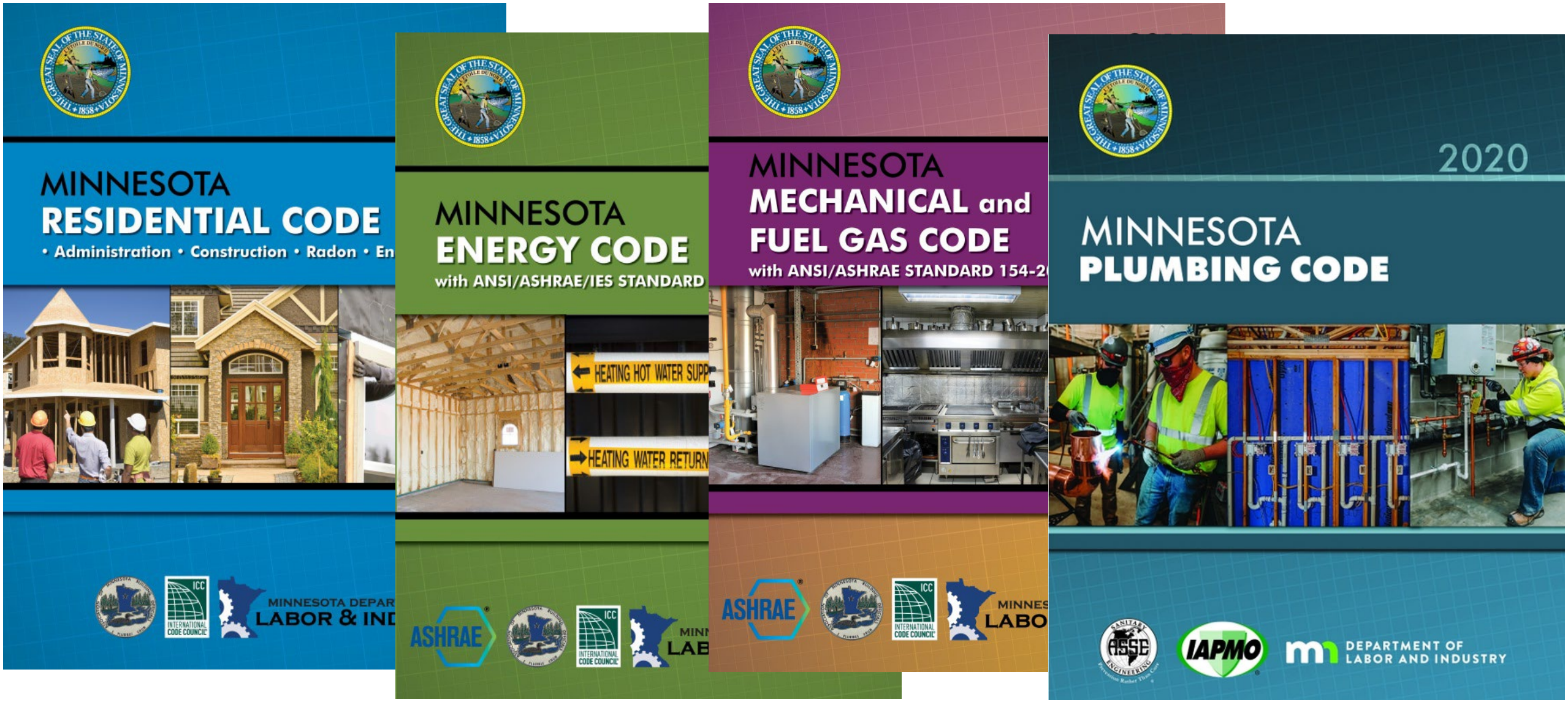
Learning Statement

- Students will become familiar with how to maneuver through the Minnesota Residential Code (MNRC).
- Students will be able to understand the review process of a building permit application and the submittal document requirements.
- Students will examine a single-family dwelling house plan in order to identify and understand building code requirements and concerns.

- MN Residential Code book
- Permit Application Process
- Plan review

Agenda

Code Books


MINNESOTA
RESIDENTIAL CODE
• Administration • Construction • Radon • En
MINNESOTA DEPAR
LABOR & IND
MINNESOTA
ENERGY CODE
with ANSI/ASHRAE/IES STANDARD
HEATING HOT WATER SUPP
HEATING WATER RETURN
ASHRAE
MINNESOTA
MECHANICAL and
FUEL GAS CODE
with ANSI/ASHRAE STANDARD 154-2
ASHRAE
MINNES
LABO
2020
MINNESOTA
PLUMBING CODE
IAPMO
DEPARTMENT OF
LABOR AND INDUSTRY

International Residential Building Code Book - IRC

- Written by ICC (International Code Council)
- IRC Contains:
  - Residential Building.
  - Residential Mechanical/Fuel Gas.
  - Residential Plumbing.
  - Solar Provisions.
  - Electrical.
  - Swimming Pools.
  - Appendices…
- IRC is designed to be a “stand alone” resource for residential construction.

Minnesota Residential Code Book - MNRC

- MNRC adapted from ICC text – based on 2018 IRC with MN amendments
  - 2015 MNRC was based on 2012 IRC.
  - IRC updated on 3-year cycle; MN updated on 6-year cycle.
    - IRC 2012 = MN 2015, IRC 2015 = MN skip, IRC 2018 = MN 2020, IRC 2021 = MN skip, IRC 2024 = MN 2026.
  - Next MN adoption will be 2024 IRC in 2026.
  - Stops at Ch. 10 – Chimneys & Fireplaces.
  - Other sections after ch. 10 are deleted and replaced with other texts (MN Mechanical & Fuel Gas code, IAPMO - Plumbing code).
  - Most appendices not adopted except for Sound Transmission & Tiny Houses.

Other MN Code Books – Residential

- Codes mostly adapted from ICC texts
- 2020 MN Energy Code – based on 2012 IECC.
  - We did not adopt the 2018 IECC.
- 2020 MN Mechanical & Fuel Gas Code (two books in one compilation) – based on 2018 IMC & IFGC.
- 2020 MN Plumbing Code – based on 2018 UPC (Uniform Plumbing Code) written by IAPMO (International Association of Plumbing & Mechanical Officials), not an ICC book.

Familiarization of the Code Book

- Marginal markings/symbols (**page vii**)
- Effective use of the code (**pages ix thru xi**)
- Contents (**pages ix thru xxi**)
- Index (**pages 563 thru 570**)
- Reference Standards (**pages 535 thru 558**)
- Numbering system (**see Section R602.10.2, page 234**)

Marginal Markings

Marginal Markings

➡ = Indicates where a paragraph or item has been deleted from the requirements of the 2015 *International Residential Code*.

> = Indicates model code language deleted by the State of Minnesota.

▌ = Indicates a technical change from the requirements of the 2015 *International Residential Code*.

MN = Indicates a State of Minnesota amendment has been made to the 2018 *International Residential Code*.

Solid vertical lines in the margins within the body of the code indicate a technical change from the requirements of the 2015 edition. Deletion indicators in the form of an arrow (➡) are provided in the margin where an entire section, paragraph, exception or table has been deleted or an item in a list of items or a table has been deleted.

A single asterisk [*] placed in the margin indicates that text or a table has been relocated within the code. A double asterisk [**] placed in the margin indicates that the text or table immediately following it has been relocated there from elsewhere in the code. The following table indicates such relocations in the 2018 edition of the *International Residential Code*.

2018 LOCATION	2015 LOCATION
R703.3.1.2	R703.11.1.4

Layout of the MNRC

- Ch. 1 – Deleted & Replaced with MN Rules 1300 (covered in a separate presentation)
- MN Provisions 1303
  - Footing depth, Snow Load, Radon requirements, etc.
- MN Residential Energy Code 1322
  - Begins with definitions pertaining to Energy section.
  - Amended International Energy Conservation Code (residential portion)

Layout of the MNRC

MN Residential Building Code

- Ch. 2 – Definitions pertaining to Building Code section
- Ch. 3 – Building Planning
  - R301 – Design:
    - Wind, snow, seismic (seismic not recognized in MN)
  - R302 – Fire Resistance
  - R303 – Light, Ventilation, & Heating
  - R304 – Minimum Room Area
  - R305 – Ceiling Height
  - R306 – Sanitation
  - R307 – Toilet, Bath, & Shower Spaces
  - R308 – Glazing

Layout of the MNRC

MN Residential Building Code

- R309 – Garages & Carports
- R310 – Emergency Escape & Rescue Openings (EEROs)
- R311 – Means of Egress
  - Stairs, landings, handrails, ramps
- R312 – Guards & Window Fall Protection
- R313 – Automatic Fire Sprinklers Systems
- R314 – Smoke Alarms
- R315 – Carbon Monoxide Alarms
- R316 – Foam Plastic

Layout of the MNRC

MN Residential Building Code

- R317 – Protection of Wood & Wood Based Products Against Decay
- R318 – Protection Against Subterranean Termites
- R319 – Site Address

- Ch. 4 – Foundations
  - Footings
  - Foundation walls
  - Drain tile
  - Water proofing (also located in Energy code, and is more restrictive)
- Ch. 5 – Floors
- Ch. 6 – Walls
  - Including wall bracing

Layout of the MNRC

MN Residential Building Code

- Ch. 7 – Wall Covering
  - Interior
    - Gypsum/fastening
    - Vapor retarder
  - Exterior
    - Water-resistive barrier
    - Flashing
    - Siding

Layout of the MNRC

MN Residential Building Code

- Ch. 8 – Roof-Ceiling Construction
  - Ceiling joists
  - Rafters
- Ch. 9 – Roof Assemblies (roof coverings)
- Ch. 10 – Chimneys & Fireplaces

Reading the Code

Always:

- Read the entire section
- Look for and read all the exceptions
- Verify the section applies to the situation (context!)

Reading the Code

Using Tables: (This also applies to listed/tested manufacturer's installation or user manuals/tables.)

- Verify the table number corresponds to code section
- Verify that the information in the headings, columns, and rows fits the condition
- Read the footnotes in order of their use

Table Footnotes

TABLE R301.5
MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS
(in pounds per square foot)

USE	LIVE LOAD
Uninhabitable attics without storage[b]	10
Uninhabitable attics with limited storage[b, g]	20
Habitable attics and attics served with fixed stairs	30
Balconies (exterior) and decks[e]	40
Fire escapes	40
Guards and handrails[d]	200[h]
Guard in-fill components[f]	50[h]
Passenger vehicle garages[a]	50[a]
Rooms other than sleeping rooms	40
Sleeping rooms	30
Stairs	40[c]

For SI: 1 pound per square foot = 0.0479 kPa, 1 square inch = 645 mm^2, 1 pound = 4.45 N.

a. Elevated garage floors shall be capable of supporting a 2,000-pound load applied over a 20-square-inch area.

b. Uninhabitable attics without storage are those where the clear height between joists and rafters is not more than 42 inches, or where there are not two or more adjacent trusses with web configurations capable of accommodating an assumed rectangle 42 inches in height by 24 inches in width, or greater, within the plane of the trusses. This live load need not be assumed to act concurrently with any other live load requirements.

c. Individual stair treads shall be designed for the uniformly distributed live load or a 300-pound concentrated load acting over an area of 4 square inches, whichever produces the greater stresses.

d. A single concentrated load applied in any direction at any point along the top.

e. See Section R507.1 for decks attached to exterior walls.

f. Guard in-fill components (all those except the handrail), balusters and panel fillers shall be designed to withstand a horizontally applied normal load of 50 pounds on an area equal to 1 square foot. This load need not be assumed to act concurrently with any other live load requirement.

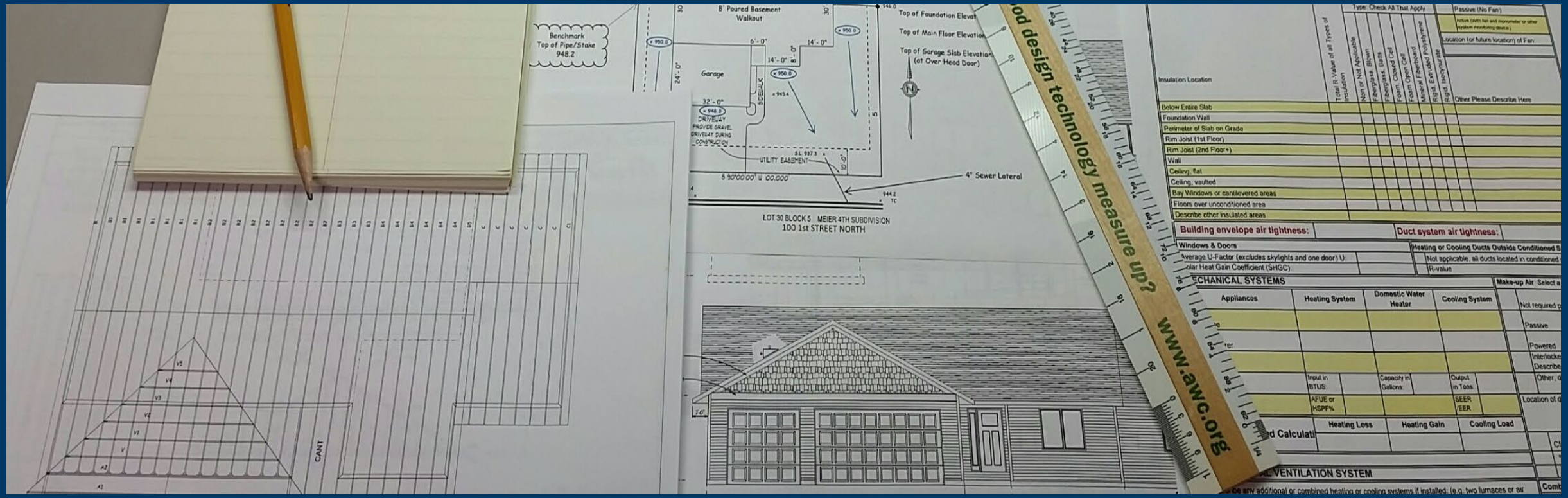
g. Uninhabitable attics with limited storage are those where the clear height between joists and rafters is 42 inches or greater, or where there are two or more adjacent trusses with web configurations capable of accommodating an assumed rectangle 42 inches in height by 24 inches in width, or greater, within the plane of the trusses.

The live load need only be applied to those portions of the joists or truss bottom chords where all of the following conditions are met:

1. The attic area is accessed from an opening not less than 20 inches in width by 30 inches in length that is located where the clear height in the attic is not less than 30 inches.
2. The slopes of the joists or truss bottom chords are not greater than 2 inches vertical to 12 units horizontal.
3. Required insulation depth is less than the joist or truss bottom chord member depth.

The remaining portions of the joists or truss bottom chords shall be designed for a uniformly distributed concurrent live load of not less than 10 pounds per square foot.

h. Glazing used in handrail assemblies and guards shall be designed with a safety factor of 4. The safety factor shall be applied to each of the concentrated loads applied to the top of the rail, and to the load on the in-fill components. These loads shall be determined independent of one another, and loads are assumed not to occur with any other live load.



Code, Permit, & Application

Why do we have a building code?

Purpose – MN Rules 1300.0030 Subp. 1

- The purpose of this code is to establish minimum requirements to safeguard the public **health, safety, and general welfare** through **structural strength, means of egress facilities, stability, sanitation, adequate light and ventilation, energy conservation, and safety** to life and property from fire and other hazards attributed to the built environment and to provide **safety to firefighters and emergency responders** during emergency operations.
- The purpose of the code is not to create, establish, or designate a particular class or group of persons who will or should be especially protected or benefited by the terms of the code.

Why do I need a permit?

Permit Required – MN Rules 1300.0120 Subp. 1

- An owner or authorized agent who intends to construct, enlarge, alter, repair, move, demolish, or change the occupancy of a building or structure, or to erect, install, enlarge, alter, repair, remove, convert, or replace any gas, mechanical, electrical, plumbing system, or other equipment, the installation of which is regulated by the code; or cause any such work to be done, shall first make application to the building official and obtain the required permit.

What documents are required?

Application for a Permit – MN Rules 1300.0120 Subp. 7

Subp. 7. Application for permit.

To obtain a permit, the applicant shall file an application in writing on a form furnished by the Department of Building Safety for that purpose. The application shall:

A. Identify and describe the work to be covered by the permit for which application is made;

B. Describe the land on which the proposed work is to be done by legal description, street address, or similar description that will readily identify and definitely locate the proposed building or work;

C. Indicate the use and occupancy for which the proposed work is intended;

D. Indicate the type of construction;

E. Be accompanied by construction documents and other information as required by the code;

F. State the valuation of the proposed work;

G. Be signed by the applicant, or the applicant's authorized agent; and

H. Give other data and information required by the building official.

More specifically…

For example…Provide in submittal documents:

- Survey/site plan showing lot size, building size, setbacks from property lines, other buildings, sewer/water, septic systems, wells, and any other items required by code or ordinance.
- Two sets of complete plans and specifications (or electronic plans).
- Energy code compliance certificate.
  - Insulation type & R-value.
  - Minimum ventilation requirements Minnesota Energy Code 1322 Chapter 4.
  - Combustion air calculations IFGC 304.1, IFGC Appendix E, worksheet E-1.
  - Makeup air calculations. IMC 501.4.1, IMC Chapter 5 Table 501.4.1.
- Floor plans for all levels. Include room size, room use, kitchen/bathroom layout, dimensions of stairway and location, window and door location with sizes, and decks/porches.

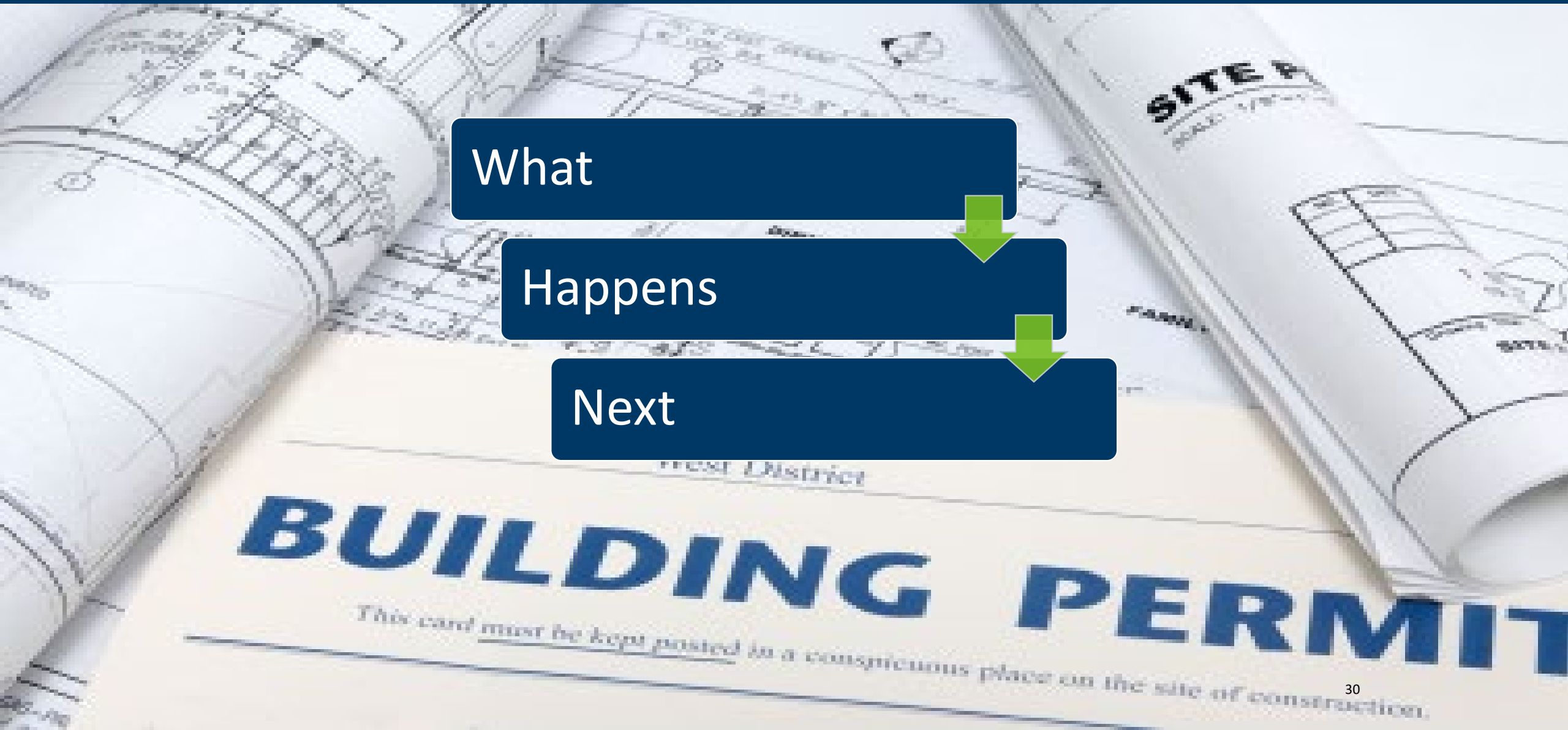
More specifically…

- Exterior elevations, showing top of foundation in relation to final grade, grading and drainage, windows, doors, siding type, roof pitch, roof covering, decks and other pertinent information.
- Typical wall section or section through the building. The following items should include but not be limited to:
  - Footing size (and reinforcing if needed).
  - Foundation type, size, height, and reinforcing.
  - Foundation drainage system (drain tile).
  - Foundation waterproofing.
  - Foundation insulation type & R value.
  - Rim joist insulation type & R value.

More specifically…

- Floor joist type, size, & spacing
- Subfloor material & thickness
- Wall thickness & stud spacing
- Wall sheathing type and thickness
- Water-Resistive Barrier method (House wrap)

Permit Process & Plan Review



Permit Application Process

Submit Application & Drawings

Cursory Review

Missing Information	Submittal is Complete
Notify applicant immediately	Zoning Review (if needed)

Perform Building Code Review

Missing Information		Aspect does NOT comply with code	Plan complies with code
Cannot proceed	Can proceed with some of review	Note aspect on plan review list	Add stamps/comments/letter as needed
Notify applicant immediately, resubmit	Note missing items, do as much of review as possible	Finish compiling list	Plans Approved
	Provide applicant list of missing items, resubmit	Provide applicant list of noncompliant items, resubmit	Notify Applicant

Collect fees & Issue permit

Why do we conduct a plan review?

- Catch errors
  - Save time.
  - Save money.
  - Opportunity to identify safety issues.
  - Field corrections are difficult to make.
- Inspector & Contractor/Owner work from the same approved plan
  - Prepares you to conduct a more effective field inspection.
  - Familiarity with the project
- Applicant is ***paying*** for a plan review! Deliver the service.

Process

Cursory Review

Missing Information

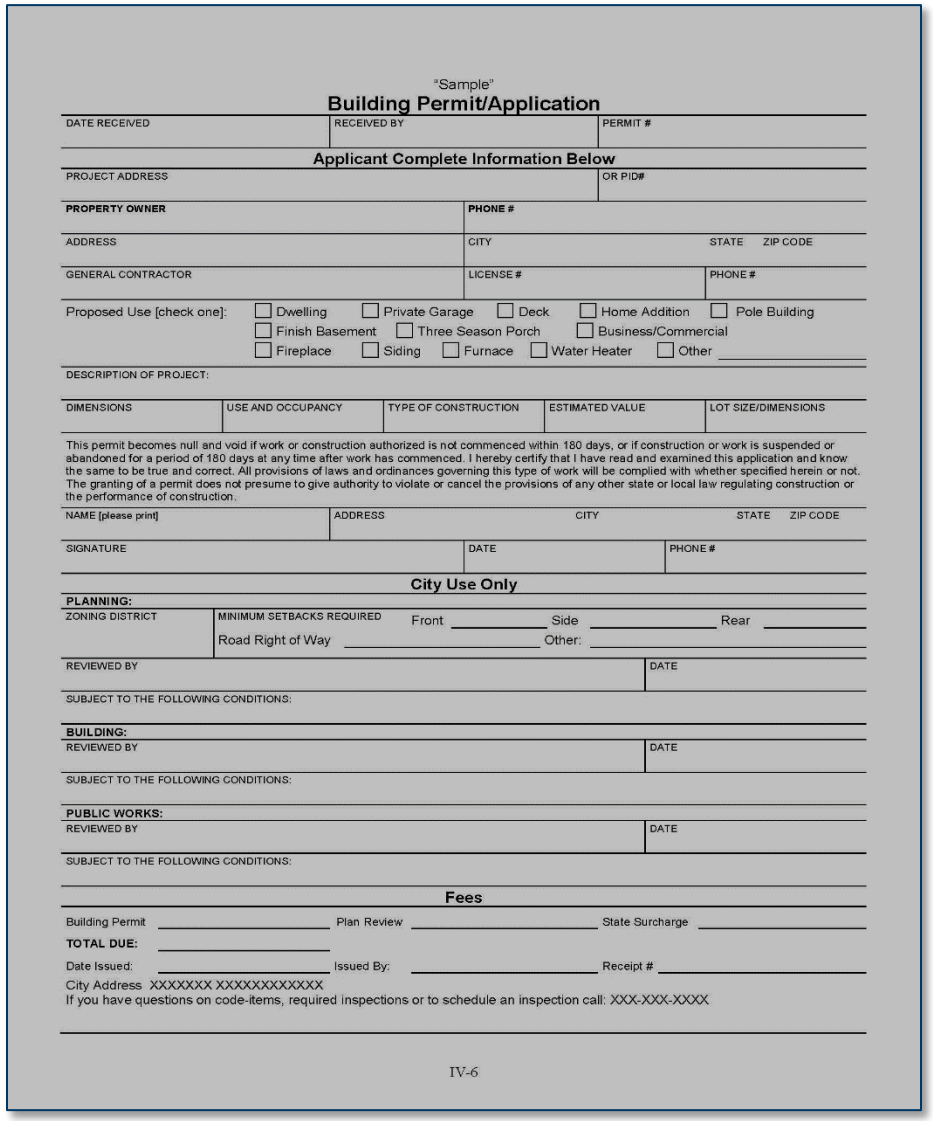
Notify applicant immediately

- Look over documents briefly to ensure you have all of the information.
  - Permit tech or administrative support staff.
  - Inspector.
  - Ideally at the counter, or within 24 hrs. of receiving application.
- Notify the applicant immediately if items are missing or incomplete.

Application

MN Rules 1300.0120 Subp. 7

- The permit application shall:
  - Identify work
  - Describe the land
  - Indicate use and occupancy
  - Type of construction
  - Accompanied by construction documents
  - State the value
  - Signed by applicant
  - Other info as required by B.O.



"Sample"

Building Permit/Application

DATE RECEIVED	RECEIVED BY	PERMIT #

Applicant Complete Information Below

PROJECT ADDRESS	OR PID#

PROPERTY OWNER	PHONE #

ADDRESS	CITY	STATE	ZIP CODE

GENERAL CONTRACTOR	LICENSE #	PHONE #

Proposed Use [check one]: ☐ Dwelling ☐ Private Garage ☐ Deck ☐ Home Addition ☐ Pole Building ☐ Finish Basement ☐ Three Season Porch ☐ Business/Commercial ☐ Fireplace ☐ Siding ☐ Furnace ☐ Water Heater ☐ Other _____

DESCRIPTION OF PROJECT:

DIMENSIONS	USE AND OCCUPANCY	TYPE OF CONSTRUCTION	ESTIMATED VALUE	LOT SIZE/DIMENSIONS

This permit becomes null and void if work or construction authorized is not commenced within 180 days, or if construction or work is suspended or abandoned for a period of 180 days at any time after work has commenced. I hereby certify that I have read and examined this application and know the same to be true and correct. All provisions of laws and ordinances governing this type of work will be complied with whether specified herein or not. The granting of a permit does not presume to give authority to violate or cancel the provisions of any other state or local law regulating construction or the performance of construction.

NAME [please print]	ADDRESS	CITY	STATE	ZIP CODE

SIGNATURE	DATE	PHONE #

City Use Only

PLANNING:

ZONING DISTRICT	MINIMUM SETBACKS REQUIRED	Front _____ Side _____ Rear _____
	Road Right of Way _____	Other: _____

REVIEWED BY	DATE

SUBJECT TO THE FOLLOWING CONDITIONS:

BUILDING:

REVIEWED BY	DATE

SUBJECT TO THE FOLLOWING CONDITIONS:

PUBLIC WORKS:

REVIEWED BY	DATE

SUBJECT TO THE FOLLOWING CONDITIONS:

Fees

Building Permit _____ Plan Review _____ State Surcharge _____

TOTAL DUE: _____

Date Issued: _____ Issued By: _____ Receipt # _____

City Address XXXXXXX XXXXXXXXXXX

If you have questions on code-items, required inspections or to schedule an inspection call: XXX-XXX-XXXX

IV-6

City of Duluth
Construction Services & Inspections Division

411 West First Street • Room 210 • Duluth, Minnesota • 55802-1194
(218) 730-5580 • Fax: (218) 730-5904 • www.duluthmn.gov/construct/

An Equal Opportunity Employer

Permit questions: 730-5240

Building Permit Application

Complete All Items

Project Name — Application Date

Site Address — Parcel ID Number

Legal Description: Subdivision, Lot & Block or other description

Applicant Name — Applicant is: ☐ Owner ☐ Contractor ☐ Owner's Agent

Contractor license #:

Applicant Address — City — State — Zip

Applicant Email (REQUIRED) — Applicant Phone (REQUIRED)

Owner Name

Owner Address — City — State — Zip

Owner Email (REQUIRED) — Owner Phone (REQUIRED)

Description of proposed work: ☐ Residential (1 or 2 Family or Townhouse) ☐ Multi-family Residential ☐ Commercial

Check Applicable:
☐ New Building ☐ Interior Remodel w/ Change of Use ☐ Interior Remodel No Change of Use ☐ Demolition
☐ Addition ☐ Sitework/Foundation Only ☐ Other

Project Valuation. **Include materials and labor for all work:**

Permit Fee: — Plan Review Fee: — State Surcharge: — Total Enclosed:

Design Professional (Architect or Engineer) or Plan Preparer Name

Design Professional or Plan Preparer Address — City — State — Zip

Design Professional or Plan Preparer Email (REQUIRED) — Phone (REQUIRED)

Commercial Multi-Family

Occupancy Use Group(s) circle:
A B E F H I M R S U

Sprinklered?
☐ No ☐ NFPA 13 ☐ NFPA 13 R

Type(s) of Construction (circle):
IA IB IIA IIB IIIA IIIB IV VA VB

Food Service Facility?
☐ No ☐ Yes

State Const. Project # - If applicable

Does the project site or any area to be disturbed by construction contain wetlands? ☐ No ☐ Yes

Applicant's Signature (REQUIRED)

I do hereby make application for a building permit. The application and accompanying documents are complete and accurate. Work shall be consistent with the plans and information provided with the permit application and shall comply with applicable codes, ordinances and laws and conditions of approval. Work shalll not begin until a building permit has been issued.

Applicant's Signature (REQUIRED)

Office Use
LUTech: Zone District: Stormwater Zone: Special Approvals:

I:\DEVELOPMENT\ConstSvcs\FORMS\Handouts\2014 Updates\Building Permit Application_2014

CITY OF ST PAUL

Department of Safety and Inspections
375 Jackson Street, Suite 220
St Paul, Minnesota 55101-1806

GENERAL BUILDING PERMIT APPLICATION

Visit our Web Site at www.stpaul.gov/dsi

PROJECT ADDRESS: Number | Street Name | St. Ave. Blvd. Etc. | N S E W | Suite/Apt | Building Name | Date

Contractor (Include Contact Person) — Address, City, State, Zip + 4 — Phone

State Building Contr. Lic. #

Contractor's Email:

Architect/Designer: — Email: — Phone

Property Owner (Include Contact Person) — Address, City, State, Zip + 4 — Phone

Select the Type of Work ► ☐ New Structure ☐ Addition ☐ Remodel/Alter ☐ Repair

Select Applicable Installation Below.

☐ Windows: # of windows ► _____
☐ Roofing: # of squares ► _____
☐ Siding: # of squares ► _____
► Note: 1 Square = 100 Square Feet

Select Type of Use ►

Mixed Commercial/ Residential buildings enter information for both the Residential and Commercial Use.

☐ Residential: # of Existing Dwelling Units ► _____ ; Final # of Dwelling Units ► _____ ; # of Dwelling Units Worked On ► _____

☐ Commercial: Value of Coml. Work ► $ _____

Est. Start Date ► — Est. Finish Date ► — **Total Value ►** $ _____

Description of Project:

Applicant certifies that all information is correct and that all pertinent state regulations and city ordinances will be complied with in performing the work for which this permit is issued.

Applicant's Signature

PLEASE COMPLETE THIS SECTION ONLY FOR NEW STRUCTURE OR ADDITION

Structure Dimensions (In Feet)

Width	Length	Height	Total Square Feet (include basement)	Basement	# of Stories
				Yes No	

Is a Fire Suppression System Available? (i.e. – Sprinklers) Yes ☐ No ☐

Lot Dimensions (In Feet)		Set Backs from Property Lines			
Lot Width	Lot Depth	Front	Back	Side 1	Side 2

For Office Use Only

Change/Expansion of Use? Yes / No

Existing Primary Use	Occupancy Group	
Proposed Primary Use	Construction Type	
Zoning District	Plan Number	

PLAN REVIEW REMARKS

S.A.C. #: Charge Credit — Reviewed By: — Date: — Warning Folder # — Vacant Bldg. Folder #

State Valuation : $

SUMMARY OF FEES	
Building Permit Fee	$
State Surcharge	$
Plan Check	$
SAC	$
SAC Processing Fee	$
Design Review Fee	$
Park Dedication Fee	$
Total Permit Fee	$

(For Office Use Only) PERMIT # ►

Signature of Cardholder (required for all charges):

☐ AMEX ☐ Discover ☐ MasterCard ☐ Visa — Security Code ► — Expiration Month/Year ►

Enter Account Number ► ►

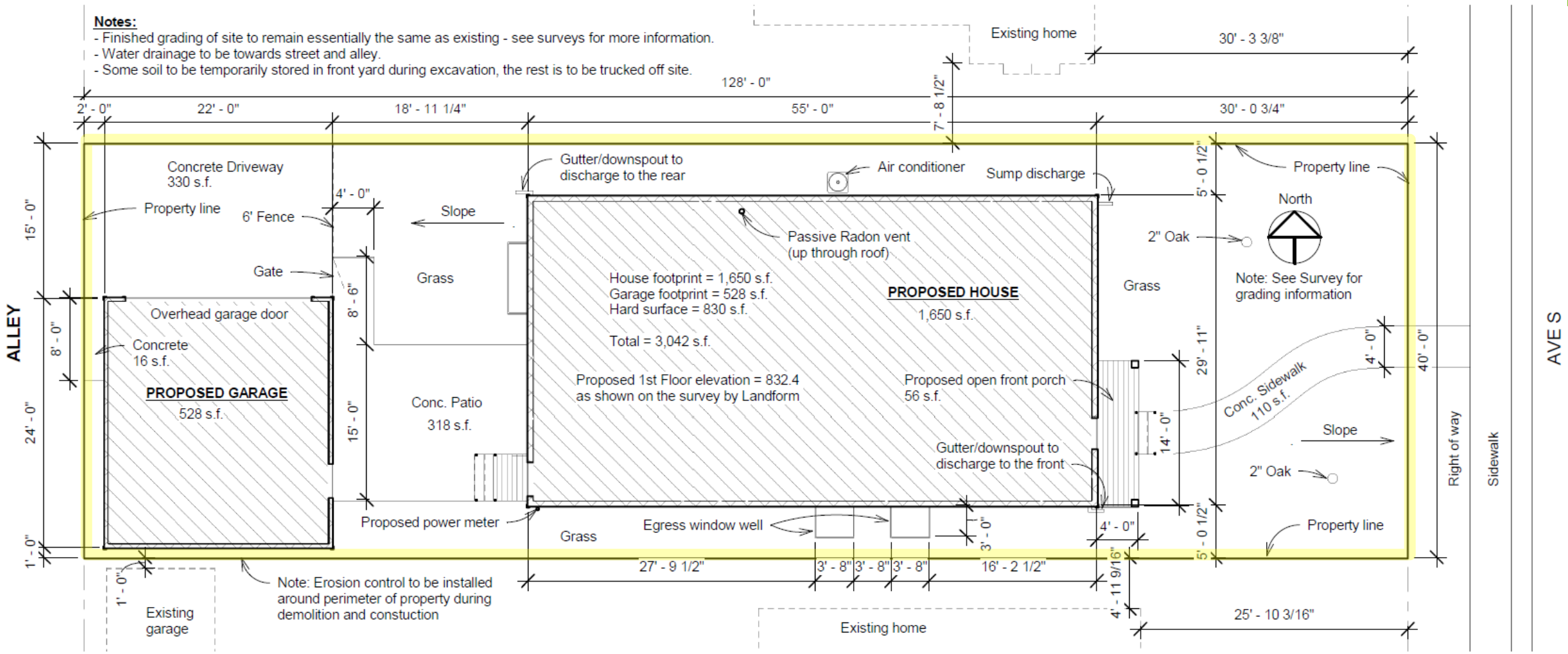
Process

Submittal is Complete

Zoning Review (if needed)

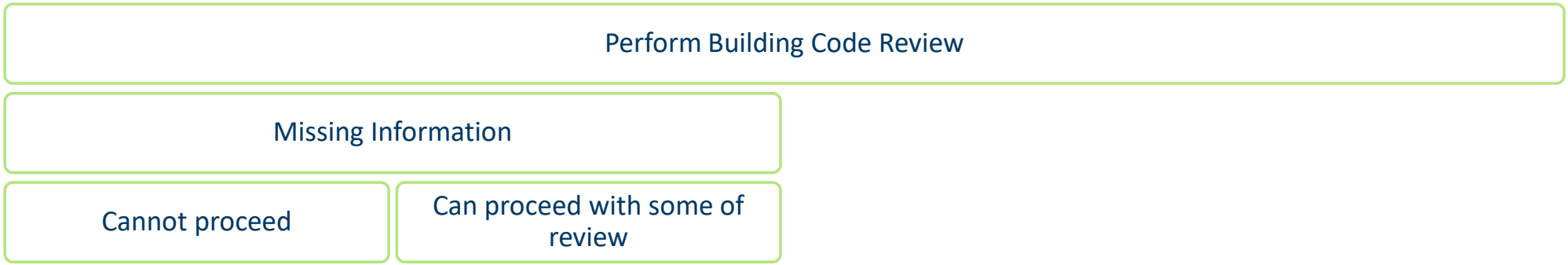
- If the submittal is complete, route documents through Zoning.
  - Site Plan/Survey will be reviewed.
  - Will the structure fit on the lot?
  - Is the structure too large?
  - Is the structure allowed in that area/zoning district?
  - Is a redesign merited?

Site Plan

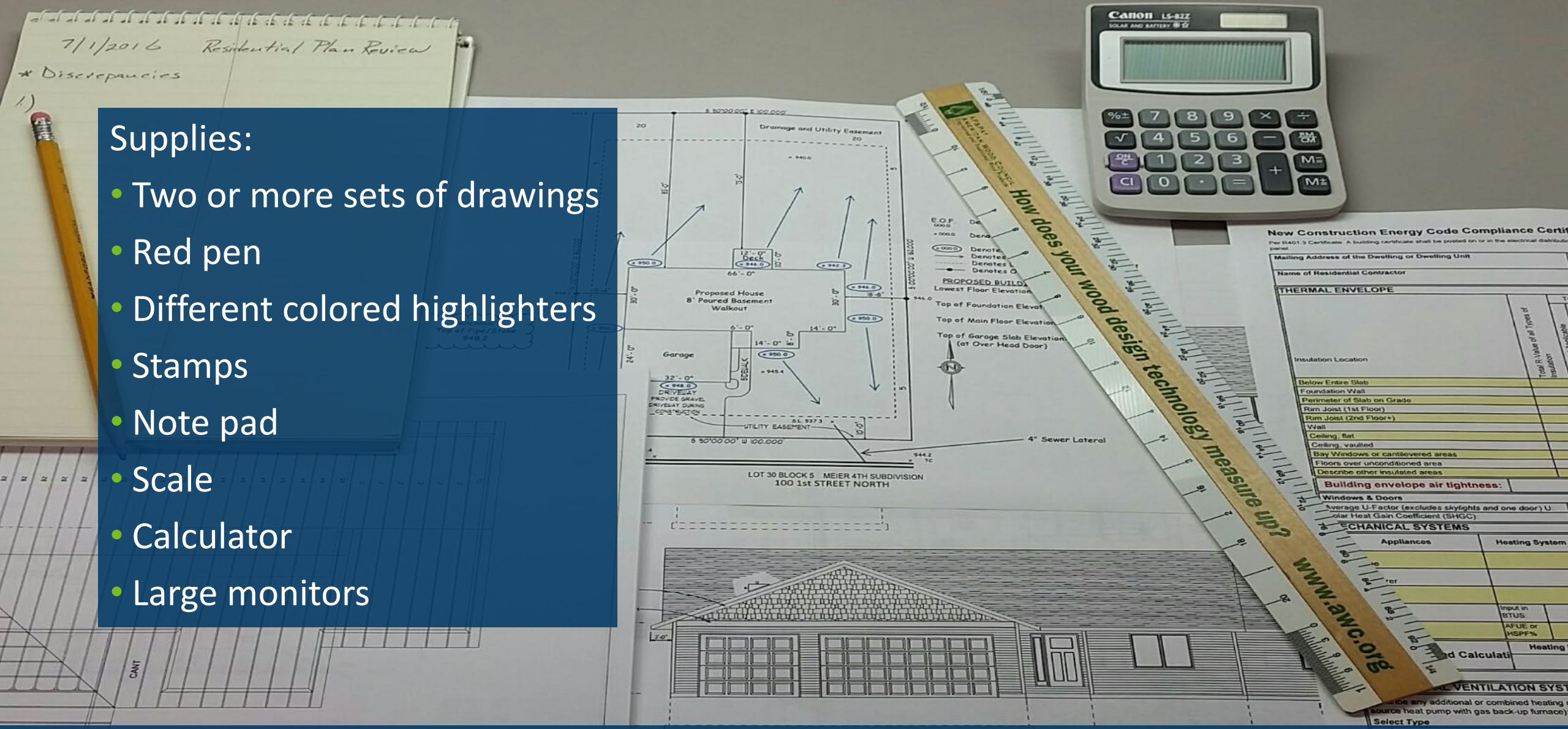


3 Site
1" = 10'-0"

Process



- Begin review – missing something?
  - If it prevents you from doing *any* of the review, notify applicant **immediately**.
  - If it is minor, note it and start the review - **do as much of the review as possible**.

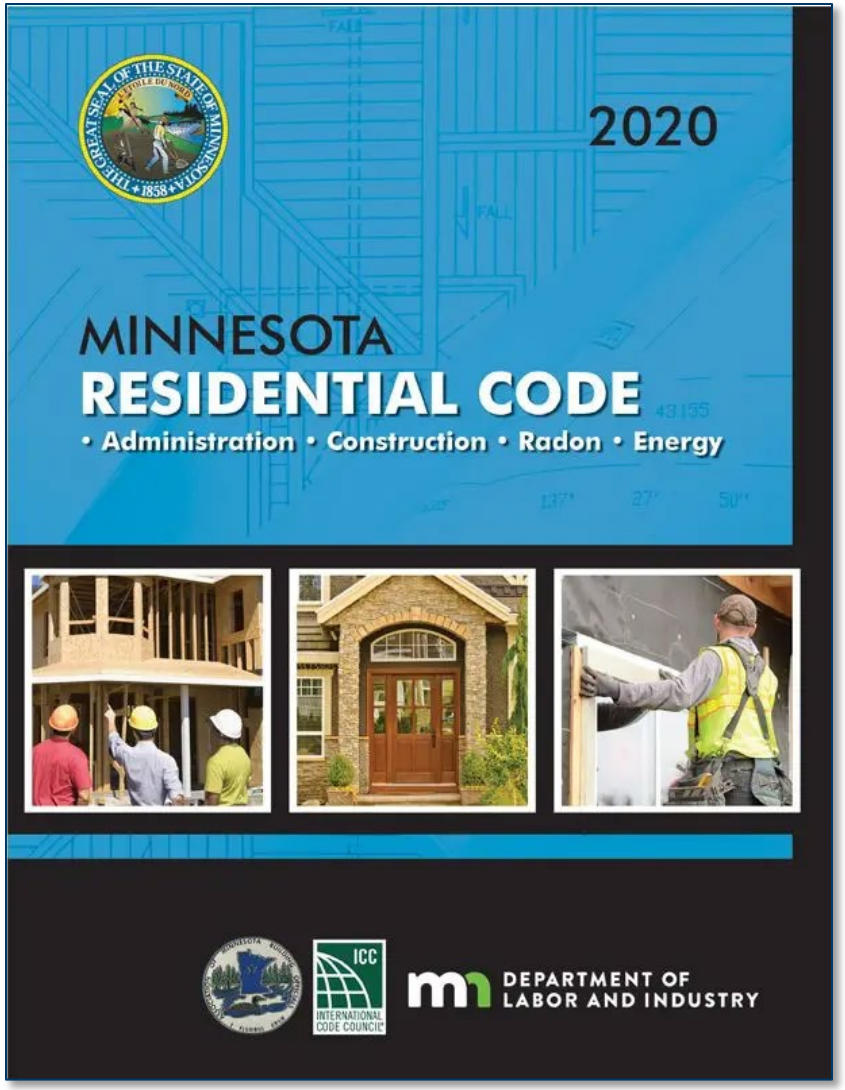


How do we conduct a plan review?

Process

MN Rules 1300.0070 Subp. 12b.

- What is it?
  - IRC – I Dwelling, single-family
  - IRC – II Dwelling, two-family
  - IRC – III Townhouse
  - IRC – IV Accessory structures
    - Garages
    - Storage sheds
    - Similar structures
- Be sure you are in the right book
  - MNRC – Residential **(1309)**
  - MNBC – Commercial **(1305)**



- **Defined as:** Occupancies not more than three stories above grade plane in height with a separate means of egress shall comply with chapter 1309...

Two Family Dwelling

Townhouse

Photo Credit: https://www.bankrate.com/real-estate/what-is-a-townhouse/

Accessory structures

Process

MN Rules 1300.0070 Subp. 12b.

- What is it?
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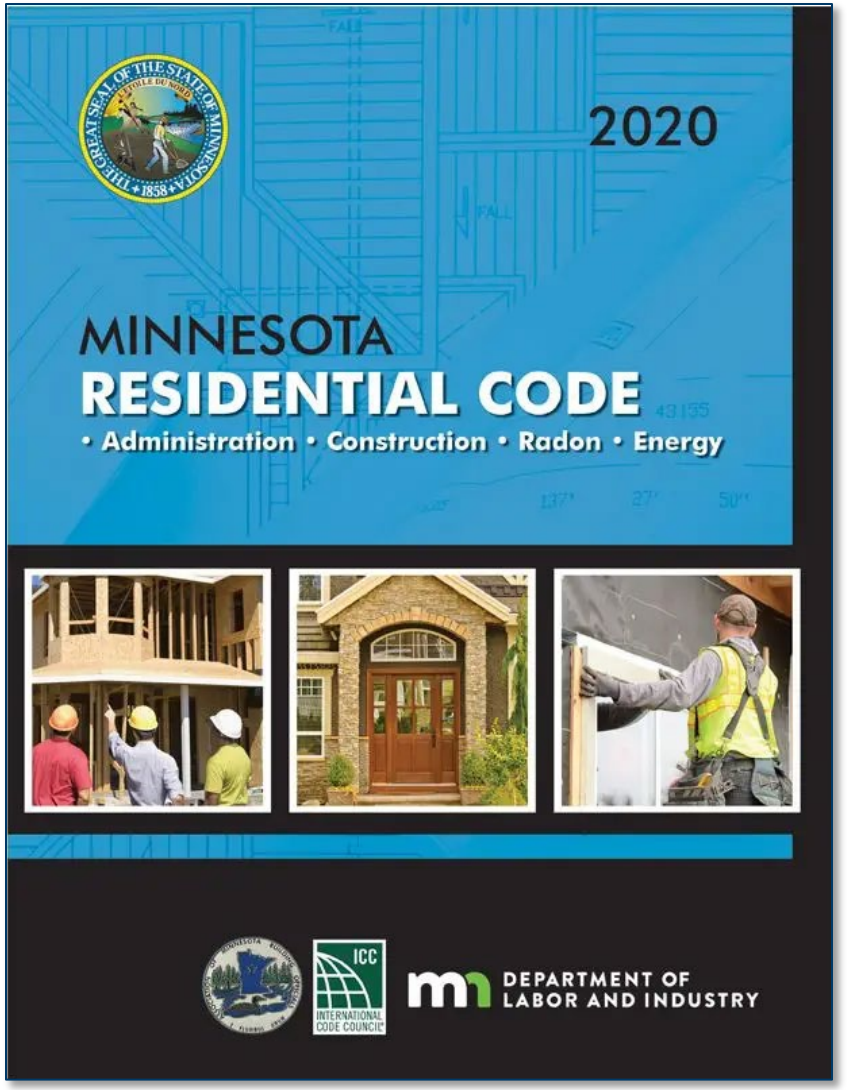

Process

MN Rules 1300.0070 Subp. 12b.

- What is it?
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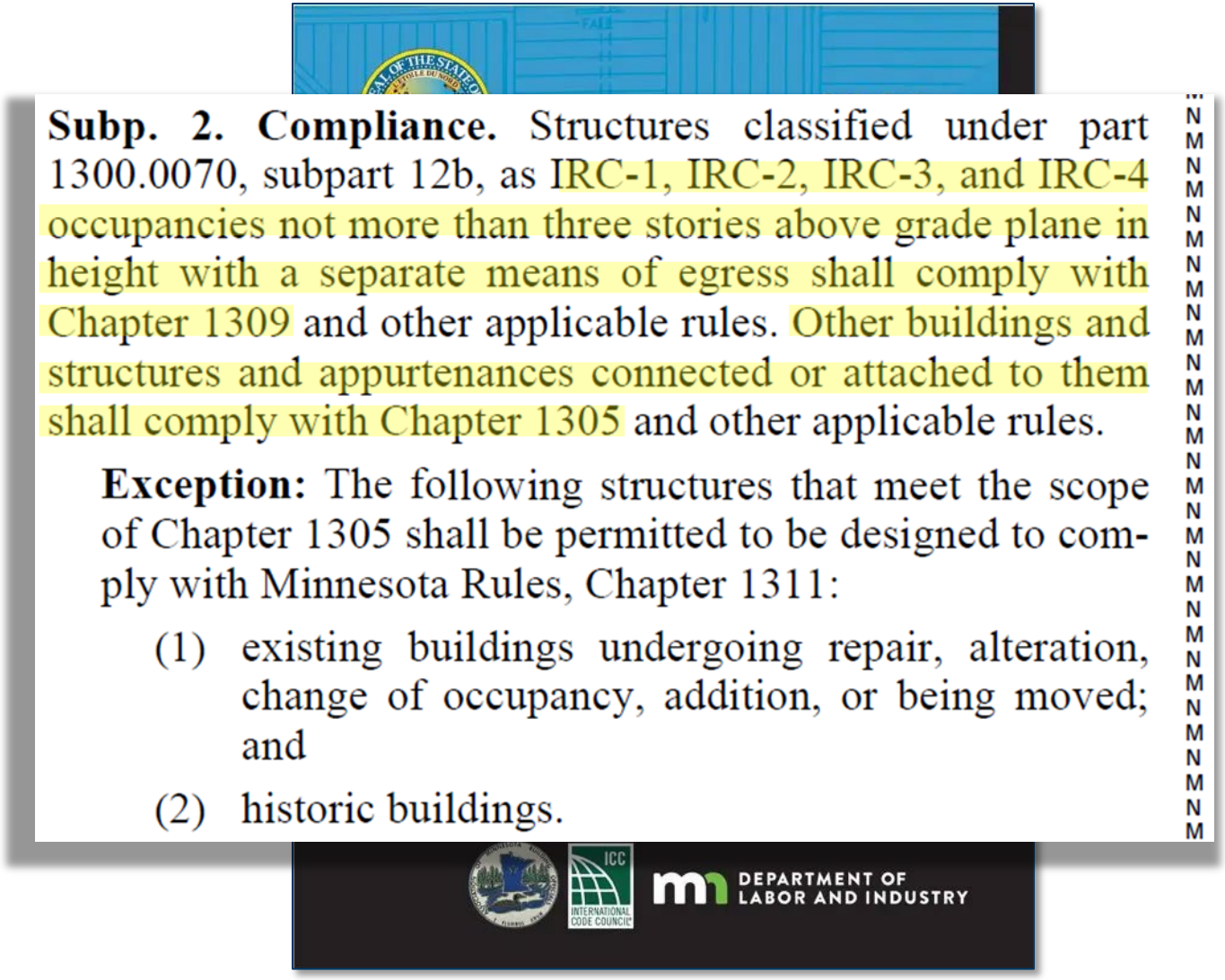
  - MNRC – Residential **(1309)**
  - MNBC – Commercial **(1305)**



Subp. 2. Compliance. Structures classified under part 1300.0070, subpart 12b, as IRC-1, IRC-2, IRC-3, and IRC-4 occupancies not more than three stories above grade plane in height with a separate means of egress shall comply with Chapter 1309 and other applicable rules. Other buildings and structures and appurtenances connected or attached to them shall comply with Chapter 1305 and other applicable rules.

Exception: The following structures that meet the scope of Chapter 1305 shall be permitted to be designed to comply with Minnesota Rules, Chapter 1311:

(1) existing buildings undergoing repair, alteration, change of occupancy, addition, or being moved; and

(2) historic buildings.

DEPARTMENT OF LABOR AND INDUSTRY

Process

- Begin review
  - Start by familiarizing yourself with the plans.
  - Flip through all of the pages and understand what is being built.
  - Don’t focus on getting technical or making calculations until you have a good overview of what is being built.
  - If you notice violations, or think of questions, note them.

Are the plans submitted and designed by a licensed architect?

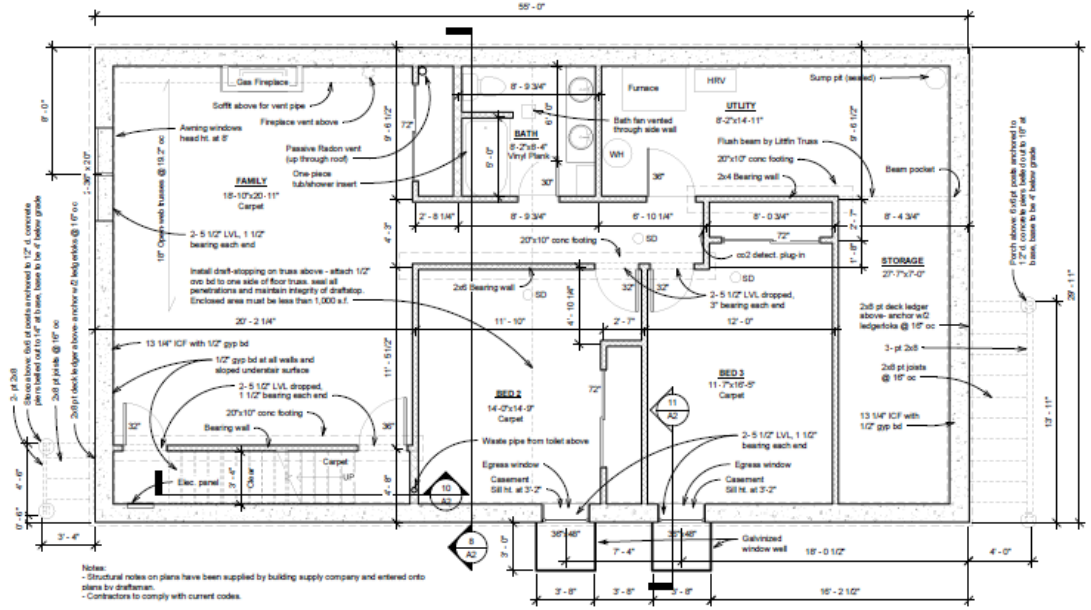
Is it *possible* to be built under the requirements of MN Rules 1309?

Design

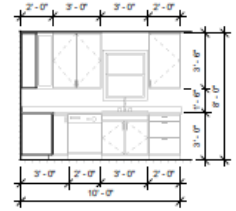
- Start to focus on the design
  - Once you understand *what* is being built, look to see if the overall design is possible under code – imagine walking through the house, entering each room.
    - Hallways to rooms
    - Landings at top and bottom of stairs
    - Windows/Egress openings
    - Lighting
    - Headroom
    - (Wind, snow, live/dead load)
    - Determine *If* the structure seems plausible

How to Start?

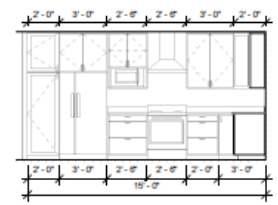
- Once you understand **what** is being proposed, and determine that the overall design *could* comply with the code, begin to look technically at the structure through the lens of code.



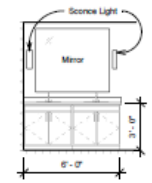
1 Lower Level
1/4" = 1'-0"



3 1b
1/4" = 1'-0"



4 1a
1/4" = 1'-0"



6 2a
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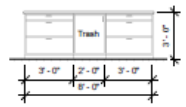
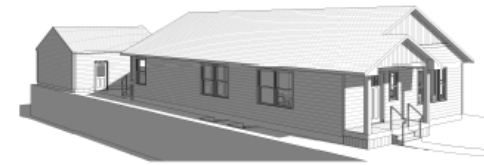


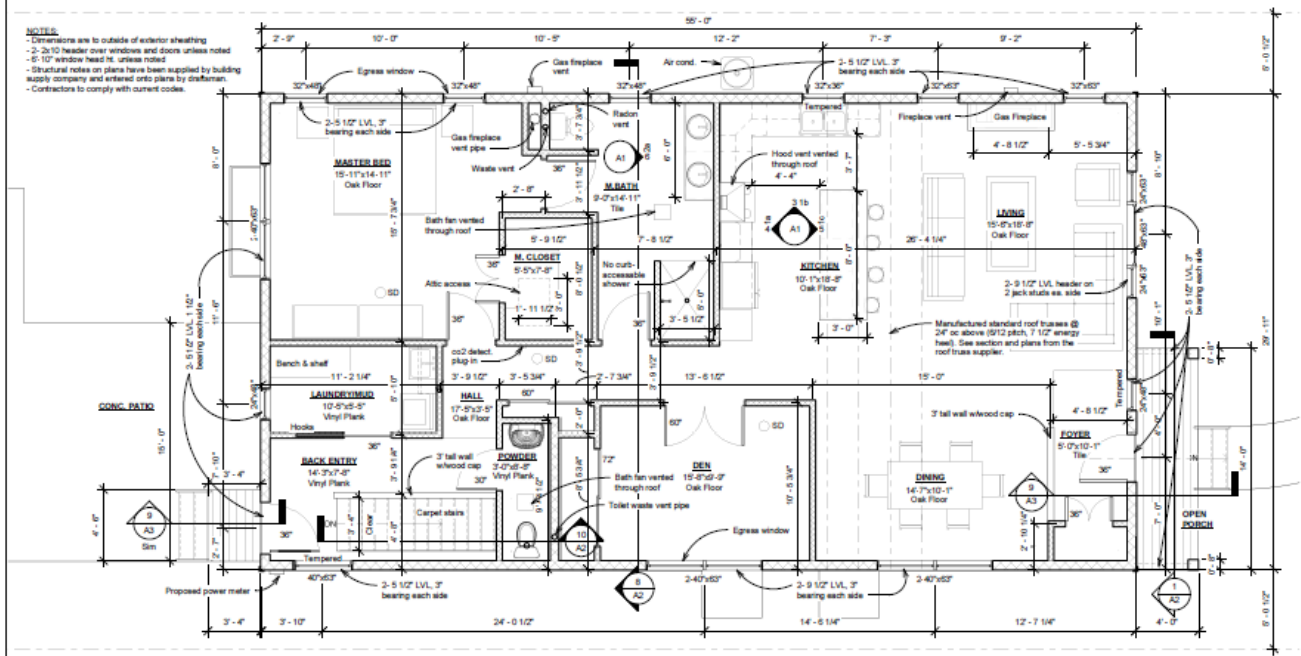
5 1c
1/4" = 1'-0"



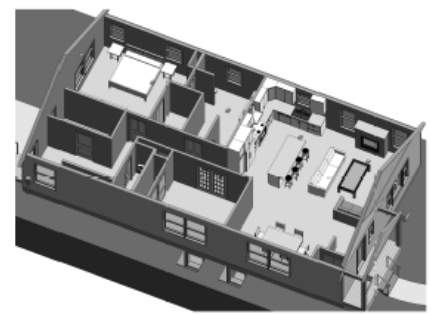
8 3D View 1

9 3D View 2

10 3D View 3



2 Main Level
1/4" = 1'-0"

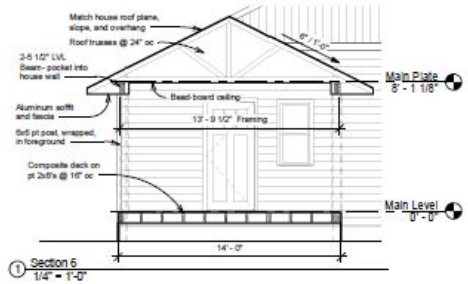


7 3D no roof set

No.	Description	Date

A1

Scale 1/4" = 1'-0"



1 Section 6
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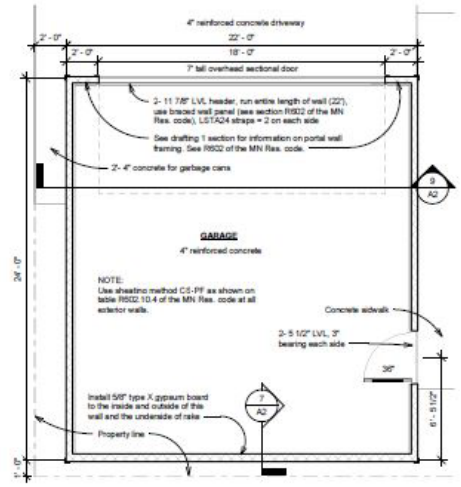
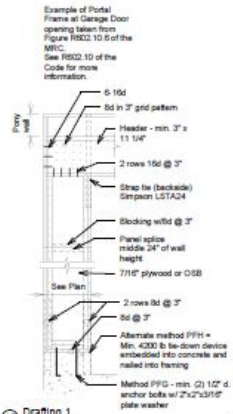
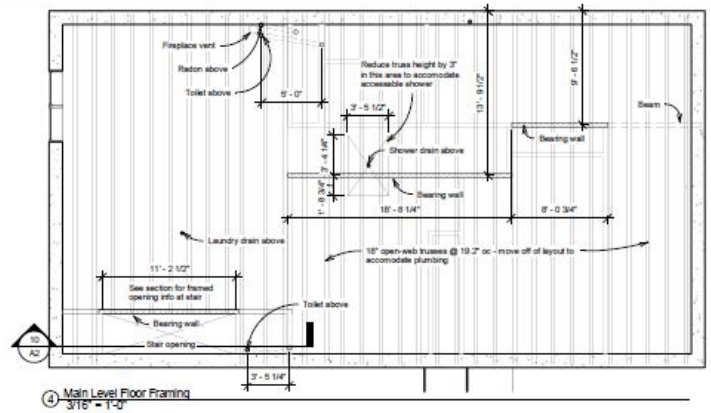


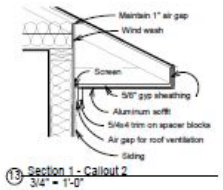
2 Garage
1/4" = 1'-0"



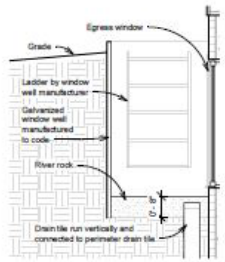
12 Drafting 1
1/2" = 1'-0"



4 Main Level Floor Framing
3/16" = 1'-0"



13 Section 1 - Callout 2
3/4" = 1'-0"



11 Section 7
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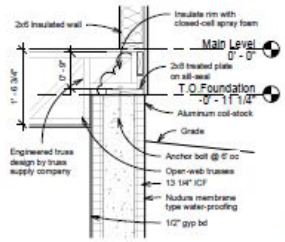

5 Section 1 - Callout 1
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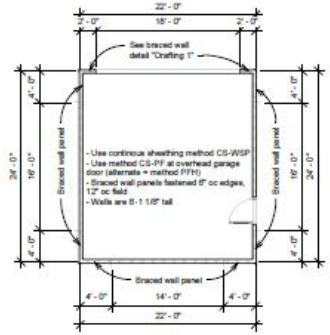
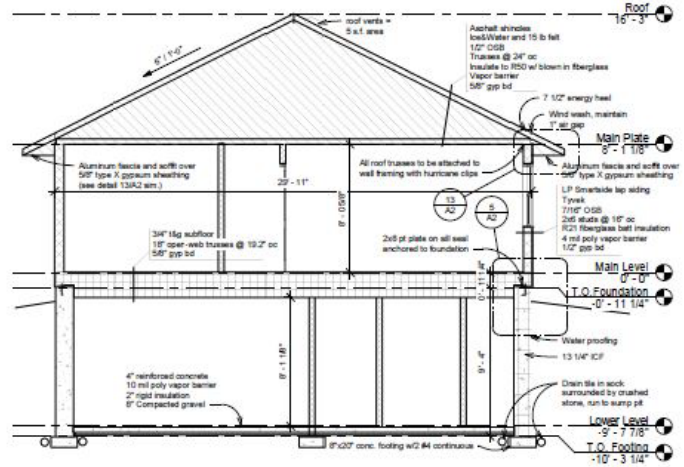


6 Garage Braced
1/8" = 1'-0"



8 Section 1
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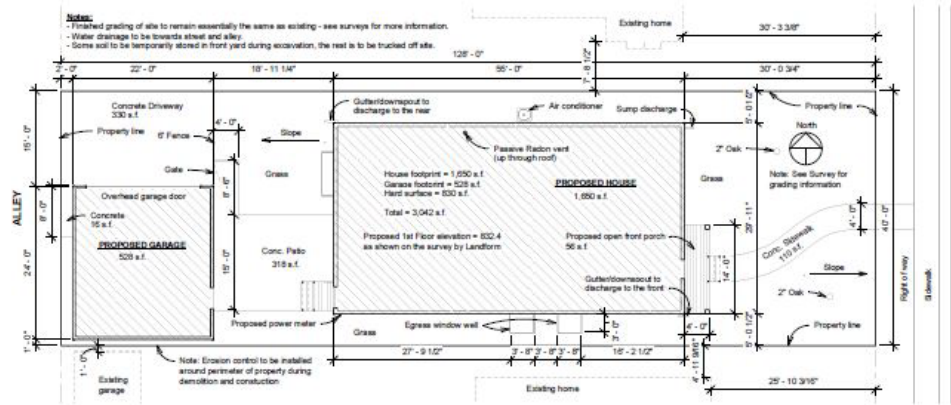
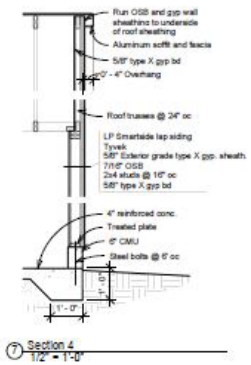
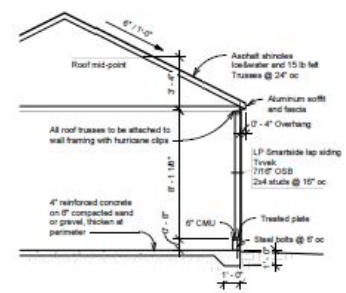


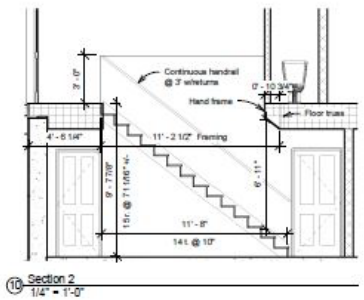
3 Site
1" = 10'-0"



7 Section 4
1/2" = 1'-0"



9 Section 3
1/4" = 1'-0"

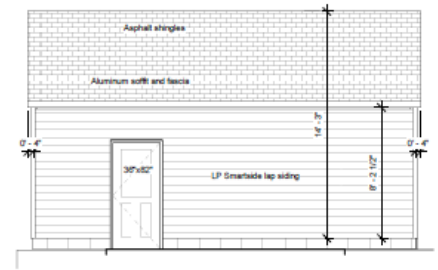


10 Section 2
1/4" = 1'-0"

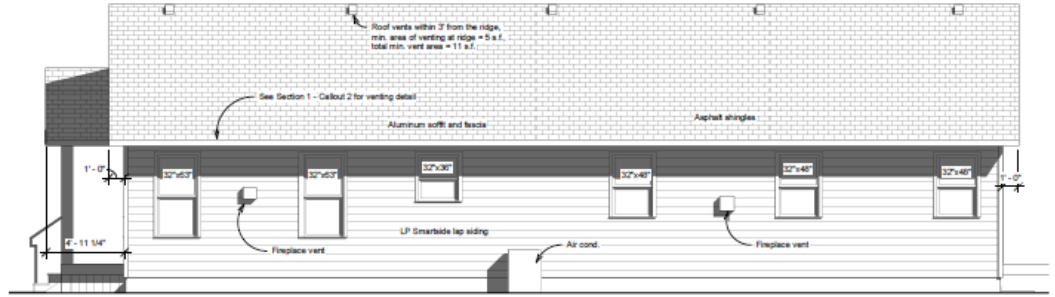
No.	Description	Date
1	Revision 1	Date 1

A2

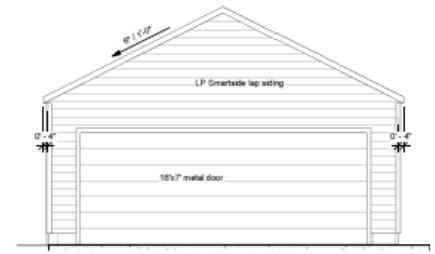
Scale: As Indicated



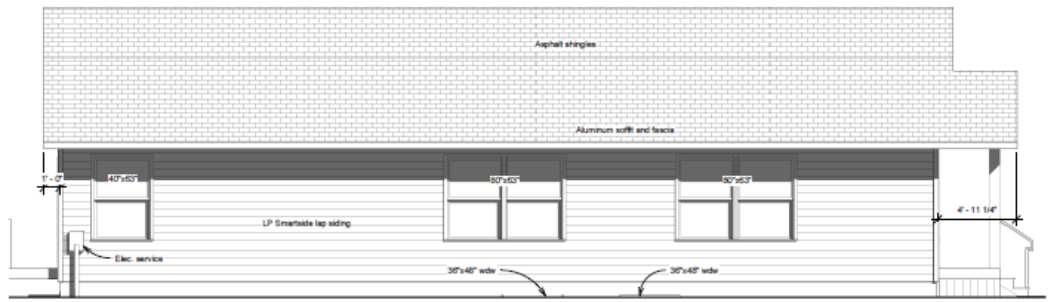
1 Garage East
1/4" = 1'-0"



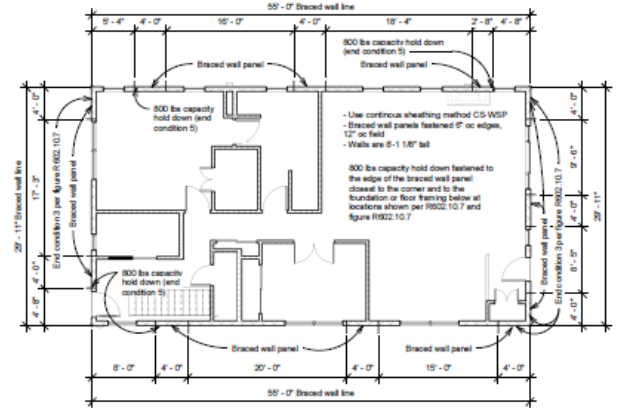
5 North
1/4" = 1'-0"



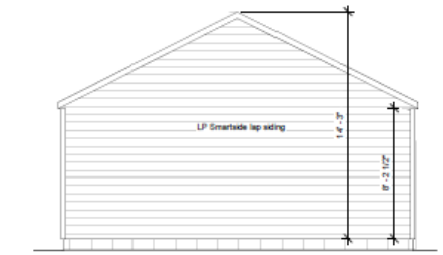
2 Garage North
1/4" = 1'-0"



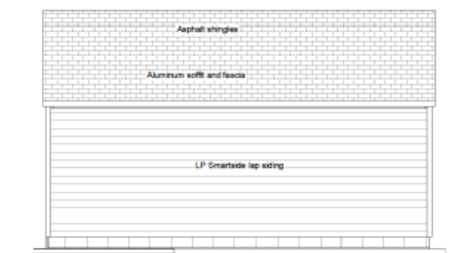
6 South
1/4" = 1'-0"



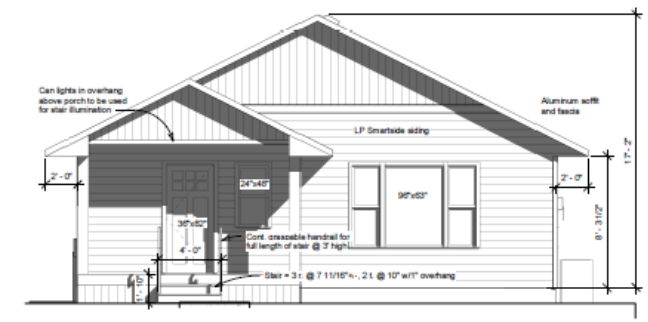
10 Main Level Braced
1/8" = 1'-0"



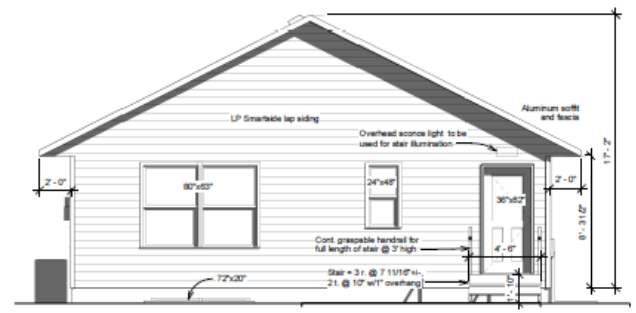
3 Garage South
1/4" = 1'-0"



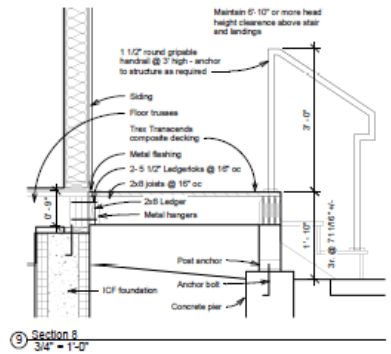
4 Garage West
1/4" = 1'-0"



7 East
1/4" = 1'-0"



8 West
1/4" = 1'-0"

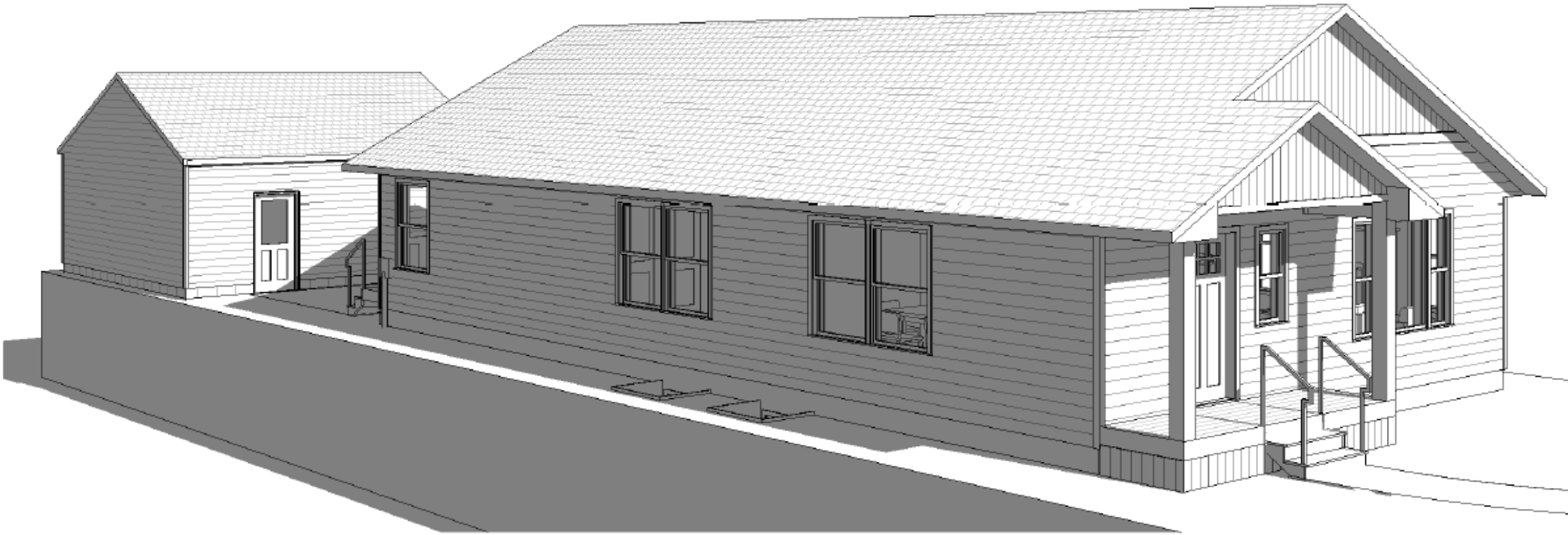


9 Section 8
3/4" = 1'-0"

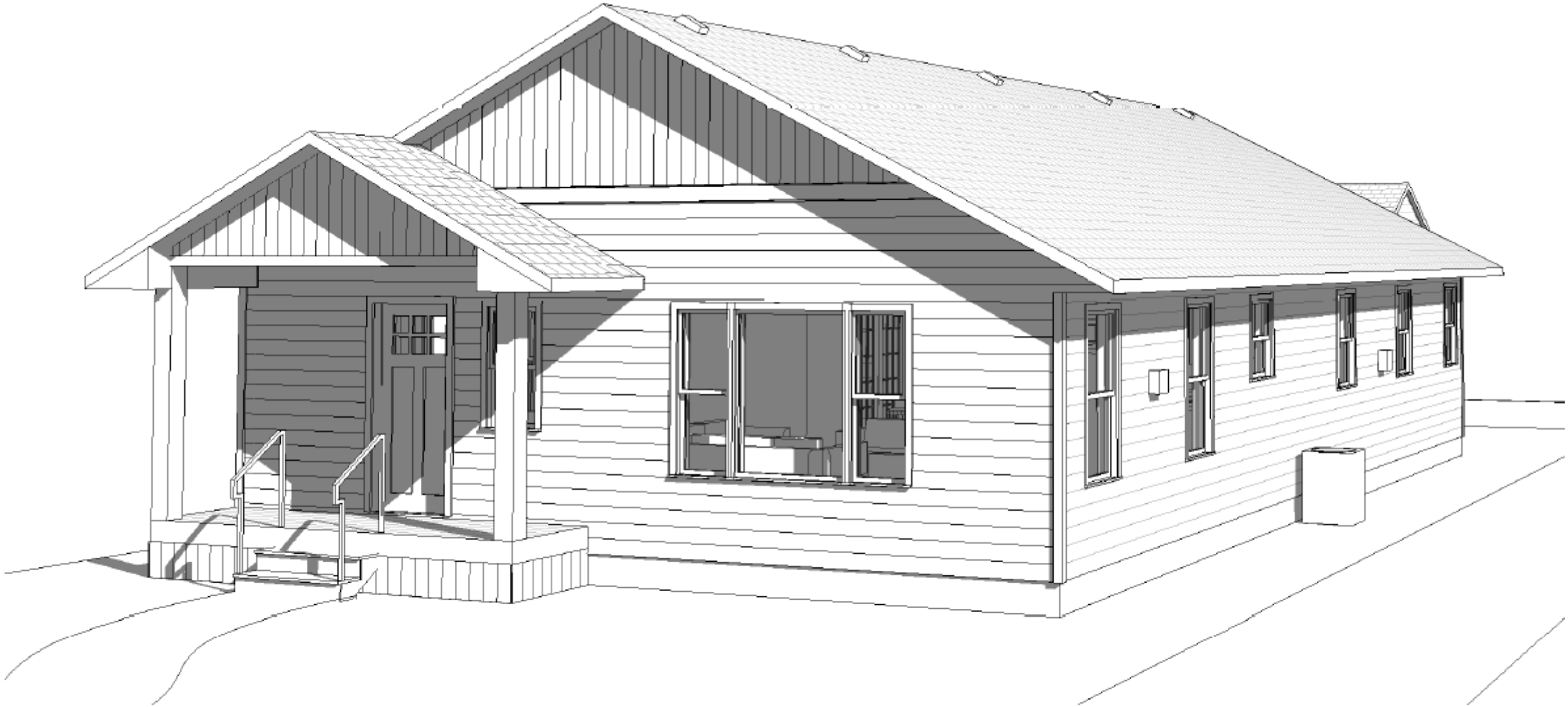
No.	Description	Date

A3

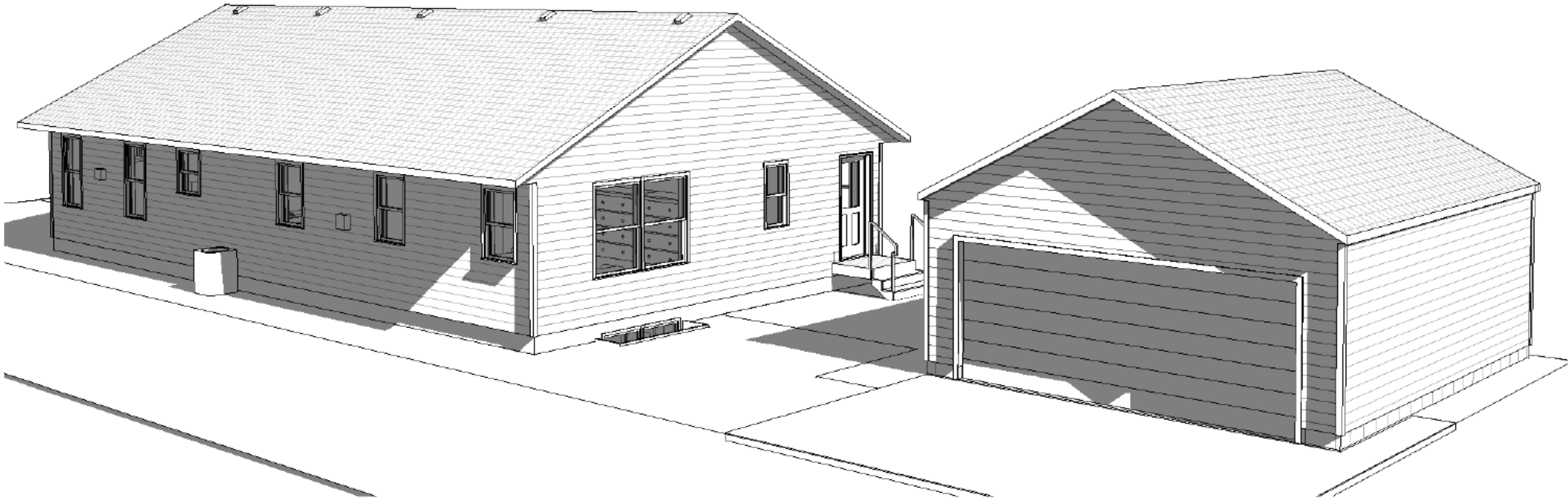
Scale: As Indicated



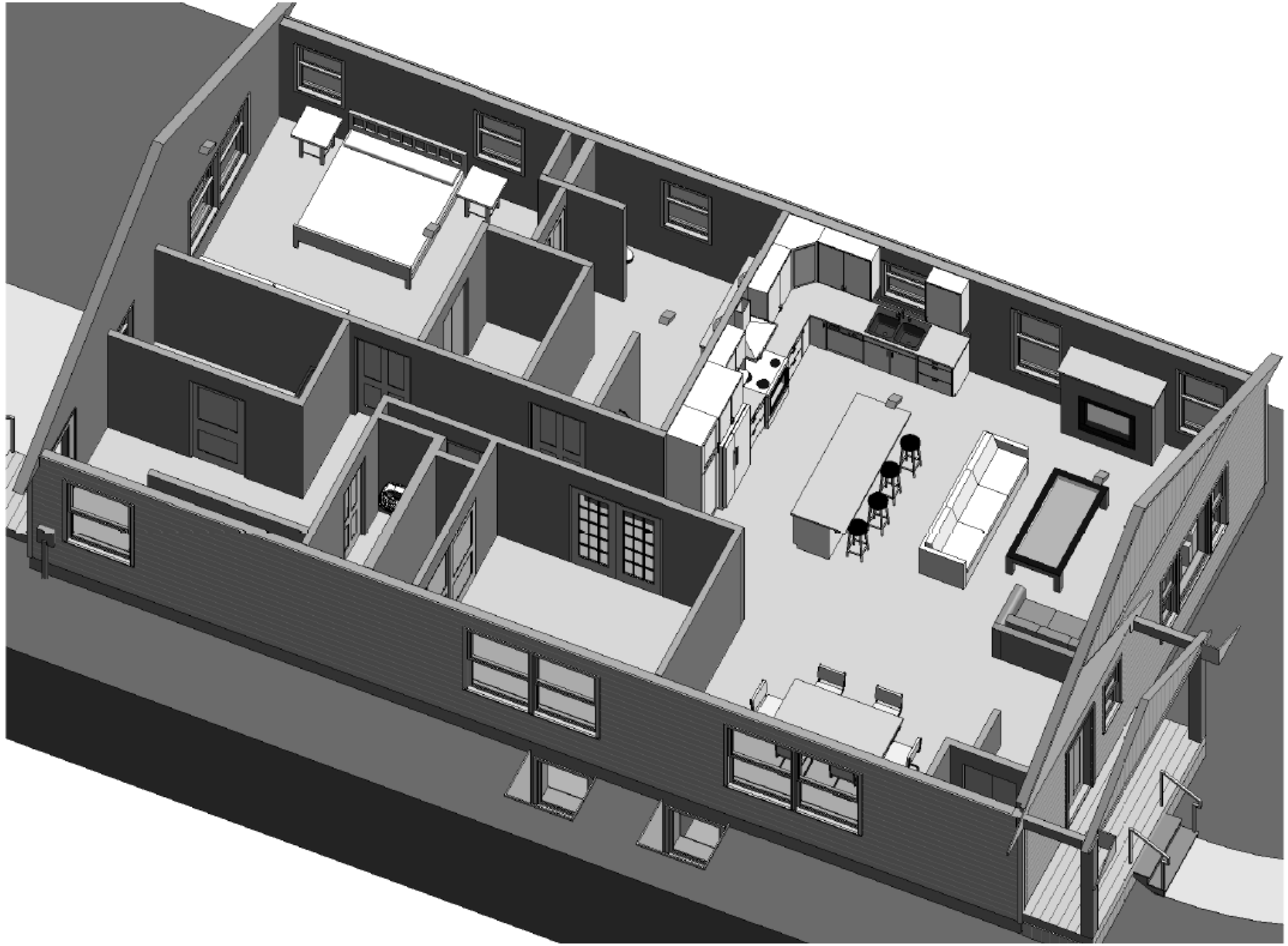
8 3D View 1



9 3D View 2



10 3D View 3



7 3D no roof set

How to Start?

- Though not explicitly stated in code, “design” takes on a few separate but related aspects:
  - Environmental factors
    - How does the location and climate affect the building?
  - Functionality/Layout
    - Does it work?
  - Structural
    - Will the structure support the loads imposed?

How to Start?

- Environmental factors
  - Ultimate wind speed
  - Wind exposure category
  - Climate Zone, temperature (heating, cooling, insulation, humidity control)
  - Flooding
  - Ground snow load
  - Roof/floor live load
  - Soil type & bearing capacity
  - Soil moisture content (frost heave)
  - Ground water mitigation
  - Radon

How to Start?

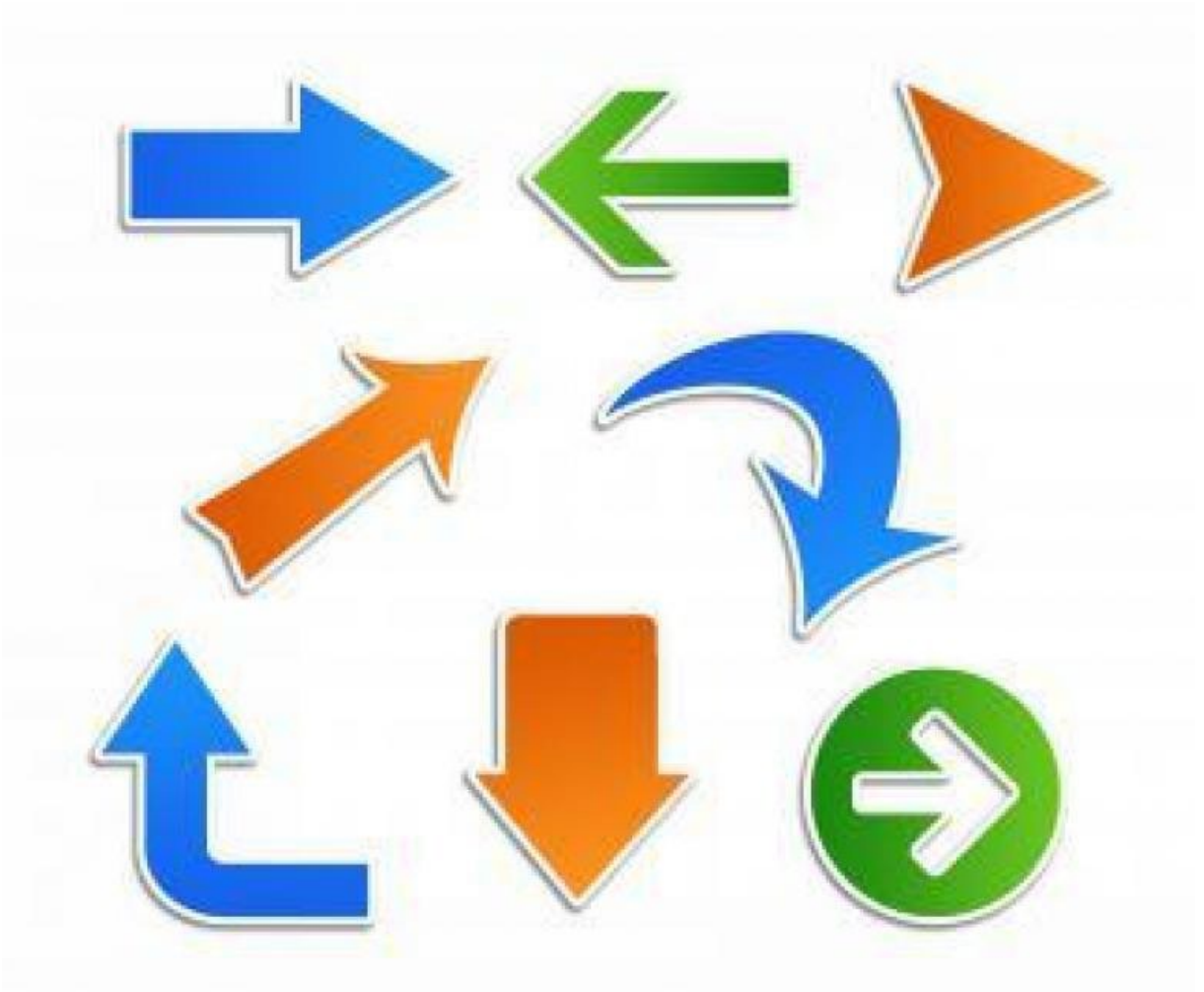
- Functionality/layout
  - Egress
  - Minimum room areas
  - Minimum clearances
  - Headroom
  - Halls
  - Stairs
  - Fire separation
  - Habitability/livability

How to Start?

- Structural
  - Loads
    - People/contents, wind, snow
  - Material
    - Type/species, span capability
  - Footings
  - Foundation walls
  - Walls
  - Floors
  - Roof/ceiling

How to Start?

- Develop an approach.
  - Top down?
  - Bottom up?
  - Outside in?
  - Inside out?
- Functionality/layout
- Structural



How to Start?

- Utilize a framework as a guide
  - ICC Checklists
  - Building Department checklist
  - Plan review letter
  - Code book – follow table of contents

Structural Review

Footings – Chapter 4

Footings

- Size
  - Width x Thickness
  - Projections
- Pads/point loads
- Frost protection
- Min 12” below natural grade (slab on grade)
- Insulation (frost protected shallow foundations)
- Drain tile

https://codes.iccsafe.org/content/MNRC2020/chapter-4-foundations

Footings

- Soil bearing capacity for your area
  - *Typically* 1,500 – 2,000 psi in metro.

TABLE R401.4.1
PRESUMPTIVE LOAD-BEARING VALUES OF FOUNDATION MATERIALS[a]

CLASS OF MATERIAL	LOAD-BEARING PRESSURE (pounds per square foot)
Crystalline bedrock	12,000
Sedimentary and foliated rock	4,000
Sandy gravel and/or gravel (GW and GP)	3,000
Sand, silty sand, clayey sand, silty gravel and clayey gravel (SW, SP, SM, SC, GM and GC)	2,000
Clay, sandy, silty clay, clayey silt, silt and sandy siltclay (CL, ML, MH and CH)	1,500[b]

For SI: 1 pound per square foot = 0.0479 kPa.

a. Where soil tests are required by Section R401.4, the allowable bearing capacities of the soil shall be part of the recommendations.

b. Where the building official determines that in-place soils with an allowable bearing capacity of less than 1,500 psf are likely to be present at the site, the allowable bearing capacity shall be determined by a soils investigation.

https://codes.iccsafe.org/content/MNRC2020/chapter-4-foundations

Footings

- Minimum compressive strength - 5000psi

TABLE R402.2
MINIMUM SPECIFIED COMPRESSIVE STRENGTH OF CONCRETE

TYPE OR LOCATION OF CONCRETE CONSTRUCTION	MINIMUM SPECIFIED COMPRESSIVE STRENGTH[a] (f'_c)		
	Weathering Potential[b]		
	Negligible	Moderate	Severe
Footings[g, h]	5,000	5,000	5,000
Basement walls, foundations, and other concrete not exposed to the weather	2,500	2,500	2,500[c]
Basement slabs and interior slabs on grade, except garage floor slabs	2,500	2,500	2,500[c]
Basement walls, foundation walls, exterior walls, and other vertical concrete work exposed to the weather	2,500	3,000[d]	3,000[d]
Porches, carport slabs, and steps exposed to the weather, and garage floor slabs	2,500	3,000[d, e, f]	3,500[d, e, f]

For SI: 1 pound per square inch = 6.895 kPa.

a. Strength at 28 days psi.

b. See Table R301.2(1) for weathering potential.

c. Concrete in these locations that may be subject to freezing and thawing during construction shall be air-entrained concrete in accordance with Footnote d.

d. Concrete shall be air-entrained. Total air content (percent by volume of concrete) shall be not less than 5 percent or more than 7 percent.

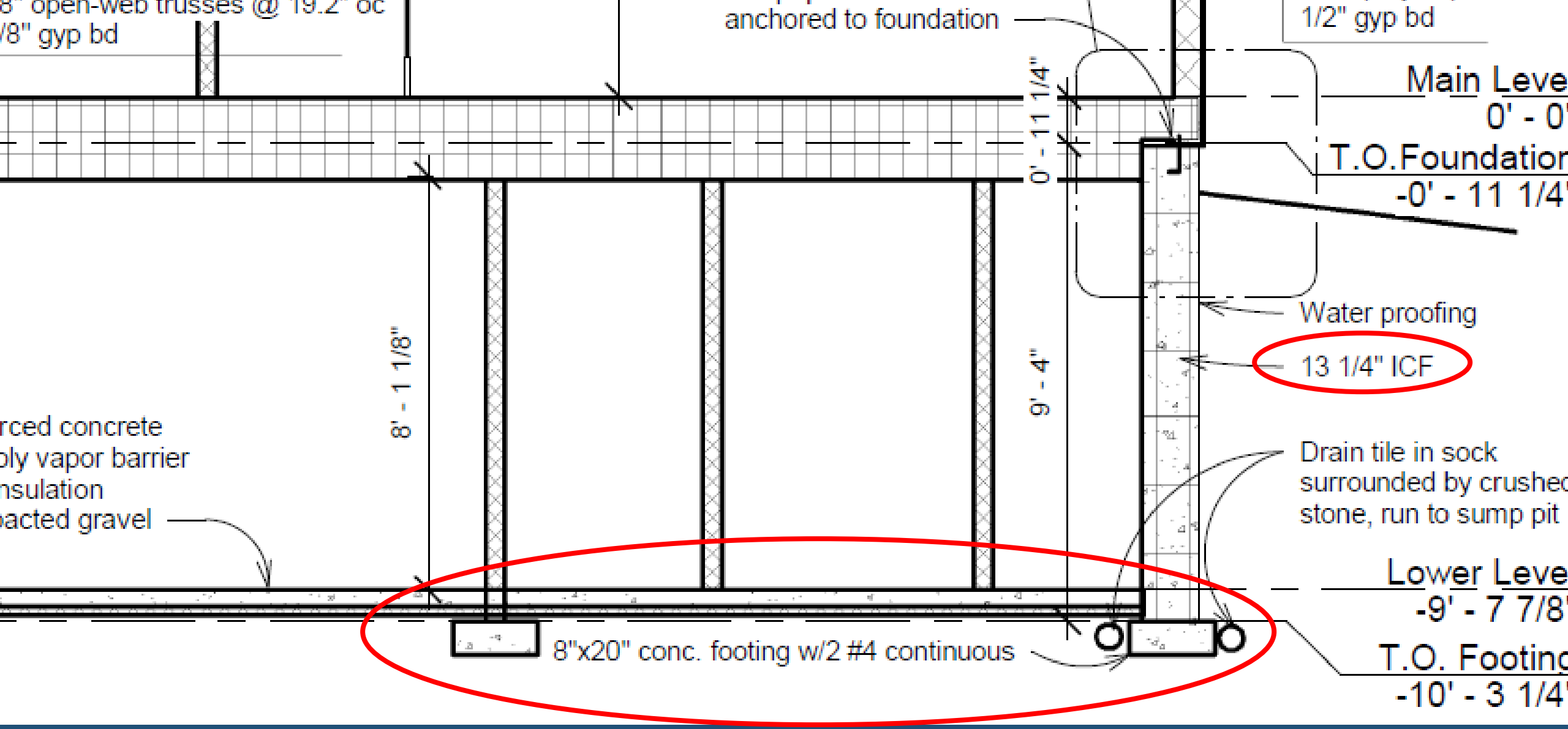
e. See Section R402.2 for maximum cementitious materials content.

f. For garage floors with a steel-troweled finish, reduction of the total air content (percent by volume of concrete) to not less than 3 percent is permitted if the specified compressive strength of the concrete is increased to not less than 4,000 psi.

g. Compressive strength ($f'c$) of 2,500 psi, with an approved admixture that provides a water and vapor resistance at least equivalent to 5,000 psi concrete.

h. Compressive strength ($f'c$) of 5,000 psi, is not required for post footings for decks or porches, wood foundations, slab-on-grade foundation walls, and footings for floating slabs.

https://codes.iccsafe.org/content/MNRC2020/chapter-4-foundations


8" open-web trusses @ 19.2" oc
/8" gyp bd
anchored to foundation
1/2" gyp bd
Main Leve
0' - 0
T.O.Foundatior
-0' - 11 1/4
0' - 11 1/4"
Water proofing
13 1/4" ICF
9' - 4"
8' - 1 1/8"
rced concrete
oly vapor barrier
nsulation
acted gravel
Drain tile in sock
surrounded by crushec
stone, run to sump pit
Lower Leve
-9' - 7 7/8
T.O. Footinc
-10' - 3 1/4
8"x20" conc. footing w/2 #4 continuous

Plans

Roof Snow Load

TABLE R301
CLIMATIC AND GEOGRAPHI

ROOF SNOW LOAD[f]	WIND DESIGN		SEISMIC DESIGN CATEGORY[i]	SUBJECT TO DAMAGE FRO		
	Speed[d] (mph)	Topographic effects[k]		Weathering[a]	Frost line depth[b]	Ter
$p_f = 0.7 * p_g$	115	Yes	A	Severe	See MR part 1303.1600	S Foo

f. The ground snow loads to be used in determining the design snow loads for bui
Ground Snow Load to verify by county. The roof snow load is a uniform load on t

1303.1700
GROUND SNOW LOAD

The ground snow load, P_g, to be used in determining the design snow loads for buildings and other structures shall be 60 pounds per square foot in the following counties: Aitkin, Becker, Beltrami, Carlton, Cass, Clearwater, Cook, Crow Wing, Hubbard, Itasca, Kanabec, Kittson, Koochiching, Lake, Lake of the Woods, Mahnomen, Marshall, Mille Lacs, Morrison, Norman, Otter Tail, Pennington, Pine, Polk, Red Lake, Roseau, St. Louis, Todd, and Wadena. The ground snow load, P_g, to be used in determining the design snow loads for buildings and other structures shall be 50 pounds per square foot in all other counties.

0.7 x 50lbs/sf = **35lbs/sf** Roof Snow Load (Southern half)

0.7 x 60lbs/sf = **42lbs/sf** Roof Snow Load (Northern half)

TABLE R403.1(3)

MINIMUM WIDTH AND THICKNESS FOR CONCRETE FOOTINGS WITH CAST-IN-PLACE CONCRETE OR FULLY GROUTED MASONRY WALL CONSTRUCTION (inches)[a, b]

SNOW LOAD OR ROOF LIVE LOAD	STORY AND TYPE OF STRUCTURE WITH CMU	LOAD-BEARING VALUE OF SOIL (psf)					
		1500	2000	2500	3000	3500	4000
	1 story—slab-on-grade	15 × 6	12 × 6	12 × 6	12 × 6	12 × 6	12 × 6
	1 story—with crawl space	20 × 6	15 × 6	12 × 6	12 × 6	12 × 6	12 × 6
	2 story—slab-on-grade	27 × 8	20 × 6	16 × 6	13 × 6	12 × 6	12 × 6
50 psf	2 story—with crawl space	32 × 11	24 × 7	19 × 6	16 × 6	14 × 6	12 × 6
	3 story—slab-on-grade	38 × 14	28 × 9	23 × 6	19 × 6	16 × 6	14 × 6
	3 story—with crawl space	43 × 16	32 × 11	26 × 8	21 × 6	18 × 6	16 × 6
	3 story—plus basement	49 × 19	37 × 13	29 × 10	24 × 7	21 × 6	18 × 6

TABLE R403.1(1)

MINIMUM WIDTH AND THICKNESS FOR CONCRETE FOOTINGS FOR LIGHT-FRAME CONSTRUCTION (inches)[a, b]

SNOW LOAD OR ROOF LIVE LOAD	STORY AND TYPE OF STRUCTURE WITH LIGHT FRAME	LOAD-BEARING VALUE OF SOIL (psf)					
		1500	2000	2500	3000	3500	4000
	1 story—slab-on-grade	15 × 6	12 × 6	12 × 6	12 × 6	12 × 6	12 × 6
	1 story—with crawl space	20 × 6	15 × 6	12 × 6	12 × 6	12 × 6	12 × 6

TABLE R403.1(2)

MINIMUM WIDTH AND THICKNESS FOR CONCRETE FOOTINGS FOR LIGHT-FRAME CONSTRUCTION WITH BRICK VENEER (inches)[a, b]

SNOW LOAD OR ROOF LIVE LOAD	STORY AND TYPE OF STRUCTURE WITH BRICK VENEER	LOAD-BEARING VALUE OF SOIL (psf)					
		1500	2000	2500	3000	3500	4000
	2 story—slab-on-grade	27 × 8	20 × 6	16 × 6	13 × 6	12 × 6	12 × 6
50 psf	2 story—with crawl space	32 × 11	24 × 7	19 × 6	16 × 6	14 × 6	12 × 6

TABLE R403.1(3)

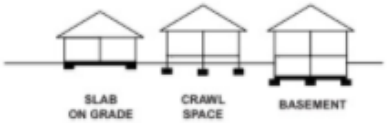
MINIMUM WIDTH AND THICKNESS FOR CONCRETE FOOTINGS WITH CAST-IN-PLACE CONCRETE OR FULLY GROUTED MASONRY WALL CONSTRUCTION (inches)[a, b]

SNOW LOAD OR ROOF LIVE LOAD	STORY AND TYPE OF STRUCTURE WITH CMU	LOAD-BEARING VALUE OF SOIL (psf)					
		1500	2000	2500	3000	3500	4000
	3 story—slab-on-grade	38 × 14	28 × 9	23 × 6	19 × 6	16 × 6	14 × 6
	3 story—with crawl space	43 × 16	32 × 11	26 × 8	21 × 6	18 × 6	16 × 6
	3 story—plus basement	49 × 19	37 × 13	29 × 10	24 × 7	21 × 6	18 × 6

For SI: 1 inch = 25.4 mm, 1 plf = 14.6 N/m, 1 pound per square foot = 47.9 N/m^2.

a. Interpolation allowed. Extrapolation is not allowed.

b. Based on 32-foot-wide house with load-bearing center wall that carries half of the tributary attic, and floor framing. For every 2 feet of adjustment to the width of the house add or subtract 2 inches of footing width and 1 inch of footing thickness (but not less than 6 inches thick).



Footings

- Which chart?
  - CIP or Fully Grouted Masonry
- Example plans have ICF walls

  (Essentially CIP walls)
- Snow Load
  - MN Provisions 1303.1700
  - 60psf in Zone 1
  - 50psf in Zone 2
  - See Table 301.2(1) – Roof snow load is 70% of ground snow load
    - $50 \times .7 = 35psf\ roof\ snow\ load$

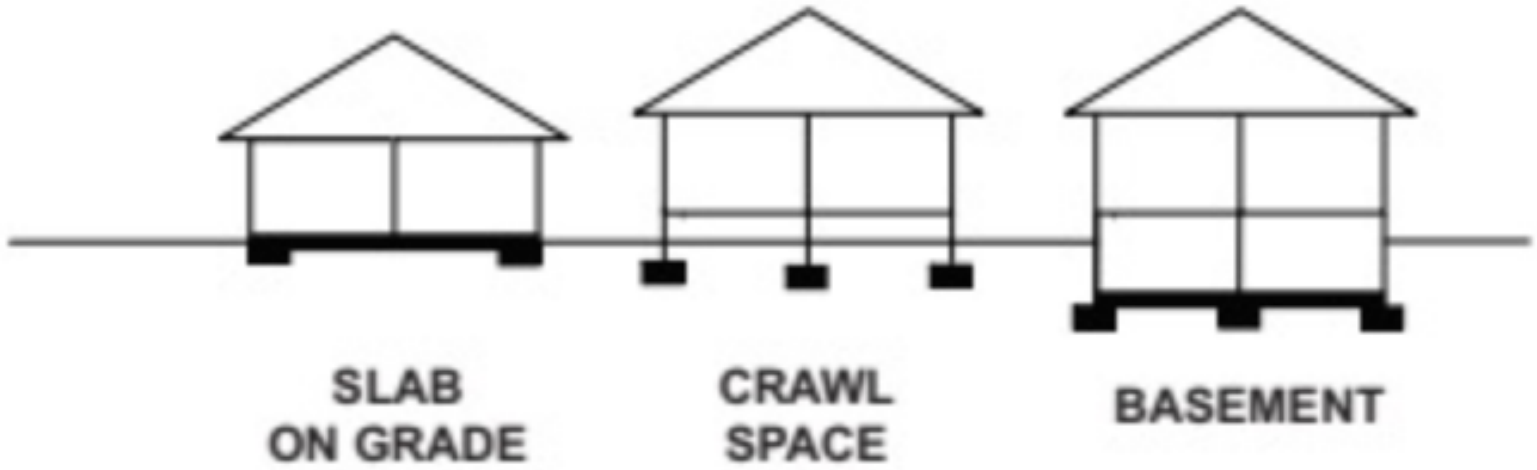
TABLE R403.1(3)
MINIMUM WIDTH AND THICKNESS FOR CONCRETE FOOTINGS
WITH CAST-IN-PLACE CONCRETE OR FULLY GROUTED MASONRY WALL CONSTRUCTION (inches)[a, b]

SNOW LOAD OR ROOF LIVE LOAD	STORY AND TYPE OF STRUCTURE WITH CMU	LOAD-BEARING VALUE OF SOIL (psf)					
		1500	2000	2500	3000	3500	4000
20 psf	1 story—slab-on-grade	14 × 6	12 × 6	12 × 6	12 × 6	12 × 6	12 × 6
	1 story—with crawl space	19 × 6	14 × 6	12 × 6	12 × 6	12 × 6	12 × 6
	1 story—plus basement	25 × 8	19 × 6	15 × 6	13 × 6	12 × 6	12 × 6
	2 story—slab-on-grade	23 × 7	18 × 6	14 × 6	12 × 6	12 × 6	12 × 6
	2 story—with crawl space	29 × 9	22 × 6	17 × 6	14 × 6	12 × 6	12 × 6
	2 story—plus basement	35 × 12	26 × 8	21 × 6	17 × 6	15 × 6	13 × 6
	3 story—slab-on-grade	32× 11	24 × 7	19 × 6	16 × 6	14 × 6	12 × 6
	3 story—with crawl space	38 × 14	28 × 9	23 × 6	19 × 6	16 × 6	14 × 6
	3 story—plus basement	43 × 17	33 × 11	26 × 8	22 × 6	19 × 6	16 × 6
30 psf	1 story—slab-on-grade	15 × 6	12 × 6	12 × 6	12 × 6	12 × 6	12 × 6
	1 story—with crawl space	20 × 6	15 × 6	12 × 6	12 × 6	12 × 6	12 × 6
	1 story—plus basement	26 × 8	20 × 6	16 × 6	13 × 6	12 × 6	12 × 6
	2 story—slab-on-grade	24 × 7	18 × 6	15 × 6	12 × 6	12 × 6	12 × 6
	2 story—with crawl space	30 × 10	22 × 6	18 × 6	15 × 6	13 × 6	12 × 6
	2 story—plus basement	36 × 13	27 × 8	21 × 6	18 × 6	15 × 6	13 × 6
	3 story—slab-on-grade	33 × 12	25 × 7	20 × 6	17 × 6	14 × 6	12 × 6
	3 story—with crawl space	39 × 14	29 × 9	23 × 7	19 × 6	17 × 6	14 × 6
	3 story—plus basement	44 × 17	33 × 12	27× 8	22 × 6	19 × 6	17 × 6
50 psf	1 story—slab-on-grade	17 × 6	13 × 6	12 × 6	12 × 6	12 × 6	12 × 6
	1 story—with crawl space	22 × 6	17 × 6	13 × 6	12 × 6	12 × 6	12 × 6
	1 story—plus basement	28× 9	21 × 6	17 × 6	14 × 6	12 × 6	12 × 6
	2 story—slab-on-grade	27 × 8	20 × 6	16 × 6	13 × 6	12 × 6	12 × 6
	2 story—with crawl space	32 × 11	24 × 7	19 × 6	16 × 6	14 × 6	12 × 6
	2 story—plus basement	38 × 14	28 × 9	23 × 6	19 × 6	16 × 6	14 × 6
	3 story—slab-on-grade	35 × 13	27 × 8	21 × 6	18 × 6	15 × 6	13 × 6
	3 story—with crawl space	41 × 15	31 × 10	24 × 7	20 × 6	17 × 6	15 × 6
	3 story—plus basement	47 × 18	35 × 12	28 × 9	23 × 7	20 × 6	17 × 6

2020 MN Residential Code

a. Interpolation allowed. Extrapolation is not allowed.

b. Based on 32-foot-wide house with load-bearing center wall that carries half of the tributary attic, and floor framing. For every 2 feet of adjustment to the width of the house, add or subtract 2 inches of footing width and 1 inch of footing thickness (but not less than 6 inches thick).

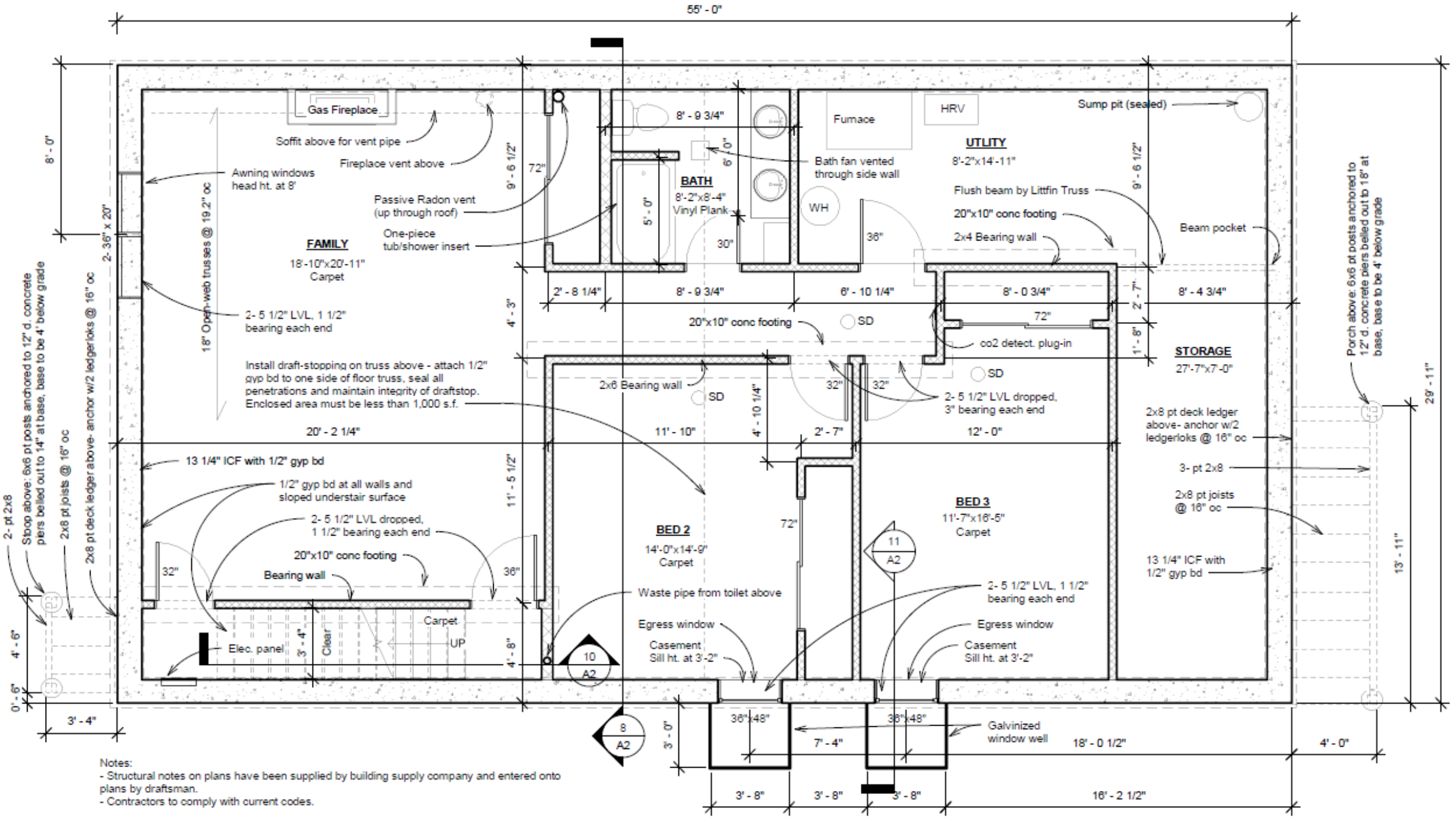


For Hand Framed Homes

(Not for clear spanning roof or floor truss…)

Footings

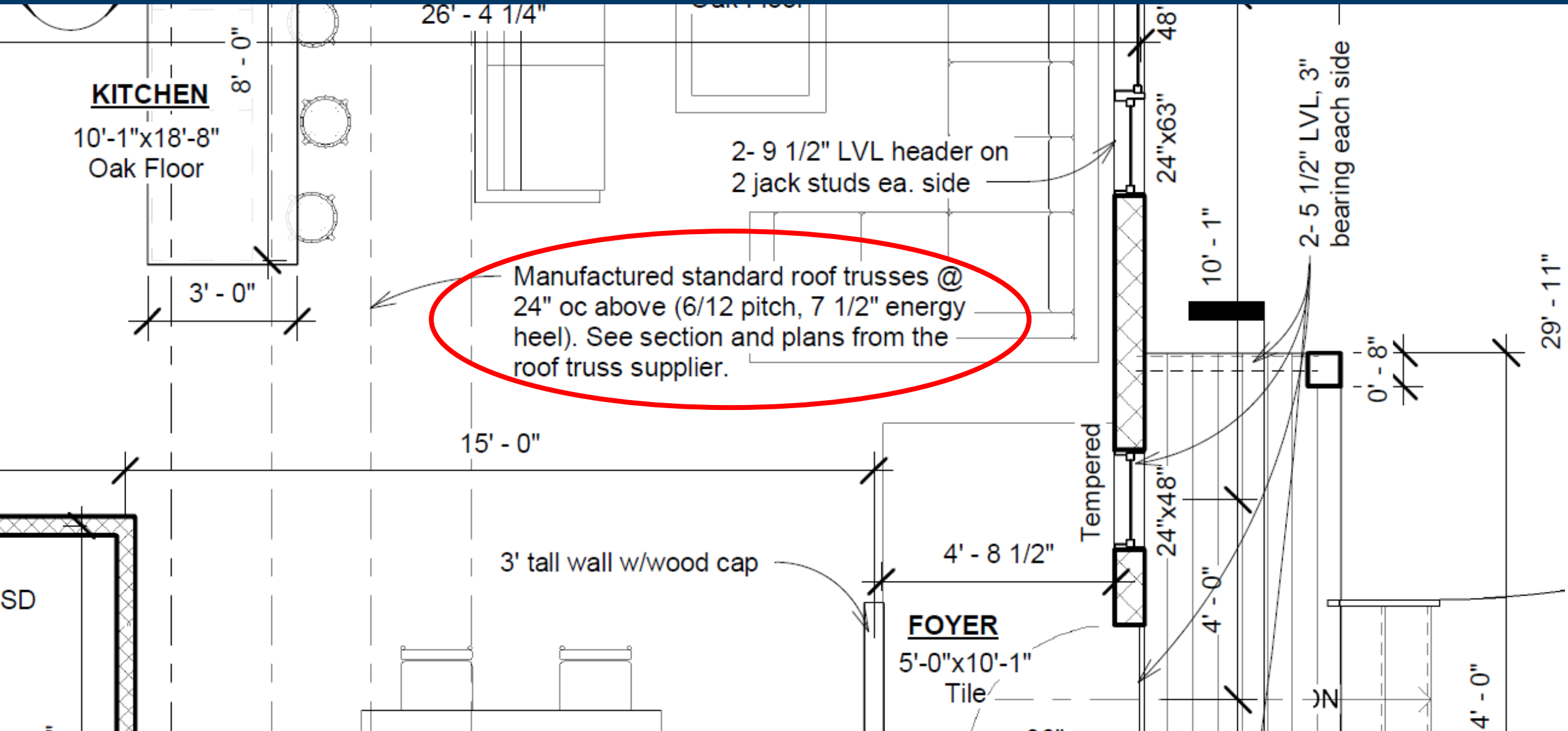
- Footnote a: Interpolation allowed. Extrapolation is not allowed.
  - Look for values between 30psf – 50psf.
- Footnote b: Based on 32’ wide house with load-bearing center wall that carries half the tributary attic, and floor framing. For every 2’ of adjustment to the width of the house add or subtract 2” of footing width and 1” of footing thickness (but not less than 6”).
- Example house is 30’ (29’-11” - see A1)
  - Subtract 2” from minimum footing width - reduced from 20-21” (based on Zone 1 or 2 snow load) to 18-19”.
- The roof truss in our example house are clear spanning and bear solely on perimeter walls with no center bearing wall, so it doesn’t fit the application of the table.



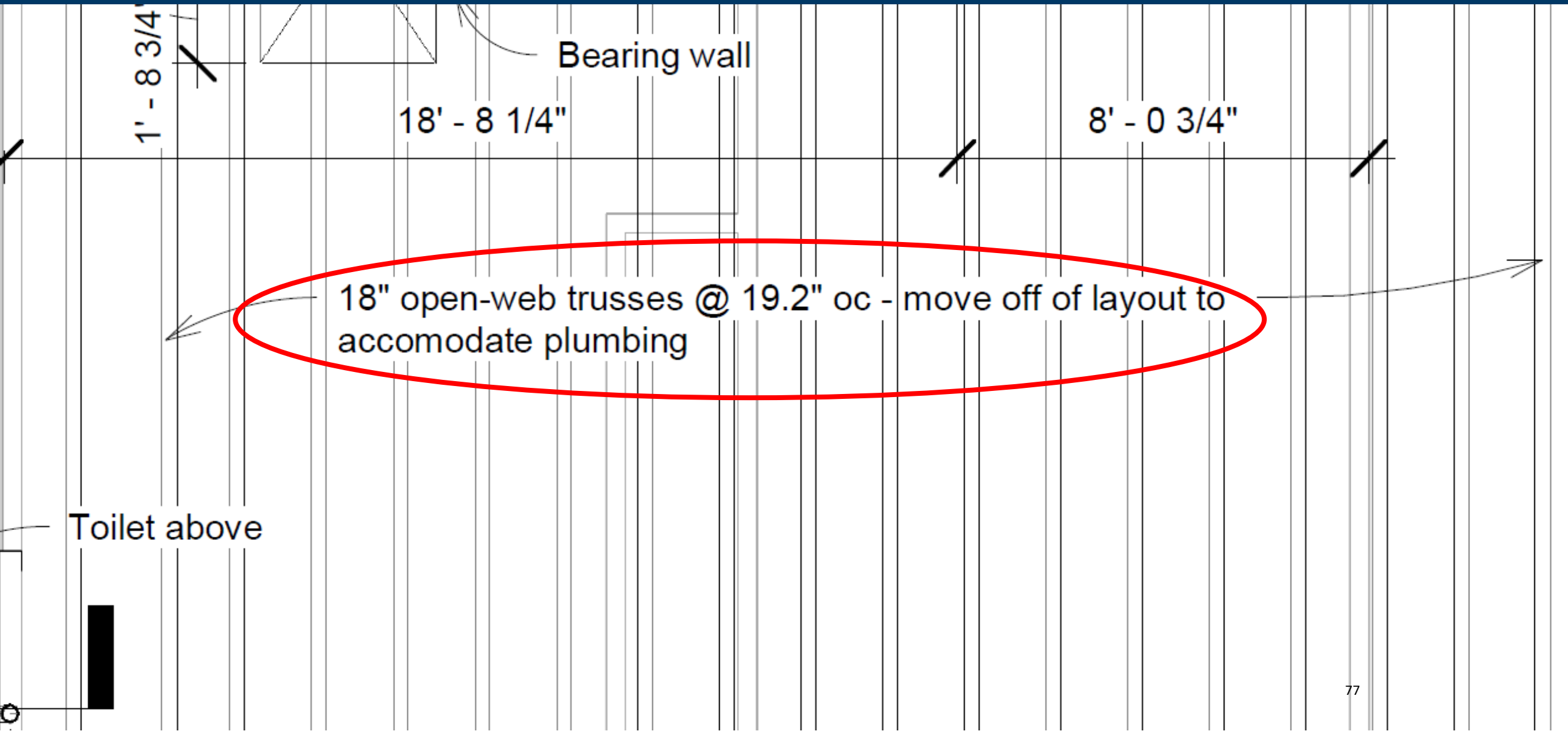
Notes:
- Structural notes on plans have been supplied by building supply company and entered onto plans by draftsman.
- Contractors to comply with current codes.

1 Lower Level
1/4" = 1'-0"

What if it has Truss?



What if it has Truss?

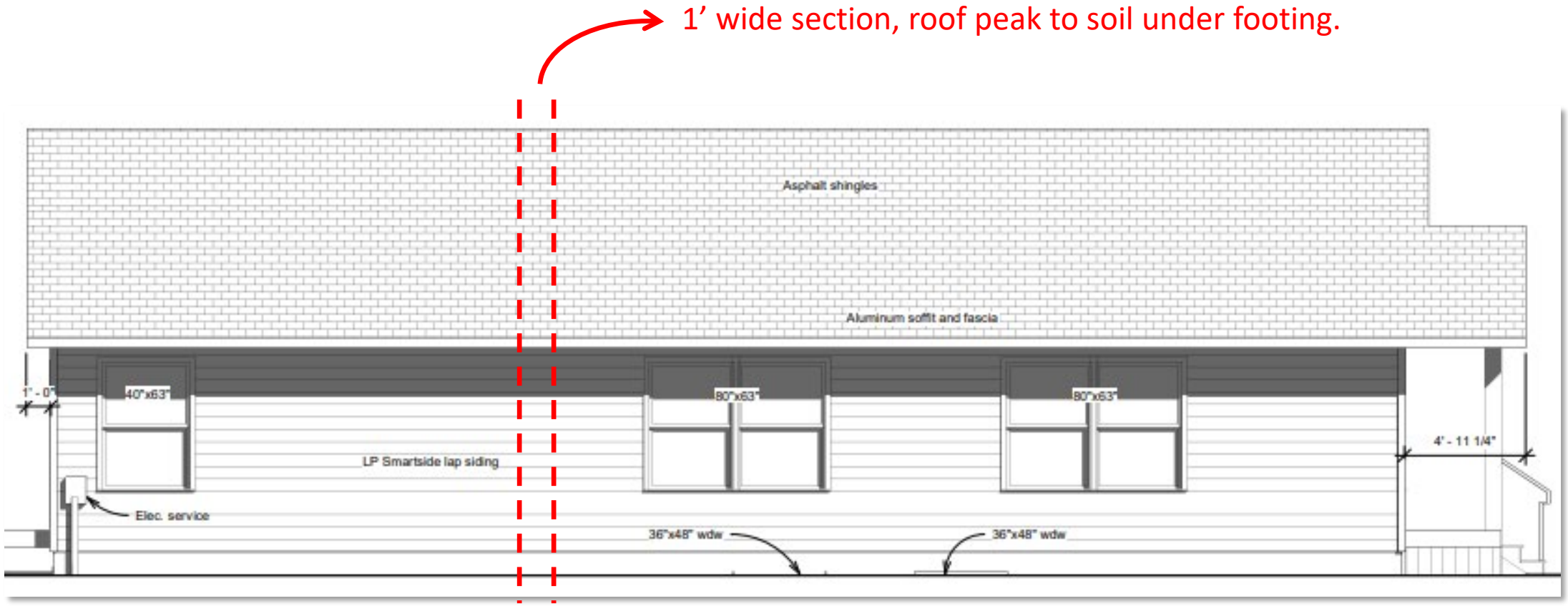


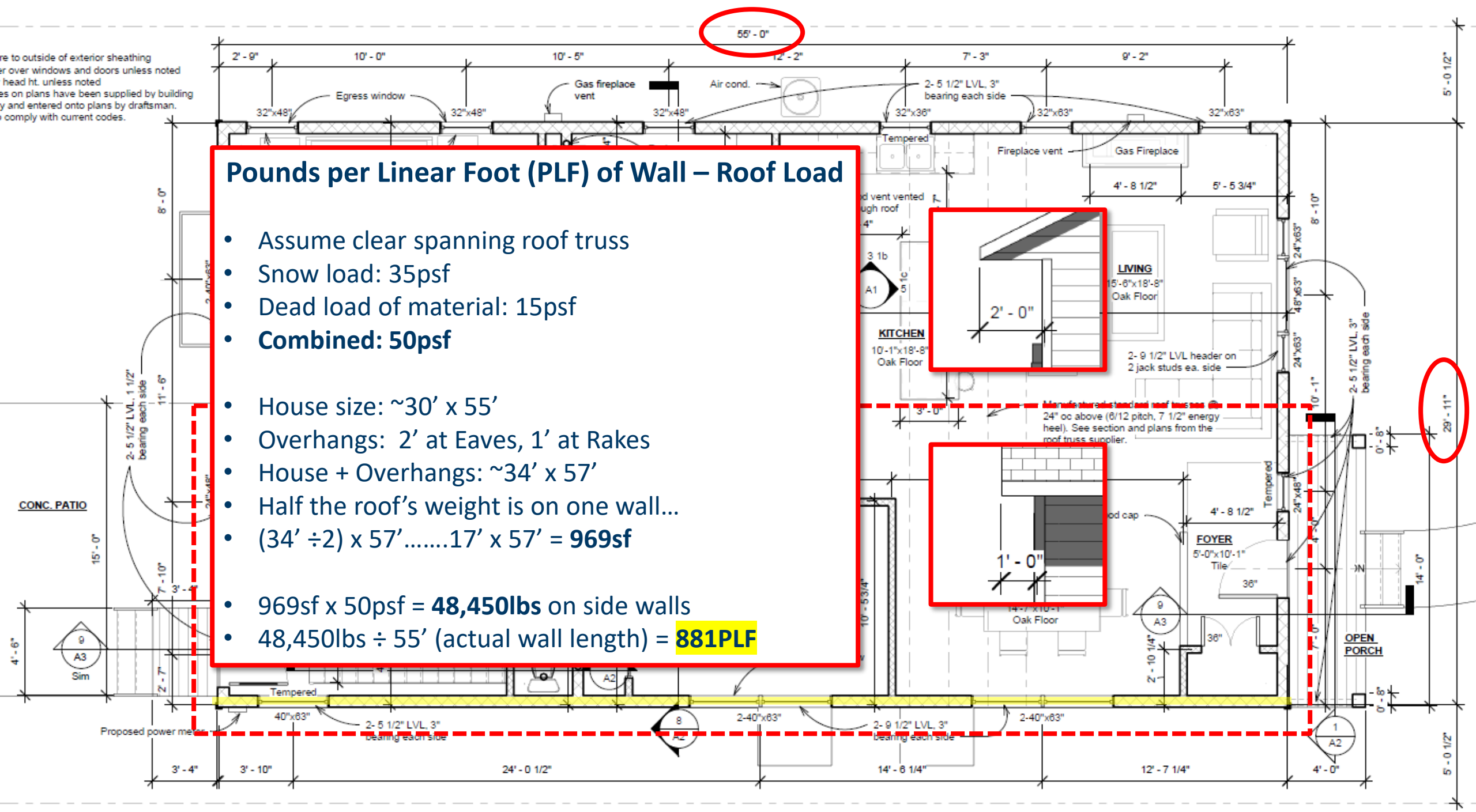
Footings

- Figure out the math…Pounds per Linear Foot (PLF) on Footing
- Need the linear foot (LF) weight of:
  - Design roof load
  - Wall load, including cladding
  - Design floor load
  - Foundation weight
  - Footing weight (may be negligible)

Footings

- Figure out the math…Pounds per Linear Foot (PLF) on Footing





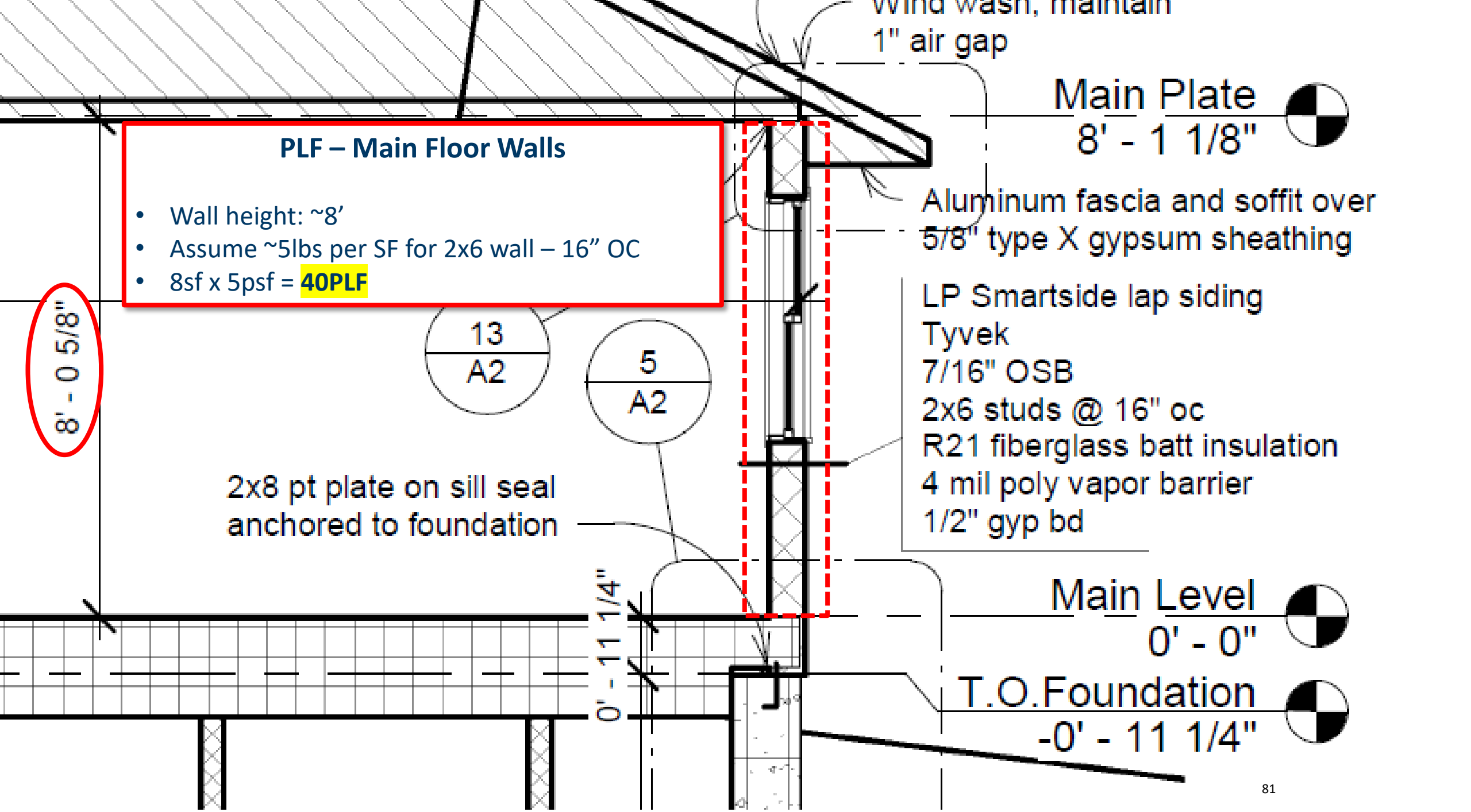
re to outside of exterior sheathing
er over windows and doors unless noted
head ht. unless noted
es on plans have been supplied by building
y and entered onto plans by draftsman.
comply with current codes.

Pounds per Linear Foot (PLF) of Wall – Roof Load

- Assume clear spanning roof truss
- Snow load: 35psf
- Dead load of material: 15psf
- **Combined: 50psf**

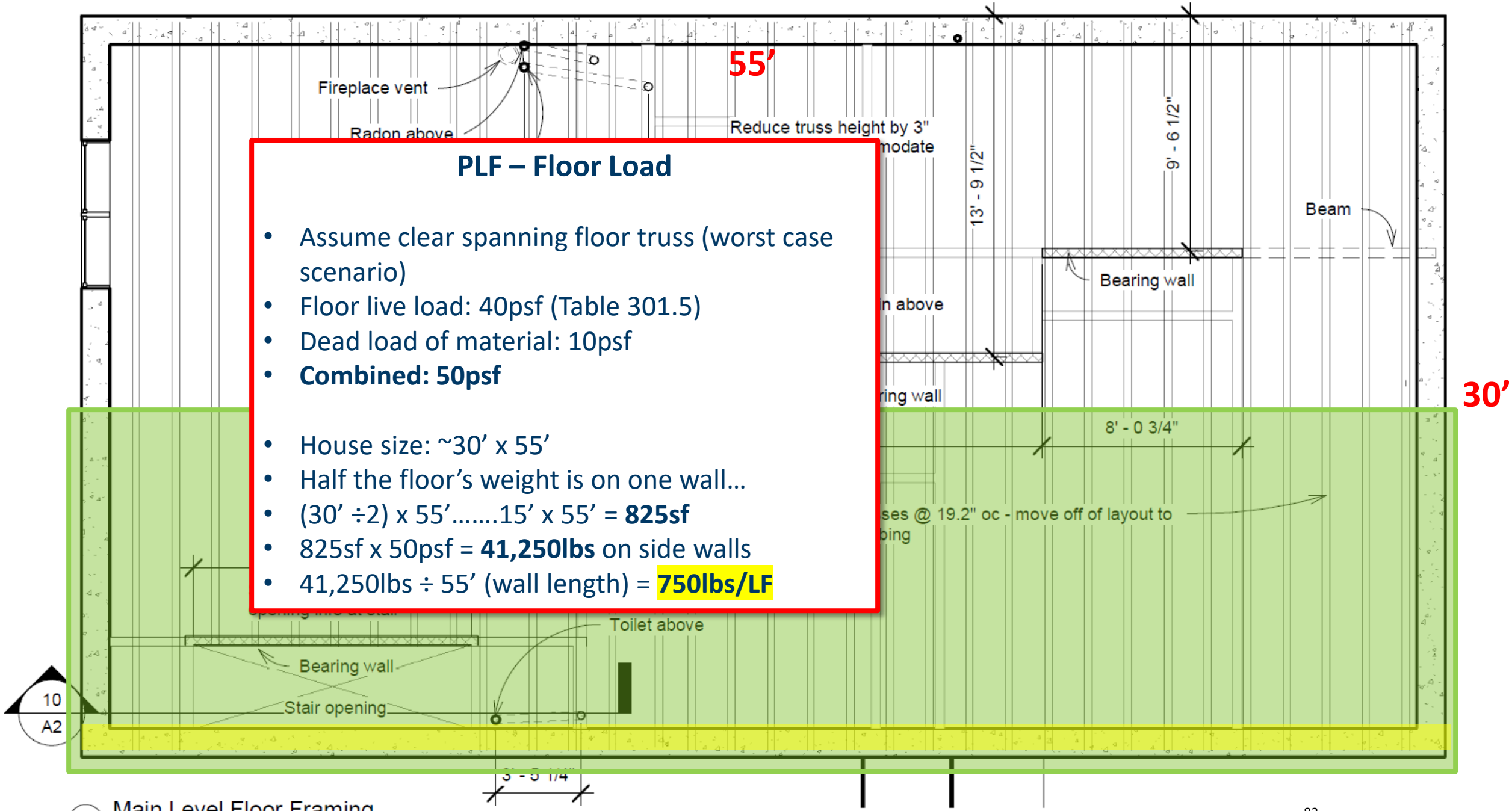
- House size: ~30’ x 55’
- Overhangs: 2’ at Eaves, 1’ at Rakes
- House + Overhangs: ~34’ x 57’
- Half the roof’s weight is on one wall…
- (34’ ÷2) x 57’…….17’ x 57’ = **969sf**

- 969sf x 50psf = **48,450lbs** on side walls
- 48,450lbs ÷ 55’ (actual wall length) = **881PLF**



PLF – Main Floor Walls

- Wall height: ~8’
- Assume ~5lbs per SF for 2x6 wall – 16” OC
- 8sf x 5psf = **40PLF**



PLF – Floor Load

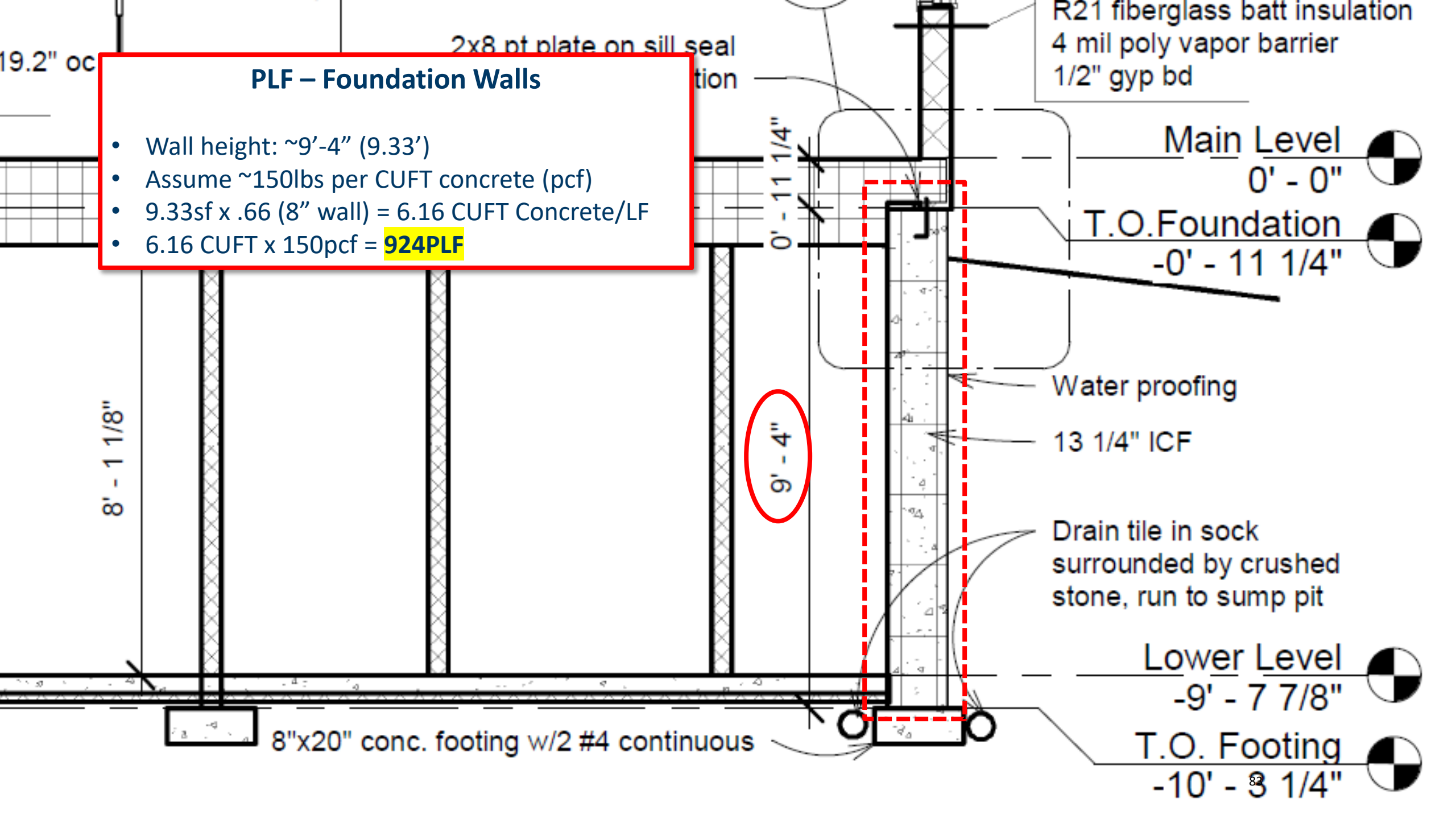
- Assume clear spanning floor truss (worst case scenario)
- Floor live load: 40psf (Table 301.5)
- Dead load of material: 10psf
- **Combined: 50psf**

- House size: ~30’ x 55’
- Half the floor’s weight is on one wall…
- (30’ ÷2) x 55’…….15’ x 55’ = **825sf**
- 825sf x 50psf = **41,250lbs** on side walls
- 41,250lbs ÷ 55’ (wall length) = **750lbs/LF**

4 Main Level Floor Framing
3/16" = 1'-0"

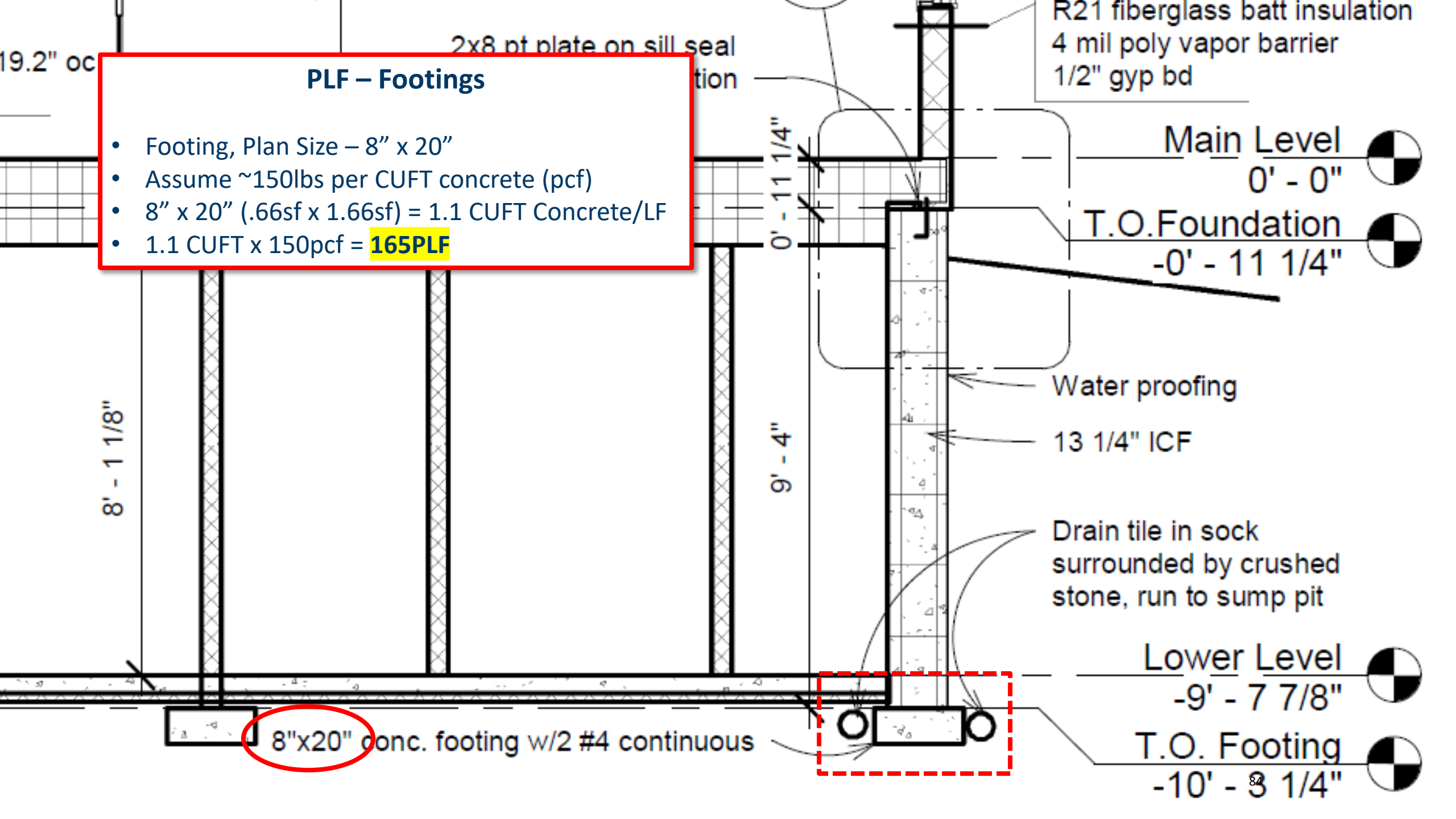
PLF – Foundation Walls

- Wall height: ~9’-4” (9.33’)
- Assume ~150lbs per CUFT concrete (pcf)
- 9.33sf x .66 (8” wall) = 6.16 CUFT Concrete/LF
- 6.16 CUFT x 150pcf = **924PLF**



PLF – Footings

- Footing, Plan Size – 8” x 20”
- Assume ~150lbs per CUFT concrete (pcf)
- 8” x 20” (.66sf x 1.66sf) = 1.1 CUFT Concrete/LF
- 1.1 CUFT x 150pcf = **165PLF**



Add the Totals:

- Figure out the math…
- Roof: 881PLF
- Main Floor Walls: 40PLF
- Main Floor: 750PLF
- Foundation Wall: 924PLF
- Footing: 165PLF
- *TOTAL PLF:* **2,760PLF**

Footing Size?

- Figure out the math…
- *TOTAL PLF:* **2,760PLF**
- Sizing the strip footing:
  - **Divide the total weight on each linear foot by the soil bearing capacity** to arrive at the minimum footing width in feet.
  - Must still check projections & depth.

Footing Size?

- Figure out the math…
- *TOTAL PLF:* **2,760PLF**
- Formula: Total weight per LF ÷ Soil bearing capacity = Width of footing (in feet)
- Examples:
  1. Assumed soil bearing capacity – 2,000lbs
     - 2,760 (total weight) ÷ 2,000 (soil capacity) = 1.38’ wide footing. Convert feet to inches: 1.38 x 12 = 16.6”
     - Round up, minimum footing width based on calculation = **17”** wide
  2. Assumed soil bearing capacity – 1,500lbs
     - 2,760 ÷ 1,500 = 1.84’ wide footing. Convert feet to inches: 1.84 x 12 = 22.1”
     - Round up, minimum footing width based on calculation = **23”** wide

Footing Size?

- Check projections & depth…Example #1:
- Assumed soil bearing capacity – **2,000lbs**
  - Plans indicate: 18” footing, 8” wall (do not count the foam on ICF wall as part of the wall thickness).
  - $18” - 8”(wall\ thickness) = 10”$
  - $10” \div 2 = 5"$ projections on each side.
  - Min footing thickness? Table 403.1(1,2,3) – “…not less than 6” thick.”
  - Minimum – 18” x 6” footing ok?
    - 5” projections are less than 6” thickness – footing complies.

R403.1.1 Minimum size. The minimum width, W, and thickness, T, for concrete footings shall be in accordance with Tables R403.1(1) through R403.1(3) and Figure R403.1(1) or R403.1.3, as applicable. The footing width shall be based on the load-bearing value of the soil in accordance with Table R401.4.1. Footing projections, P, shall be not less than 2 inches (51 mm) and shall not exceed the thickness of the footing. Footing thickness and projection

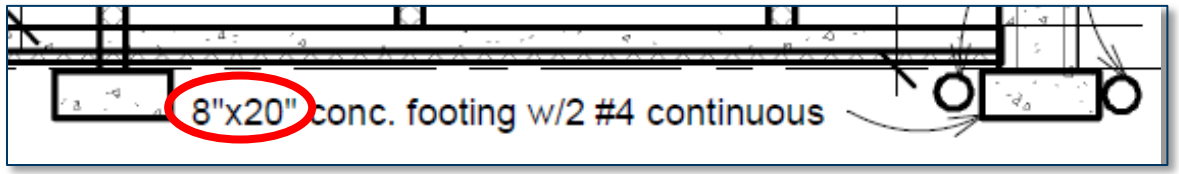
Footing Size?

- Check projections & depth…Example #2:
- Assumed soil bearing capacity – **1,500lbs**
  - Plans indicate: 23” footing, 8” wall (do not count the foam on ICF wall as part of the wall thickness).
  - $23” - 8” \ (wall\ thickness) = 15”$
  - $15” \div 2 = 7\frac{1}{2}$" projections on each side.
  - Min thickness? Table 403.1(1,2,3) – “…not less than 6” thick.”
  - Minimum – 23” x 6”
    - $7\frac{1}{2}$” projections are *greater* than thickness - does NOT comply unless thickness is increased.
  - 23” x 8” *would* comply.

R403.1.1 Minimum size. The minimum width, W, and thickness, T, for concrete footings shall be in accordance with Tables R403.1(1) through R403.1(3) and Figure R403.1(1) or R403.1.3, as applicable. The footing width shall be based on the load-bearing value of the soil in accordance with Table R401.4.1. Footing projections, P, shall be not less than 2 inches (51 mm) and shall not exceed the thickness of the footing. Footing thickness and projection

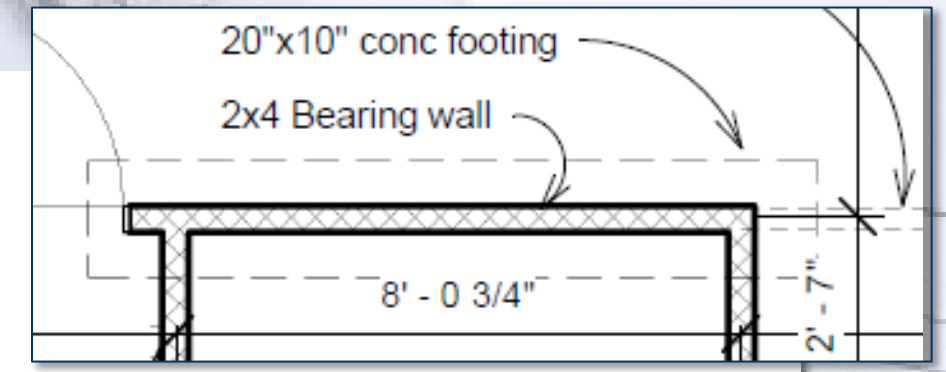
Footings – Check Size

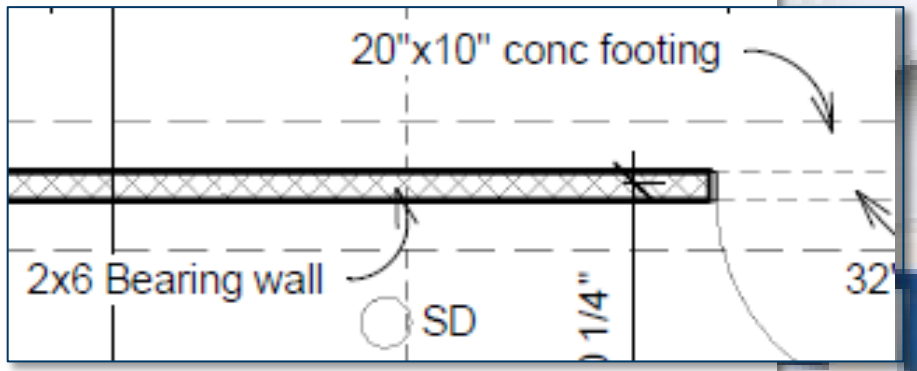
- Reference house drawings – page A2.
- Exterior Walls – perimeter strip footings
  - Page A2 – plans indicate perimeter footings are 20” x 8” (w/ 2 #4 bar continuous)
  - 20” x 8” min based on math is ok for 2,000lb soil bearing capacity. (Math indicated 18” x 6” was minimum compliant footing)
- Check footing thickness & projections.
  - R403.1.1 Minimum Size
    - Footing projections …shall not exceed the thickness of the footing.
  - 20” footing – 8” wall = 12” remaining
  - $12^{"} \div 2 = 6^{"}$
  - Projections of $6^{"}$ is less than 8” thickness, so it complies.



Footings

- Reference house drawings – page A1
- Interior footings
  - Center bearing wall footings – 20” x 10”
  - Width is ok based on previous exercise checking perimeter footings (20” min). Perimeter was carrying roof load, interior footings are only carrying floor load.
  - Thickness – 10” is ok (6” was tabular minimum).
  - Check projections for worst situation (2x4 wall):
    - $20^{"} footing - 3\frac{1}{2}^{"} \ (2x4\ bearing\ wall) = 16\frac{1}{2}^{"}$
    - $16\frac{1}{2}^{"} \div 2 = 8\frac{1}{4}^{"}$ projections
    - Projection of $8\frac{1}{4}^{"}$ is less than 10” thickness, so it complies.
    - The 2x6 bearing wall has a smaller projection, no need to check.





Footings – Pads/Point Loads

- Sizing pads/point load footing
  - Figure out the loading on the post or column
  - Formula - *Area x Floor Load*
    - L x W = Area
    - Area x Floor Load (40psf living, 30 sleeping) = Total Load (*TL*)
    - *(More detail later in presentation.)*

TABLE R301.5
MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS
(in pounds per square foot)

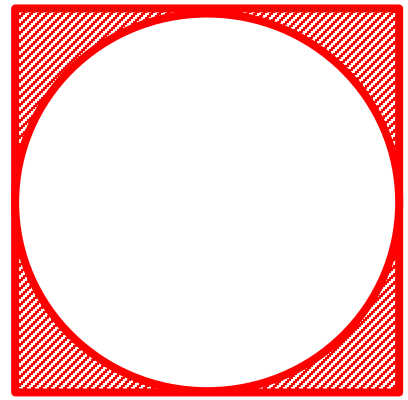
USE	LIVE LOAD
Uninhabitable attics without storage[b]	10
Uninhabitable attics with limited storage[b, g]	20
Habitable attics and attics served with fixed stairs	30
Balconies (exterior) and decks[e]	40
Fire escapes	40
Guards and handrails[d]	200[h]
Guard in-fill components[f]	50[h]
Passenger vehicle garages[a]	50[a]
Rooms other than sleeping rooms	40
Sleeping rooms	30
Stairs	40[c]

For SI: 1 pound per square foot = 0.0479 kPa, 1 square inch = 645 mm^2, 1 pound = 4.45 N.

a. Elevated garage floors shall be capable of supporting a 2,000-pound load applied over a 20-square-inch area.

Footings – Sizing Pads/Point Loads

- Formulas
- $\sqrt{\left(\frac{TL}{Soil\ Capacity}\right) x\ 144} =$ ***Square Footing Size***
- $Square\ Footing\ Size \times 1.13 =$ ***Round Footing Size***



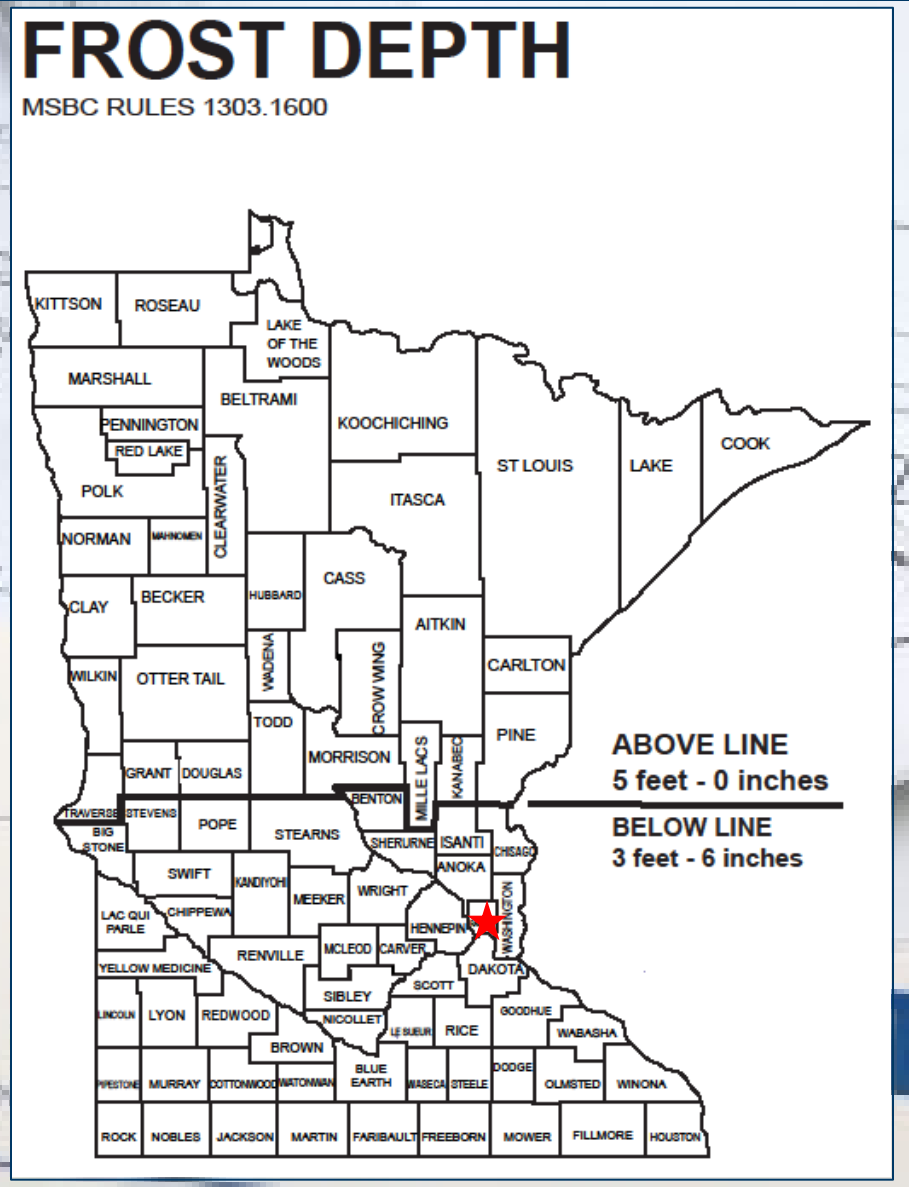
- Example – 10,000lb load on a column, assumed 2000lb soil capacity.
  - $\frac{10{,}000}{2000}\ x\ 144 = 720$
  - $\sqrt{720} = 26.83$ or 27” x 27” **square footing.**
  - 26.83 x 1.13 = 30.32 or 30” diameter **round footing.**

Footings – Pads/Point Loads

- How thick?
- R403.1.1 Minimum Size
  - Footing projections …shall not exceed the thickness of the footing.
- Back to example
  - 10,000lb load on a column, assumed 2000lb soil capacity = 27” x 27” square footing
  - $27 - 5\frac{1}{2}\ (column\ size) = 21\frac{1}{2}$
  - $21\frac{1}{2} \div 2 = 10\frac{3}{4}$
  - So, pad footing must be 11” thick min.

Footing Depth

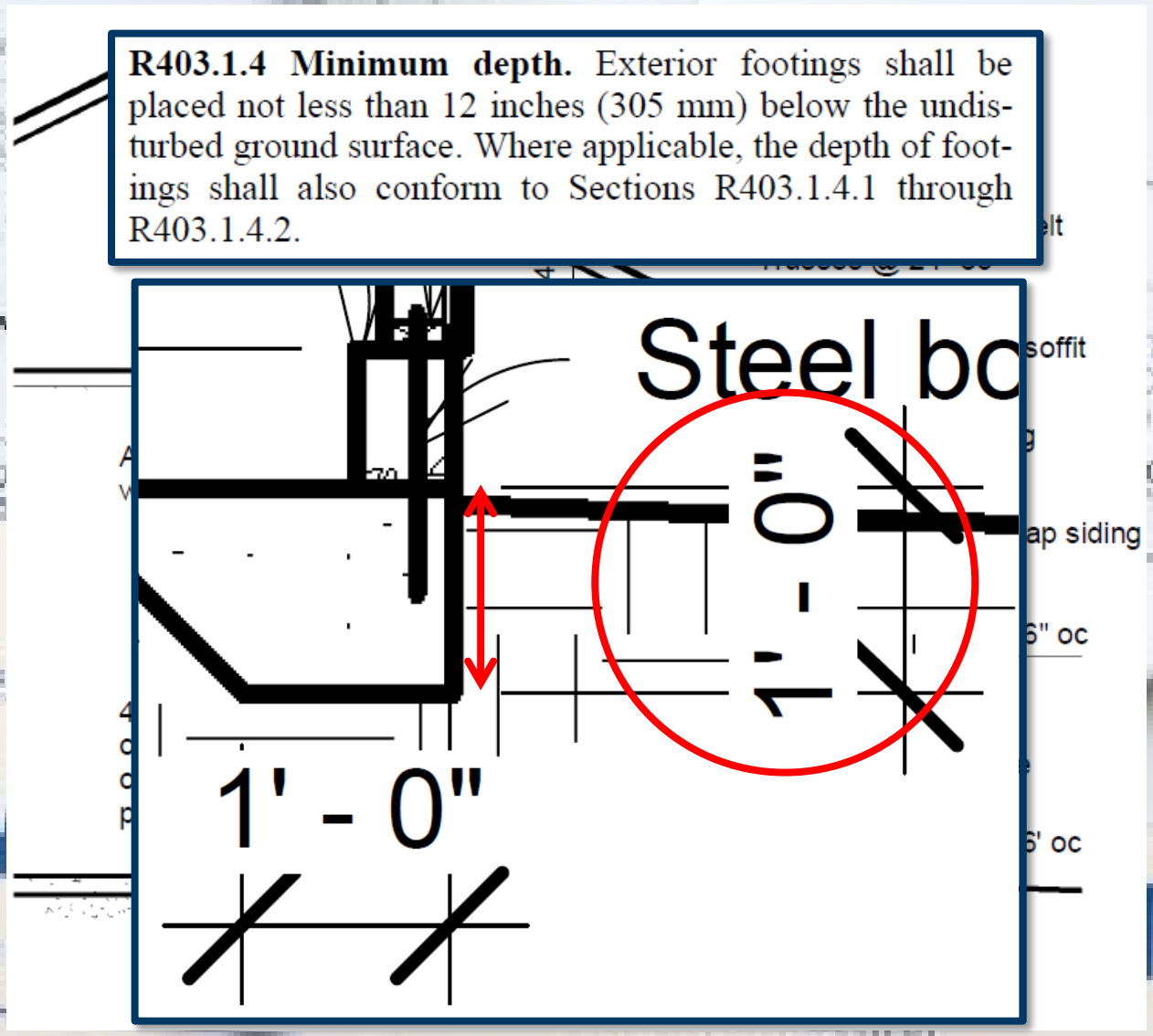
- Frost protection
- MN Provisions 1303.1600 Subpart 1.
  - Zone I – 3-1/2’ (42”)
  - Zone II – 5’ (60”)
- DLI Website:
  - https://www.dli.mn.gov/sites/default/files/pdf/bc_map_frost_depth.pdf



Footing Depth

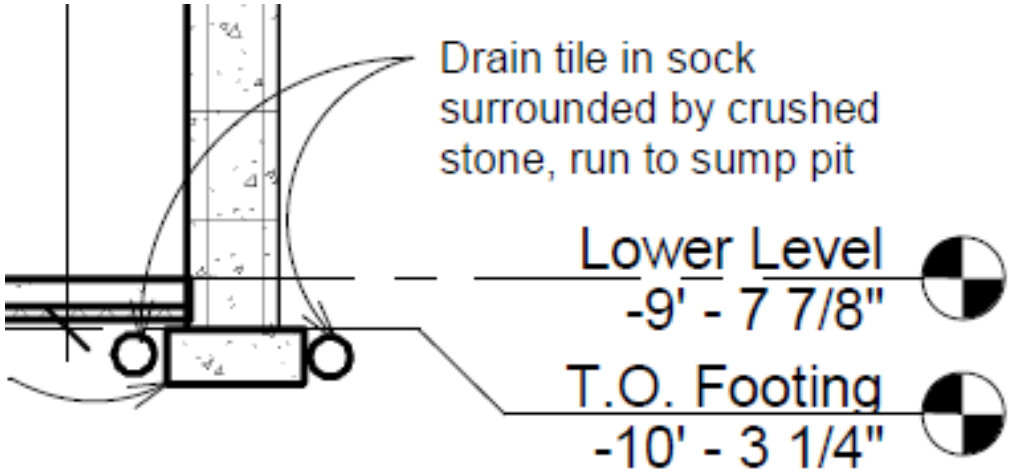
- House Plans – A2
  - A2 Section 1 - full depth basement – complies.
- Garage Plans A2 Section 3
  - Slab on grade.
  - R403.1.4 Minimum Depth

    Exterior footings shall be placed not less than 12” below the undisturbed ground surface.
  - – 12” below grade – complies.



Footings

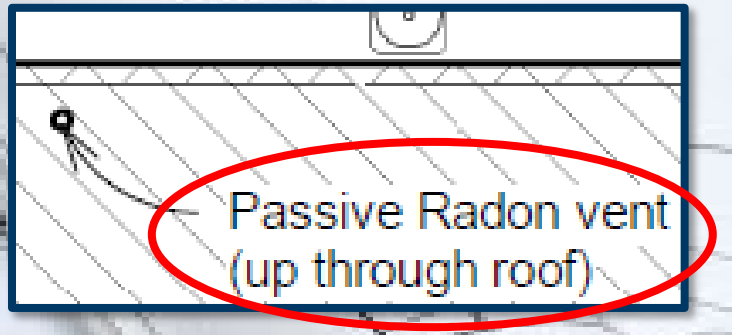
- Drain tile
  - **R405.1 Concrete or masonry foundations.** Drains shall be provided around concrete or masonry foundations that retain earth and enclose habitable or usable spaces located below *grade.* Drainage tiles, gravel or crushed stone drains, perforated pipe or other *approved* means or systems shall be installed at or below the top of the footing or below the bottom of the slab and shall discharge by gravity or mechanical means into an *approved* drainage system.
    - Exception: A drainage system is not required where the foundation is installed on well-drained soil ground or sand gravel mixture soils according to the unified soil classification system, group I soils, as detailed in table R 405.1.
- A2 Section 1

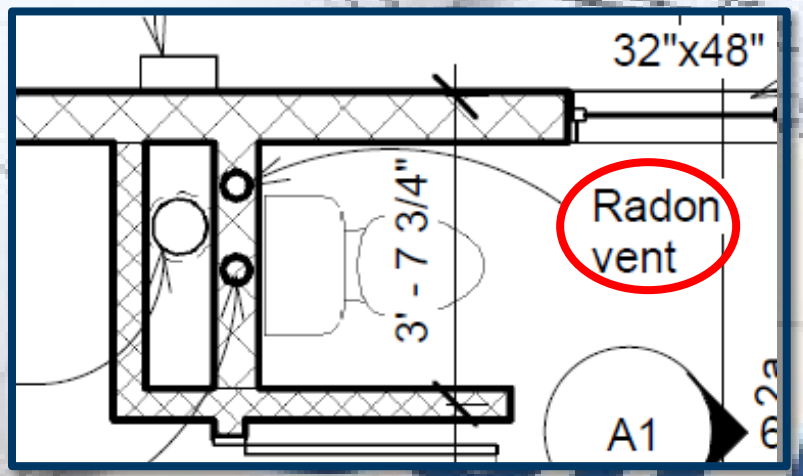


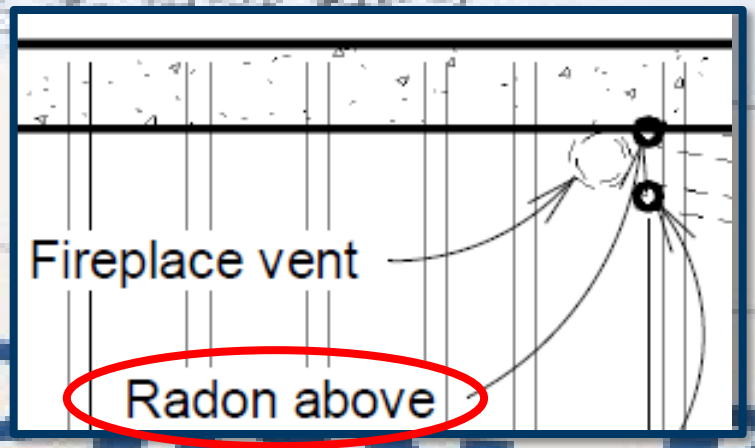
Radon

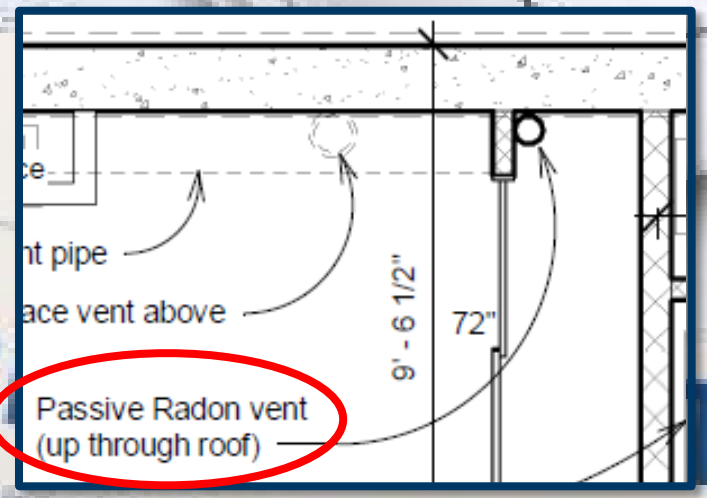
MN Provisions 1303.2402

- **Subp 1. Gas permeable material preparation.** A gas permeable material shall be placed on the prepared subgrade under all floor systems.

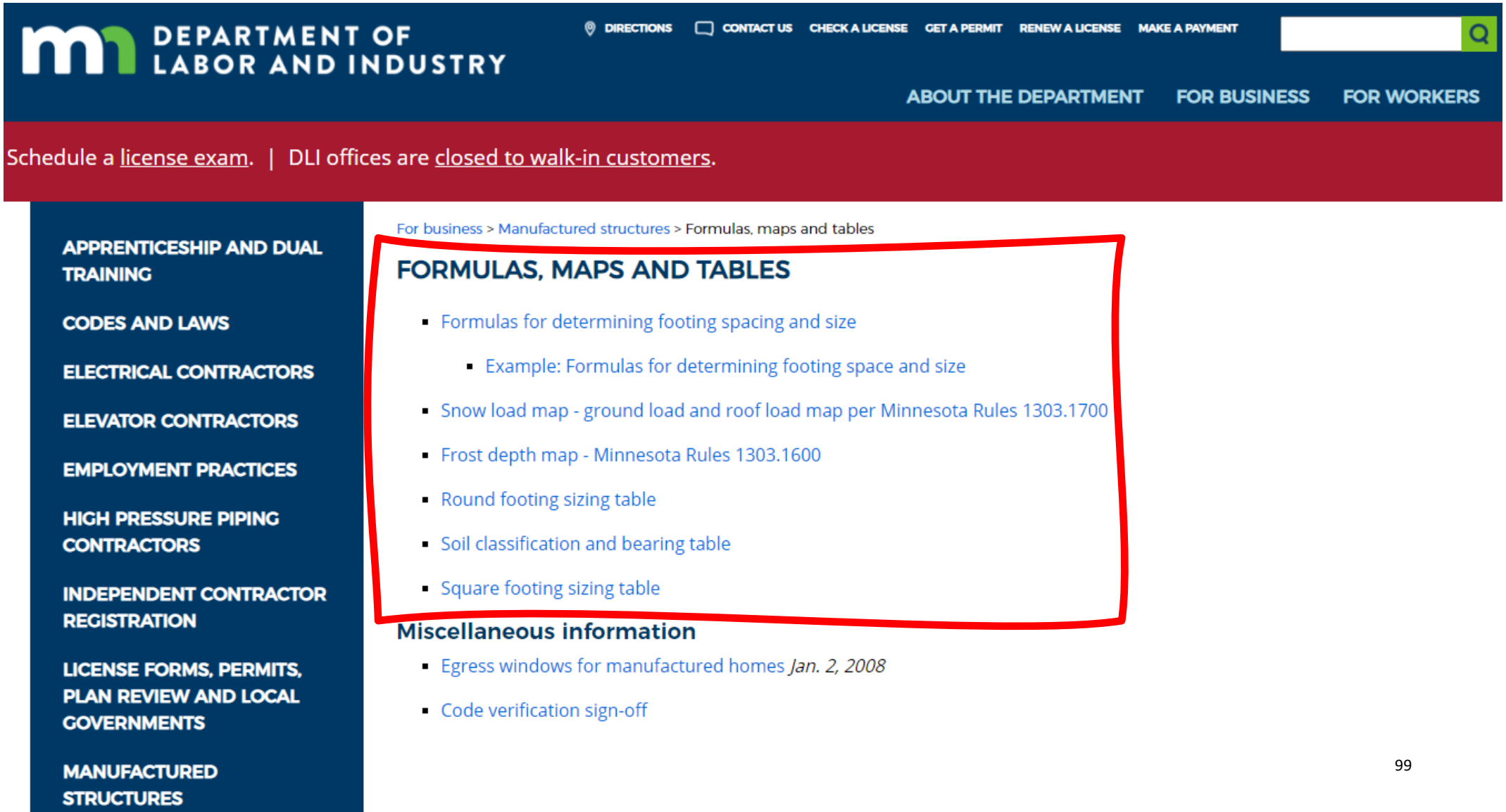








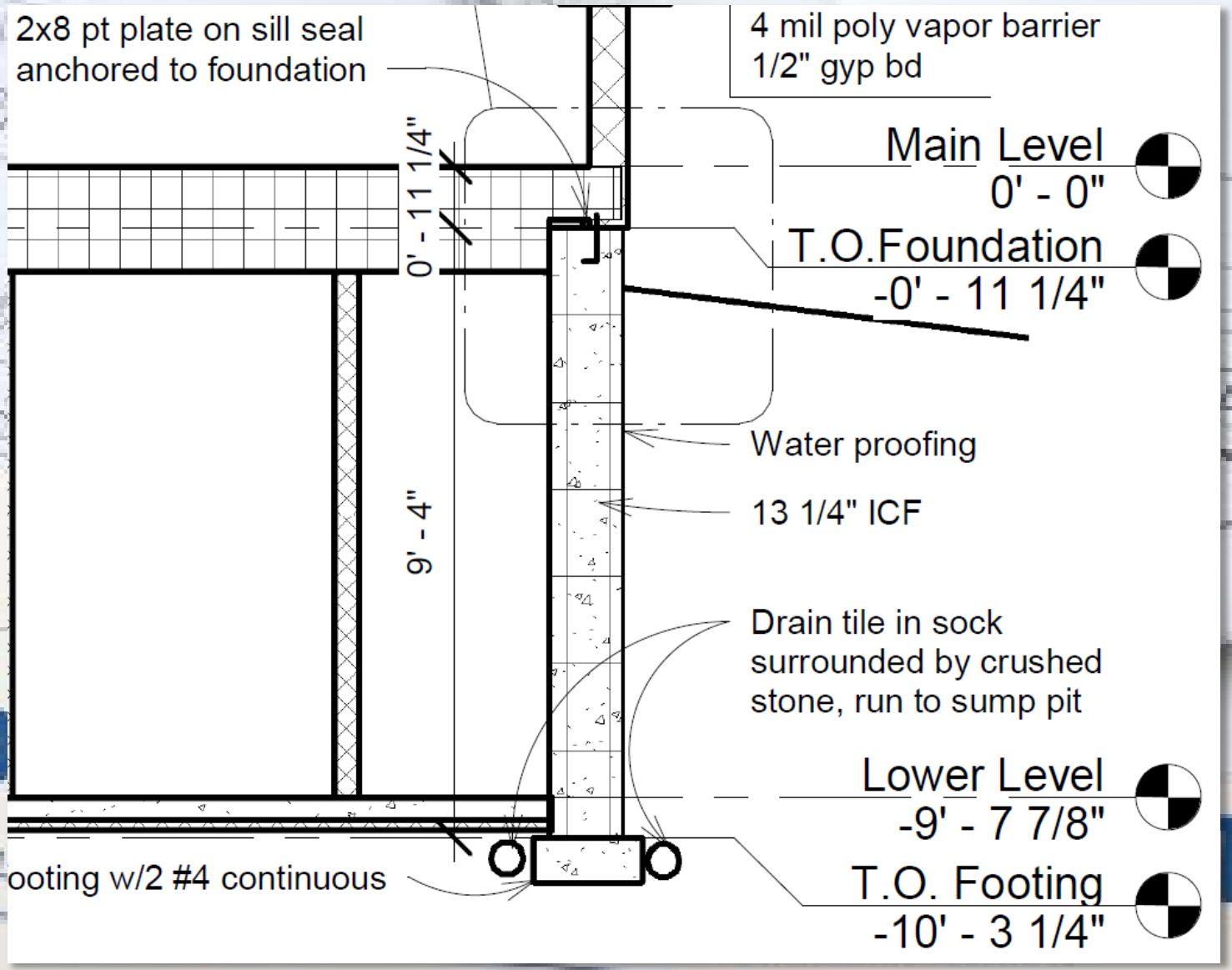
Other Helpful Resources…



Foundation Wall – Chapter 4

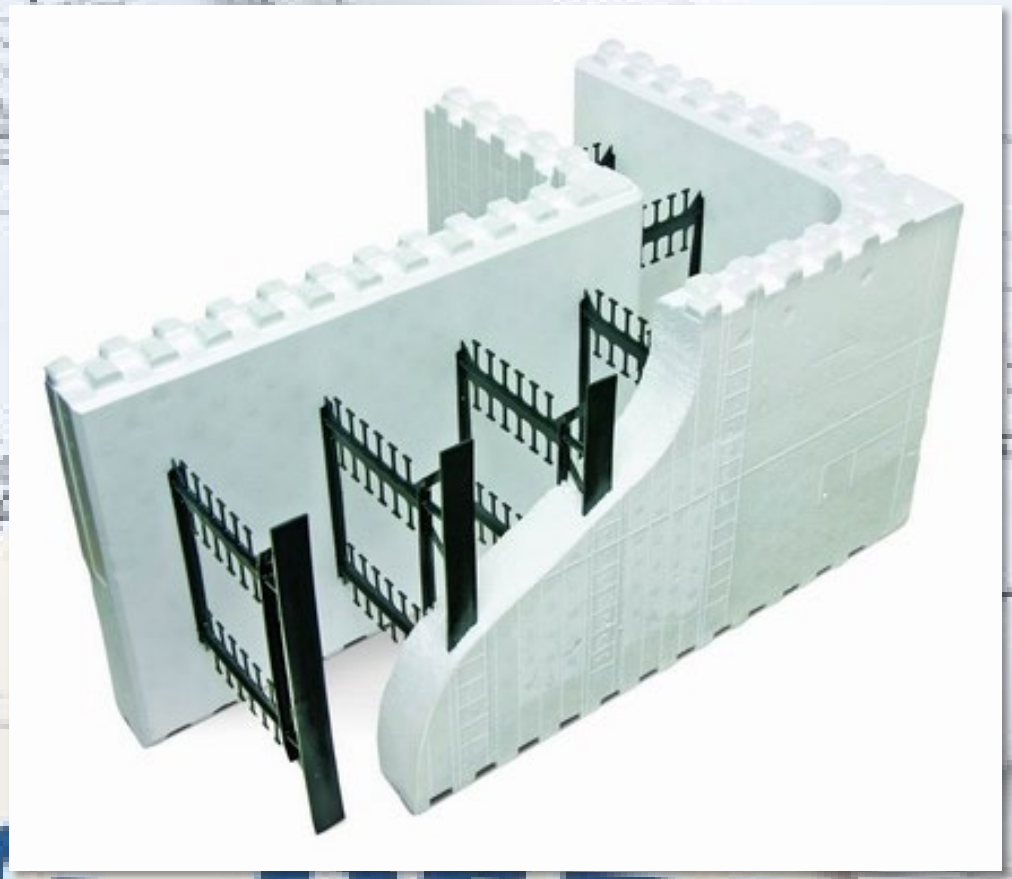
Foundation Wall

- Check these items:
  - Wall height
  - Thickness
  - Reinforcement – Vertical/Horizontal
    - Block wall
    - Poured wall
    - Other
  - Waterproofing
  - Drain tile/drainage
  - Insulation
  - Lateral Support
  - Backfill



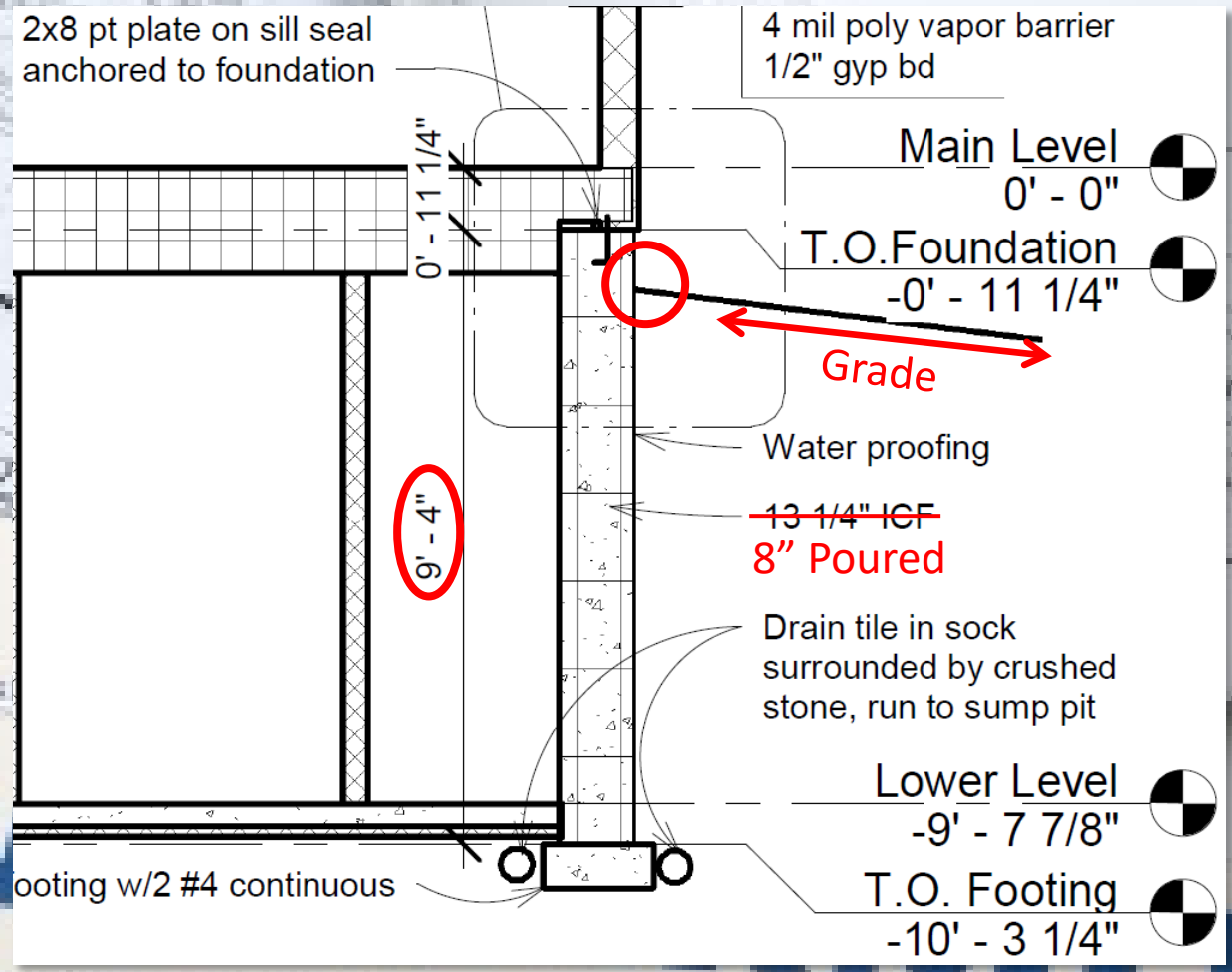
Foundation Wall

- Wall height – A2 Section 1
  - Insulated Concrete Forms – Manufacturer Specs.
    - Reinforcing.
    - Lintels.
    - Openings.
    - Reinforcing while pouring concrete to prevent form failure.
  - 9-4” wall, 13-1/4” ICF Block (8” core wall thickness).



Foundation Wall Reinforcement

- Wall height – A2 Section 1
  - Let's assume a poured wall, not an ICF wall for the sake of the example.
  - 9'-4" wall, 8" thick
  - Total unsupported wall – sill plate to top of floor: ~9'
  - Height of unbalanced backfill: ~8' (Unbalanced – lateral pressure on one side, no support on the other, like a beam turned sideways)



Foundation Wall – Vertical Reinforcement

TABLE R404.1.2(3)
MINIMUM VERTICAL REINFORCEMENT FOR 8-INCH (203 mm) NOMINAL FLAT CONCRETE BASEMENT WALLS[b, c, d, e, f, h, i, j]

MAXIMUM UNSUPPORTED WALL HEIGHT (feet)	MAXIMUM UNBALANCED BACKFILL HEIGHT[g] (feet)	MINIMUM VERTICAL REINFORCEMENT-BAR SIZE AND SPACING (inches)		
		Soil classes[a] and design lateral soil (psf per foot of depth)		
		GW, GP, SW, SP 30	GM, GC, SM, SM-SC and ML 45	SC, ML-CL and inorganic CL 60
8	4	NR	NR	NR
	5	NR	NR	NR
	6	NR	NR	6 @ 37
	7	NR	6 @ 36	6 @ 35
	8	6 @ 41	6 @ 35	6 @ 26
9	4	NR	NR	NR
	5	NR	NR	NR
	6	NR	NR	6 @ 35
	7	NR	6 @ 35	6 @ 32
	8	6 @ 36	6 @ 32	6 @ 23
	9	6 @ 35	6 @ 25	6 @ 18
10	4	NR	NR	NR
	5	NR	NR	NR
	6	NR	NR	6 @ 35
	7	NR	6 @ 35	6 @ 29
	8	6 @ 35	6 @ 29	6 @ 21
	9	6 @ 34	6 @ 22	6 @ 16
	10	6 @ 27	6 @ 17	6 @ 13

Table Footnotes

For SI: 1 inch = 25.4 mm; 1 foot = 304.8 mm; 1 pound per square foot per foot = 0.1571 kPa^2/m, 1 pound per square inch = 6.895 kPa.

NR = Not Required.

a. Soil classes are in accordance with the Unified Soil Classification System. Refer to Table R405.1.

b. Table values are based on reinforcing bars with a minimum yield strength of 60,000 psi, concrete with a minimum specified compressive strength of 2,500 psi and vertical reinforcement being located at the centerline of the wall. See Section R404.1.3.3.7.2.

c. Vertical reinforcement with a yield strength of less than 60,000 psi and bars of a different size than specified in the table are permitted in accordance with Section R404.1.3.3.7.6 and Table R404.1.2(9).

d. NR indicates vertical reinforcement is not required.

e. Deflection criterion is $L/240$, where L is the height of the basement wall in inches.

f. Interpolation is not permitted.

g. Where walls will retain 4 feet or more of unbalanced backfill, they shall be laterally supported at the top and bottom before backfilling.

h. See Section R404.1.3.2 for minimum reinforcement required for basement walls supporting above-grade concrete walls.

i. See Table R608.3 for tolerance from nominal thickness permitted for flat walls.

j. The use of this table shall be prohibited for soil classifications not shown.

Foundation Wall – Horizontal Reinforcement

TABLE R404.1.2(1)
MINIMUM HORIZONTAL REINFORCEMENT FOR CONCRETE BASEMENT WALLS[a, b]

MAXIMUM UNSUPPORTED HEIGHT OF BASEMENT WALL (feet)	LOCATION OF HORIZONTAL REINFORCEMENT
≤ 8	One No. 4 bar within 12 inches of the top of the wall story and one No. 4 bar near mid-height of the wall story.
> 8	One No. 4 bar within 12 inches of the top of the wall story and one No. 4 bar near third points in the wall story.

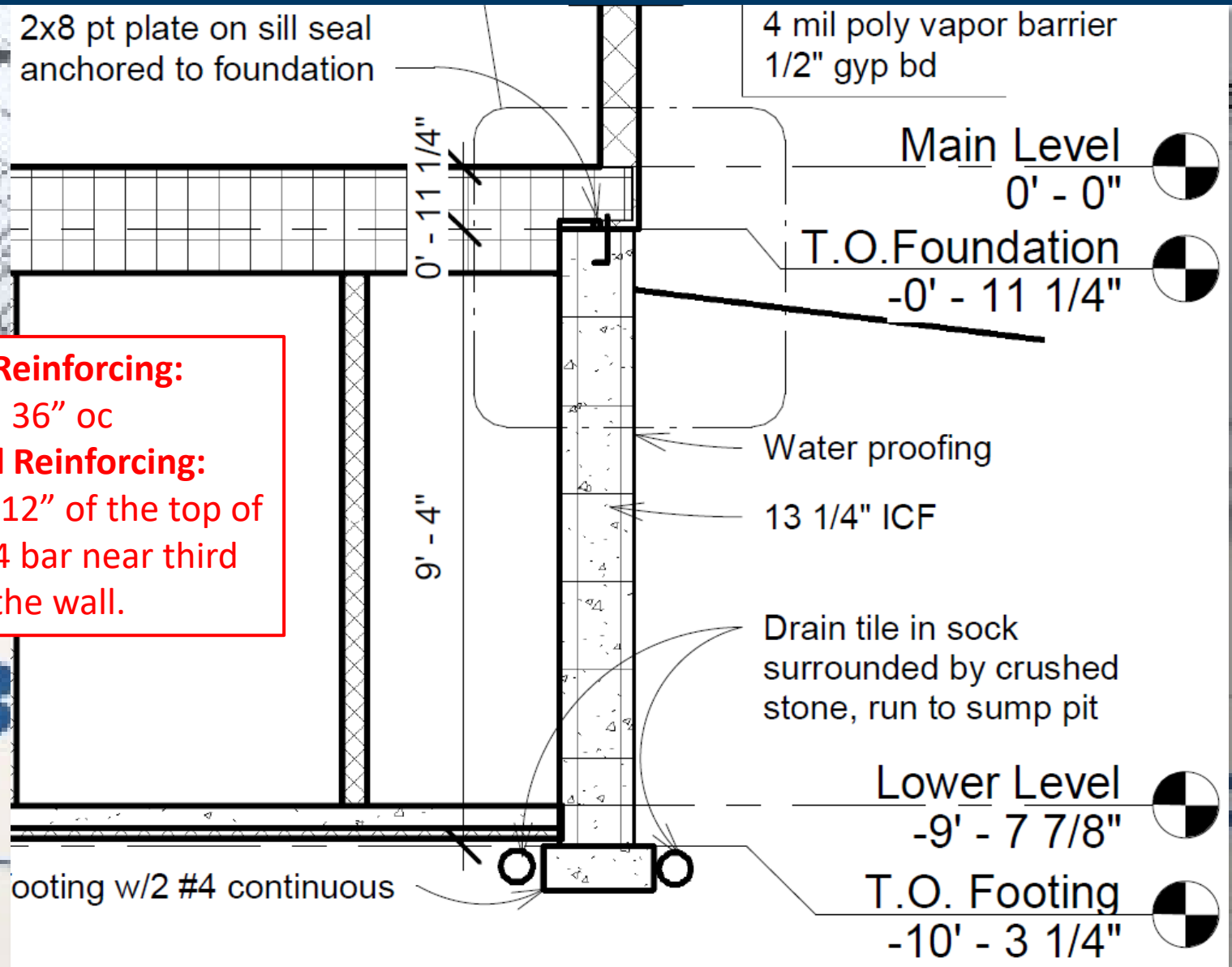
For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square inch = 6.895 kPa.

a. Horizontal reinforcement requirements are for reinforcing bars with a minimum yield strength of 40,000 psi and concrete with a minimum concrete compressive strength of 2,500 psi.

b. See Section R404.1.3.2 for minimum reinforcement required for foundation walls supporting above-grade concrete walls.

Foundation Wall Reinforcing

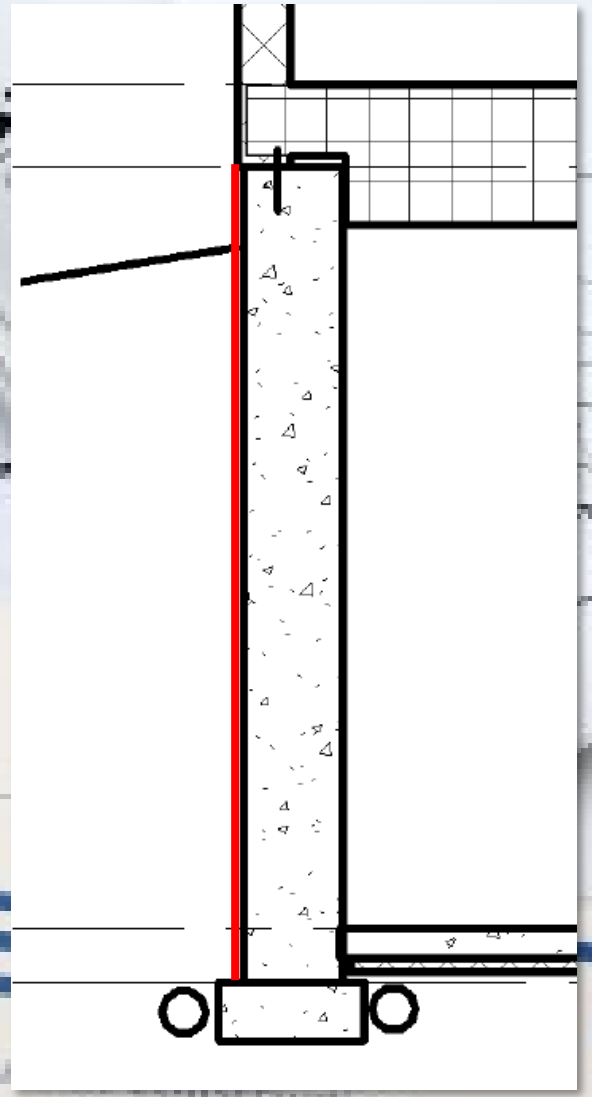
Min Vertical Reinforcing:
#6 bar @ 36” oc
Min Horizontal Reinforcing:
One #4 bar within 12” of the top of the wall & one #4 bar near third points in the wall.



Foundation Wall Waterproofing

- **R406.2 Concrete and masonry foundation waterproofing.** Exterior foundation walls that retain earth and enclose below grade interior spaces, floors, and crawl spaces shall be waterproofed. Waterproofing shall be installed at a minimum from the top of the footing to the finished grade or in accordance with the manufacturer's installation instructions. Walls shall be waterproofed in accordance with one of the following:

1. Two-ply hot-mopped felts.
2. Fifty-five-pound (25 kg) roll roofing.
3. Six-mil (0.15 mm) polyvinyl chloride.
4. Six-mil (0.15 mm) polyethylene.
5. Forty-mil (1 mm) polymer-modified asphalt.
6. Sixty-mil (1.5 mm) flexible polymer cement.
7. One-eighth-inch (3 mm) cement-based, fiber-reinforced, waterproof coating.
8. Sixty-mil (1.5 mm) solvent-free liquid-applied synthetic rubber.



Foundation Wall Waterproofing

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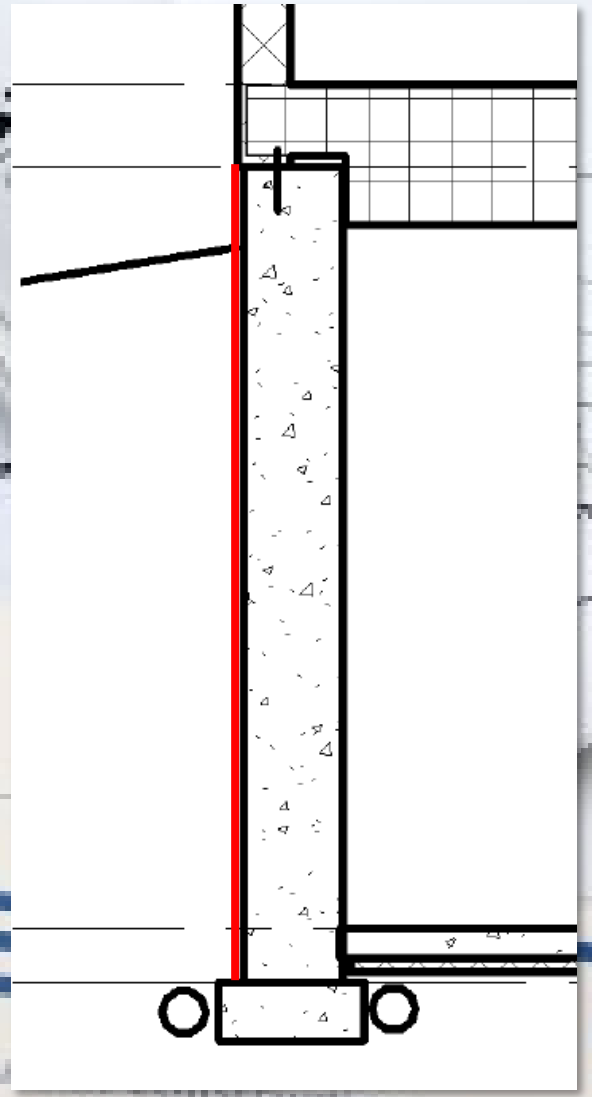
4. Six-mil (0.15 mm) polyethylene.
5. Forty-mil (1 mm) polymer-modified asphalt.
6. Sixty-mil (1.5 mm) flexible polymer cement.
7. One-eighth-inch (3 mm) cement-based, fiber-reinforced, waterproof coating.
8. Sixty-mil (1.5 mm) solvent-free liquid-applied synthetic rubber.



Foundation Wall Waterproofing

- **R406.2 Concrete and**

foundation walls that re
floors, and crawl space
installed at a minimum
in accordance with the
be waterproofed in acc

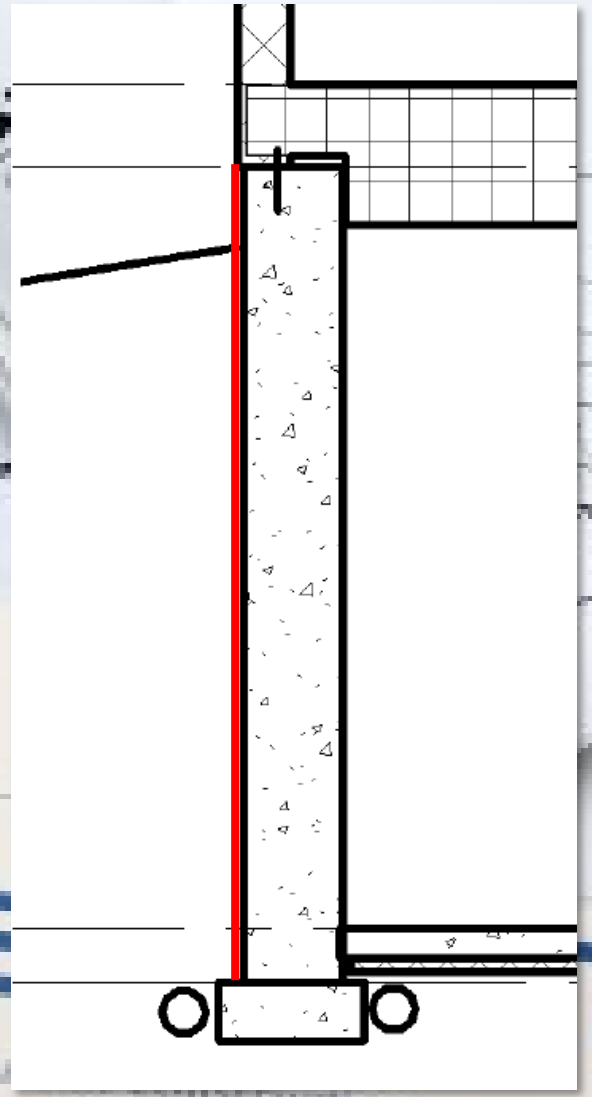
1. Two-ply hot-moppe
2. Fifty-five-pound (25
3. Six-mil (0.15 mm) p
4. Six-mil (0.15 mm) p
5. Forty-mil (1 mm) po
6. Sixty-mil (1.5 mm) f
7. One-eighth-inch (3
   coating.
8. Sixty-mil (1.5 mm) s

SECTION R402
BUILDING THERMAL ENVELOPE

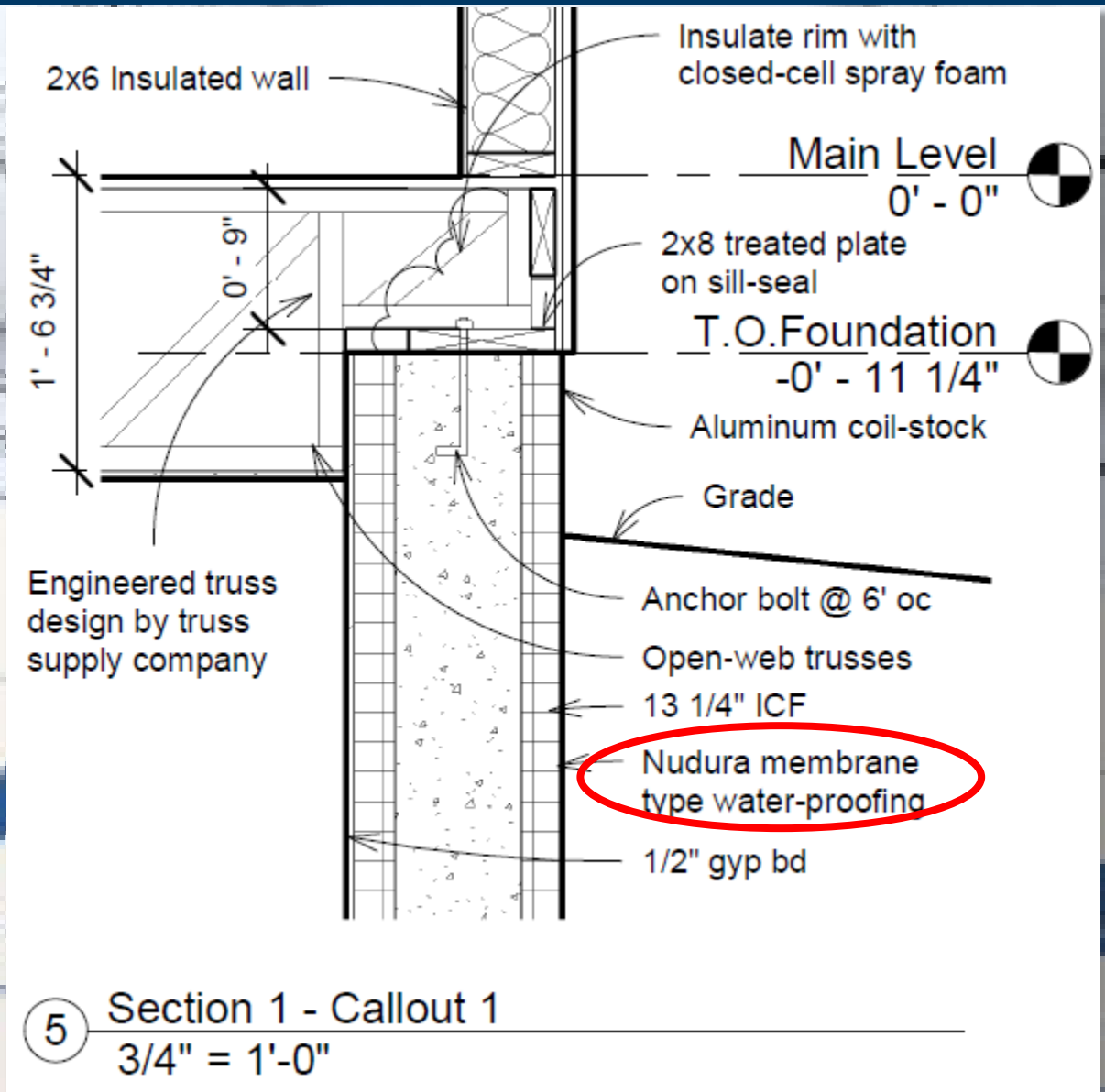
R402.1 General (Prescriptive). The *building thermal envelope* shall meet the requirements of Sections R402.1.1 through R402.1.4.

R402.1.1 Insulation, waterproofing, and fenestration criteria. The building thermal envelope shall meet the requirements of Table R402.1.1 based on the climate zone specified in Chapter 3, and the requirements contained in Section R402.2. Cast-in-place concrete and masonry block foundation walls shall be waterproofed according to IRC Section R406 and the following requirements:

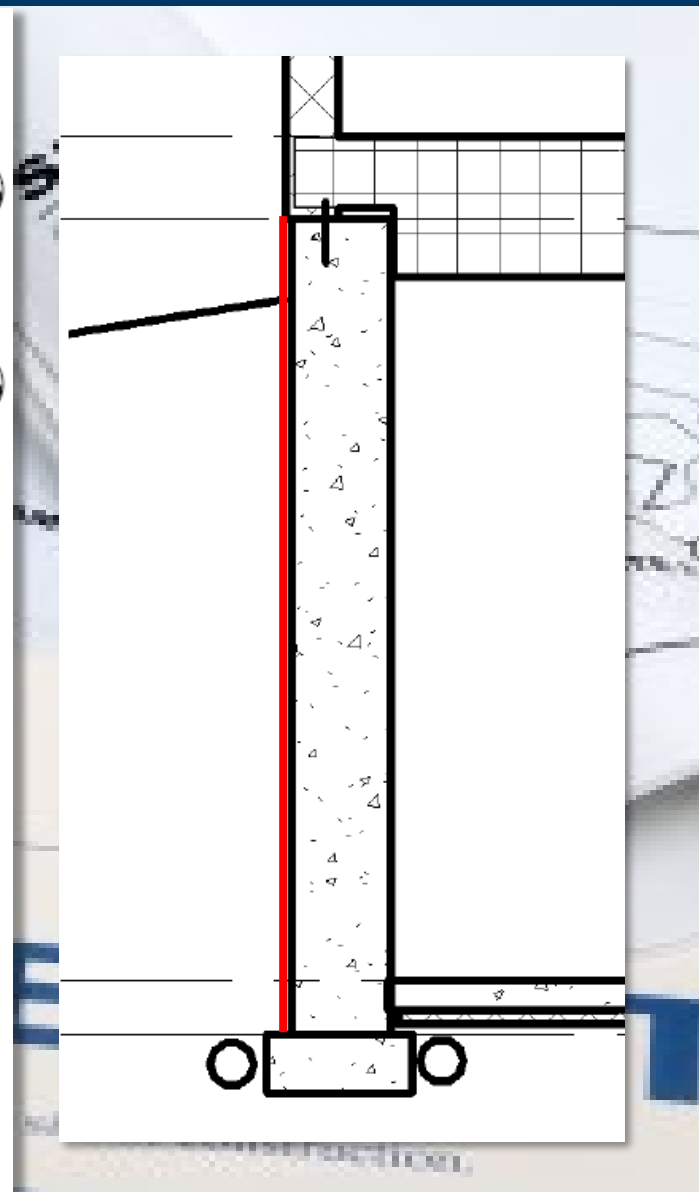
1. The waterproofing shall extend from the top interior wall edge, across the top of the wall, and down the exterior wall face to the top of the footing. If a full width, closed-cell material is installed to create a seal between the sill plate and the top of the foundation wall, the installation is deemed to meet the requirements for the top of the wall waterproofing.
2. If the walls are exposed to the exterior environment, the waterproofing system shall have a rigid, opaque,



Foundation Wall Waterproofing

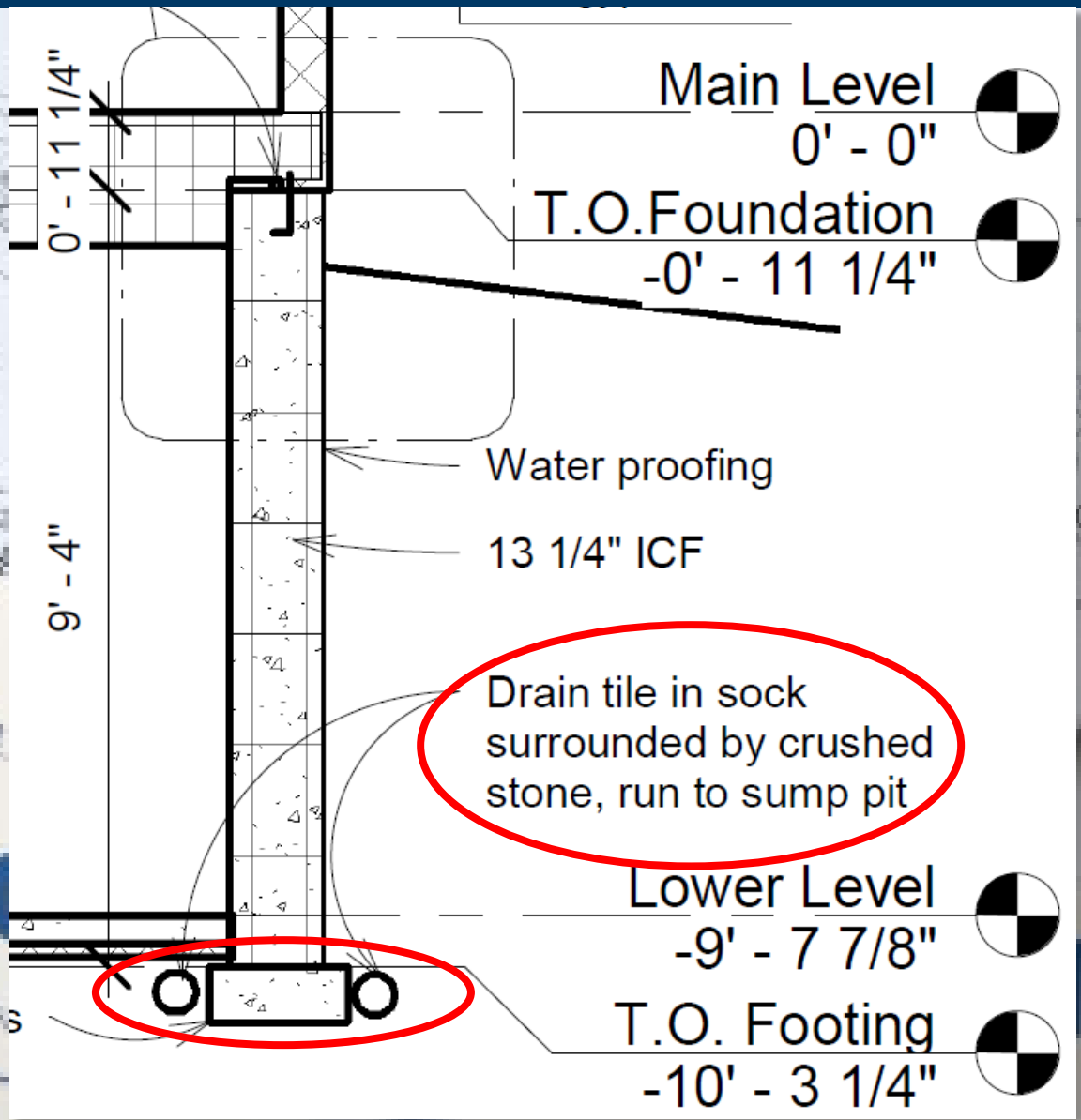


5 Section 1 - Callout 1
3/4" = 1'-0"



Foundation Wall Drainage

- **SECTION R405 FOUNDATION DRAINAGE**
- **R405.1 Concrete or masonry foundations.** Drains shall be provided around concrete or masonry foundations that retain earth and enclose habitable or usable spaces located below *grade*. Drainage tiles, gravel or crushed stone drains, perforated pipe or other *approved* systems or materials shall be installed at or below the top of the footing or below the bottom of the slab and shall discharge by gravity or mechanical means into an *approved* drainage system…
- **Exception:** A drainage system is not required where the foundation is installed on well-drained ground or sandgravel mixture soils according to the Unified Soil Classification System, Group I soils, as detailed in Table R405.1.



Foundation Wall Insulation

Residential Energy Code

TABLE R402.1.1
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT[a]

CLIMATE ZONE	FENESTRATION *U*-FACTOR[b]	SKYLIGHT[b] *U*-FACTOR	GLAZED FENESTRATION SHGC[b,e]	CEILING[j] *R*-VALUE	WOOD FRAME WALL *R*-VALUE[f]	MASS WALL *R*-VALUE[i,g,h]	FLOOR *R*-VALUE	BASEMENT[c, i] WALL *R*-VALUE	SLAB[d] *R*-VALUE & DEPTH	CRAWL SPACE[c, i] WALL *R*-VALUE
6	0.32	0.55	NR	49	20, 13+5	15/20	30[e]	15	10, 3.5 ft	15
7	0.32	0.55	NR	49	21	19/21	38[e]	15	10, 5 ft	15

For SI: 1 foot = 304.8 mm.

a. R-values are minimums. U-factors and SHGC are maximums. When insulation is installed in a cavity that is less than the label or design thickness of the insulation, the installed R-value of the insulation shall not be less than the R-value specified in the table.

b. The fenestration U-factor column excludes skylights. The SHGC column applies to all glazed fenestration.

c. See Section R402.2.8.

d. Insulation R-values for heated slabs shall be installed to the depth indicated or to the top of the footing, whichever is less.

e. Or insulation sufficient to fill the framing cavity, R-19 minimum.

f. First value is cavity insulation, second is continuous insulation or insulated siding, so "13+5" means R-13 cavity insulation plus R-5 continuous insulation or insulated siding. If structural sheathing covers 40 percent or less of the exterior, continuous insulation R-value shall be permitted to be reduced by no more than R-3 in the locations where structural sheathing is used to maintain a consistent total sheathing thickness.

g. The second R-value applies when more than half the insulation is on the interior of the mass wall.

h. When using log-type construction for thermal mass walls the following applies:

(1) a minimum of a 7-inch diameter log shall be used; and

(2) the U-value of fenestration products shall be 0.29 overall on average or better.

i. See Section 402.2.8. A minimum R-19 cavity insulation is required in wood foundation walls.

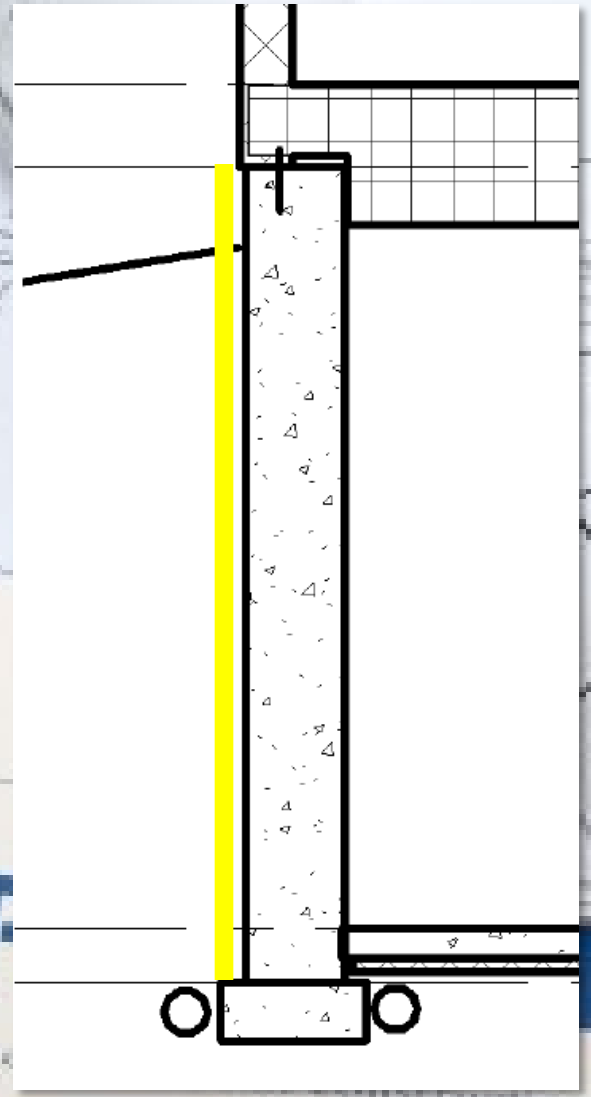
j. Roof/ceiling assemblies shall have a minimum 6-inch energy heel.

Foundation Wall Insulation

- **R402.2.8 Basement walls.** Walls associated with conditioned basements shall be insulated from the top of the basement wall down to 10 feet below grade or to the top of the footing, whichever is less. Foundation insulation shall be installed according to the manufacturer's installation instructions. Walls associated with unconditioned basements shall meet the requirements of this section unless the floor overhead is insulated in accordance with Sections R402.l.1 and R402.2.7 and the following requirements:
  - a. R-15 insulation for concrete and masonry foundations shall be installed according to R402.l.l.1 to R402.l.l.8 and a minimum of a R-10 shall be installed on the exterior of the wall. Interior insulation, other than closed cell spray foam, shall not exceed R-11. Foundations shall be waterproofed in accordance with the applicable provisions of the International Residential Code (IRC).
    - Exception: R-10 continuous insulation on the exterior of each foundation wall shall be permitted to comply with this code if the tested air leakage rate required in Section R402.4.1.2 does not exceed 2.6 air changes per hour and the total square feet between the finished grade and the top of each foundation wall does not exceed 1.5 multiplied by the total lineal feet of each foundation wall that encloses conditioned space. Interior insulation, other than closed cell spray foam, shall not exceed R-11. See footnote c to Table R402.2.l.

Foundation Wall Insulation

- ICF Foundation wall has insulation incorporated into itself. See manufacturer specifications.
- For example, let's assume an 8" poured or block wall…
- 9'-4" from top of footing (tof) to sill plate.
- Insulation may be draining or nondraining insulation.

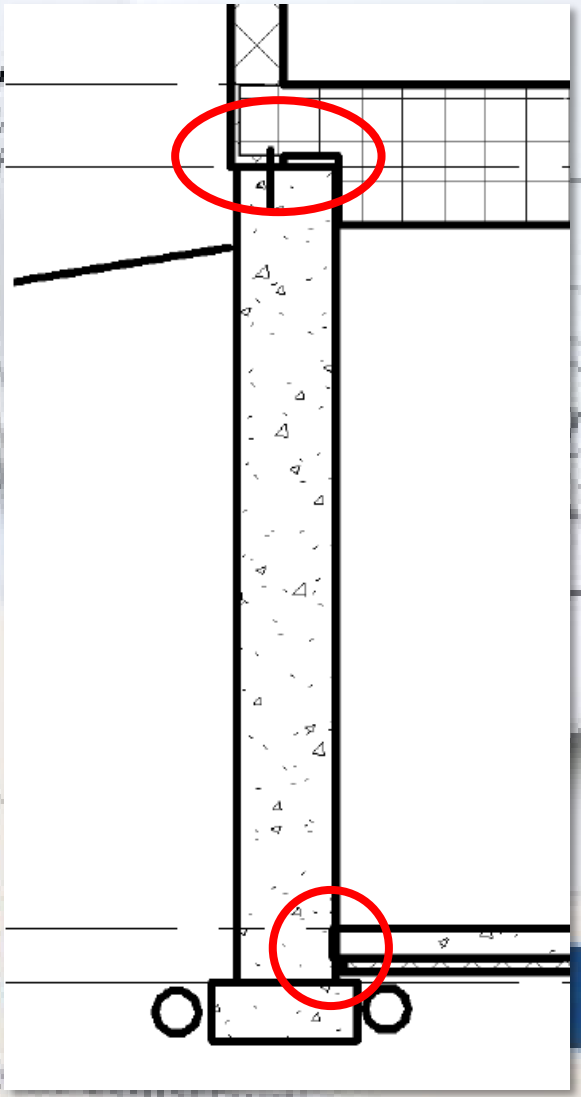


Foundation Wall Lateral Support

- **SECTION R404 FOUNDATION AND RETAINING WALLS**
- **R404.1 Concrete and masonry foundation walls.** Concrete foundation walls shall be selected and constructed in accordance with the provisions of Section R404.1.2. Masonry foundation walls shall be selected and constructed in accordance with the provisions of Section R404.1.3. Concrete and masonry foundation walls shall be laterally supported at the top and bottom. Foundation walls that meet all of the following shall be considered laterally supported:

1. Full basement floor shall be 3.5 inches thick concrete slab poured tight against the bottom of the foundation wall.
2. Floor joists and blocking shall be connected to the sill plate at the top of wall with an approved connector with listed capacity meeting the top of wall reaction in Table R404.1(1). Maximum spacing of floor joists shall be 24 inches on center. Spacing of blocking shall be in accordance with Table R404.1(1).
3. Bolt spacing for the sill plate shall be no greater than the requirements in Table R404.1(1).
4. The floor shall be blocked perpendicular to the floor joists. Blocking shall be installed in accordance with footnote f of Table R404.1(1).

- **Exception:** Cantilevered concrete and masonry foundation walls supporting unbalanced backfill that do not have permanent lateral support at the top of the foundation shall be constructed according to 404.1.1(5), Table R404.1.1(6), or TableR404.1.1(7).



Foundation Wall Lateral Support

TABLE R404.1(1)
MAXIMUM ANCHOR BOLT AND BLOCKING SPACING FOR SUPPORTED FOUNDATION WALL

MAX. WALL HEIGHT	MAX. UNBALANCED BACKFILL HEIGHT	SOIL CLASSES[a]	SOIL LOAD (pcf/ft)	TOP OF WALL REACTION (plf)[e]	1/2" DIAMETER ANCHOR BOLT SPACING (inches)[b, c, d]	SPACING OF BLOCKING PERPENDICULAR TO FLOOR JOISTS (inches)[f]
8′-0″	7′-6″	GW, GP, SW, & SP	30	260	72	72
		GM, GC, SM, SM-SC, & ML	45	400	72	72
		SC, MH, ML-CL, & I-CL	60	530	48	48
9′-0″	8′-6″	GW, GP, SW, & SP	30	340	72	72
		GM, GC, SM, SM-SC, & ML	45	510	48	48
		SC, MH, ML-CL, & I-CL	60	680	32	32
10′-0″	9′-6″	GW, GP, SW, & SP	30	430	64	64
		GM, GC, SM, SM-SC, & ML	45	640	40	40
		SC, MH, ML-CL, & I-CL	60	860	24	24

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

a. Soil classes are in accordance with the Unified Soil Classification System. Refer to Table R405.1.

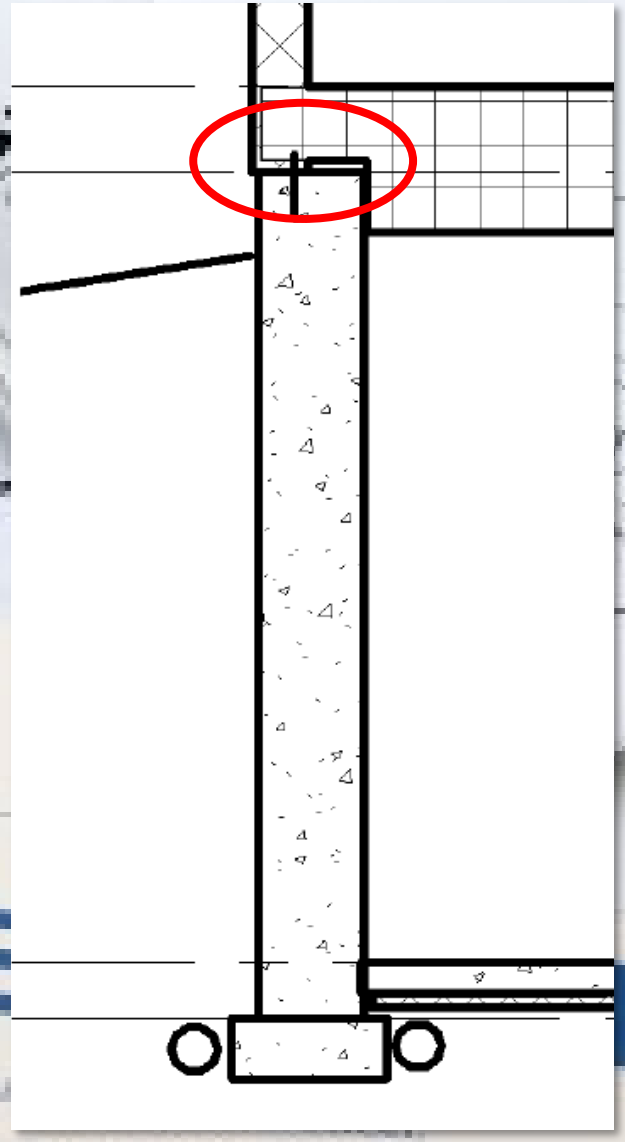
b. Anchor bolts shall be cast-in-place with a minimum 7-inch embed. Where vertical reinforcing is required by other sections of this code, the anchor bolts shall be within 8 inches of the vertical reinforcing and are to be spaced as required by this table. Anchor bolts installed in masonry shall be grouted in place with not less than 1 inch of grout measured from the inside face of the masonry and the anchor bolt.

c. The sill plate shall be 2 x 6 minimum. Anchor bolts shall be placed at least $2^1/_2$ inches from the edge of the sill plate and the edge of the foundation wall.

d. Anchor bolts shall have a 2 inch by $^1/_8$ inch thick round or square washer tightened and countersunk $^1/_4$ inch into the top of the sill plate. Use of standard and noncountersunk washers is permitted where anchor bolt spacing is half the spacing required by this table.

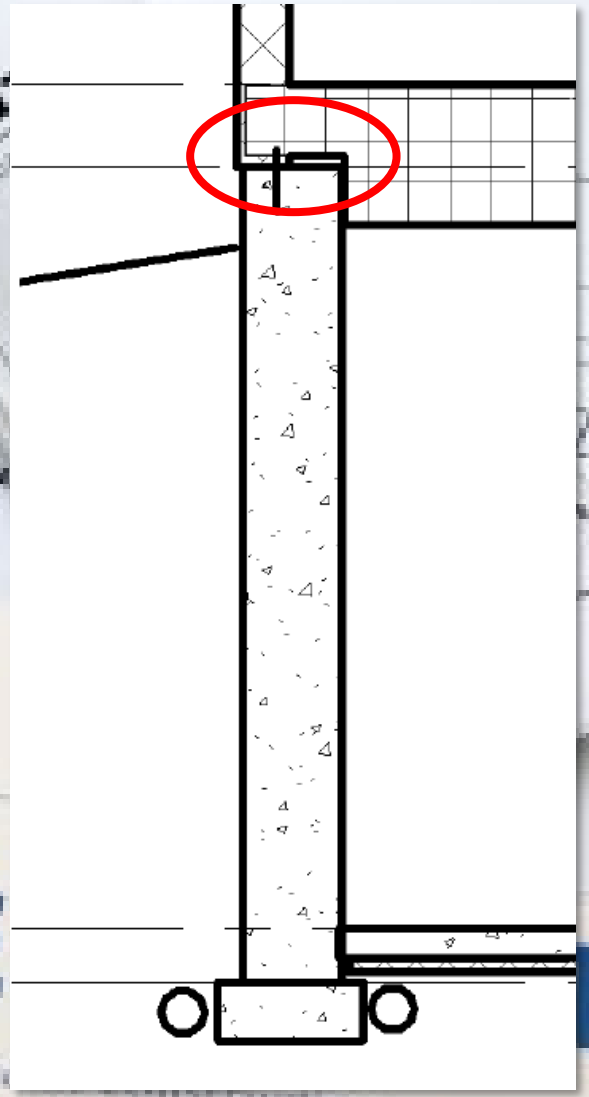
e. Minimum load to be used for the sizing of accepted anchors or fasteners if anchor bolts are not used.

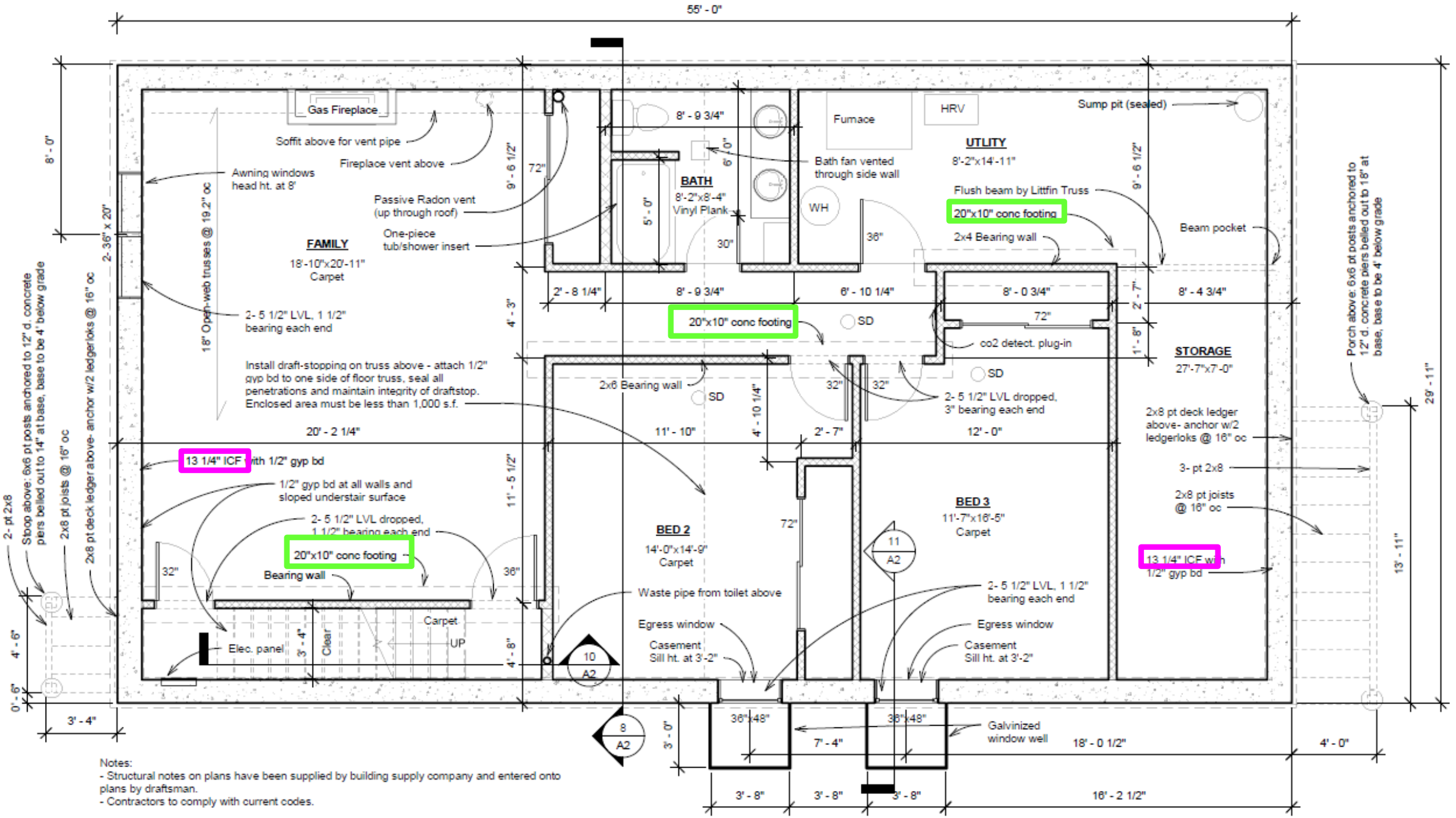
f. Perpendicular blocking shall be 2-by the full depth joists or an approved alternative full depth joist material that is installed in the first three joists spaces adjacent to the foundation wall. The blocking shall be connected to the sill plate with an approved fastener sized in accordance with Footnote e. The floor sheathing shall be nailed to the blocking through the subfloor with a minimum of 8d common ($2^1/_2$ x 0.131) nails at 3 inches on center or an equivalent connector. Blocking shall be installed within 8 inches of an anchor bolt location.



Foundation Wall Backfill

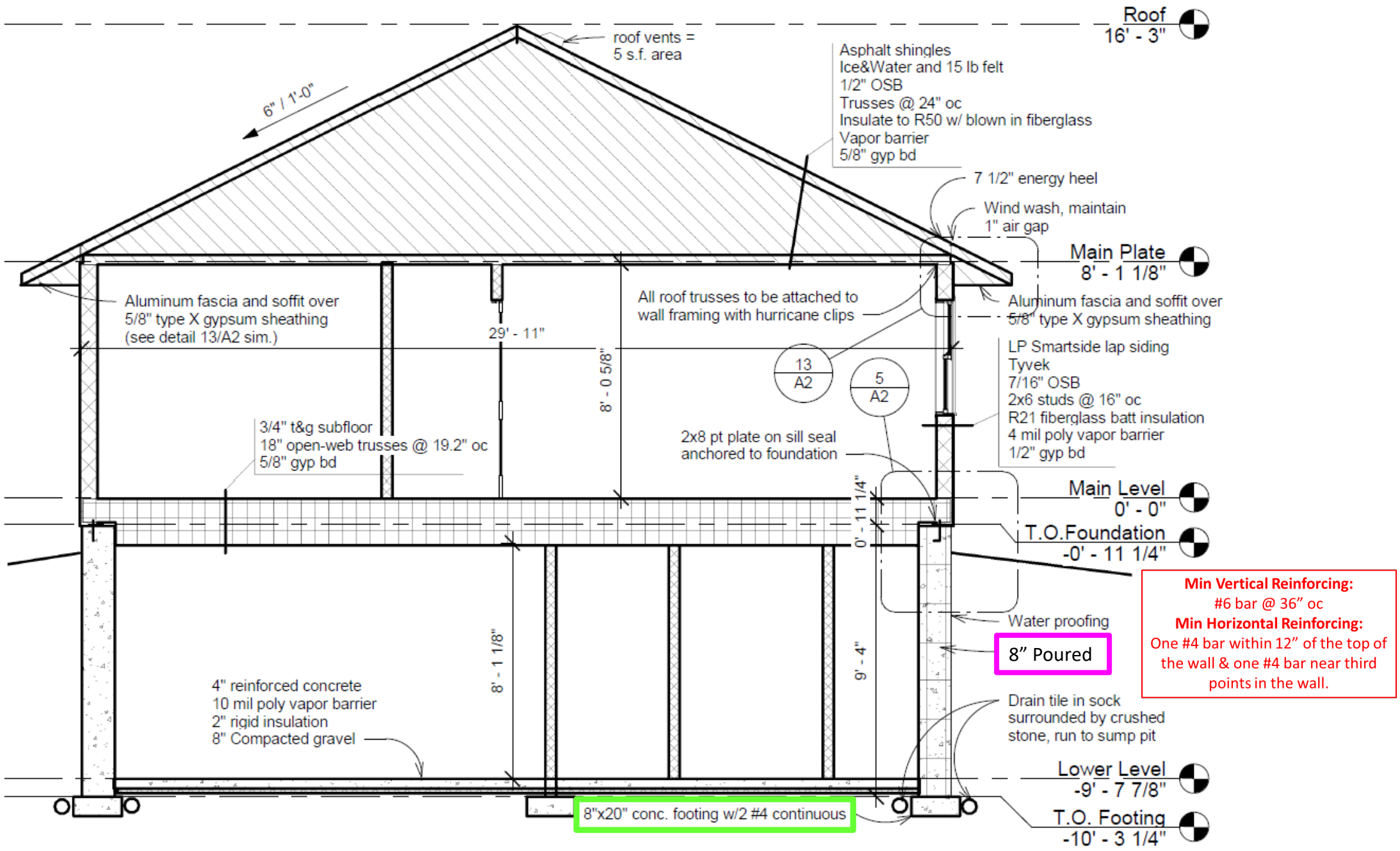
- **R404.1.7 Backfill placement.** Backfill shall not be placed against the wall until the wall has sufficient strength and has been anchored to the floor above, or has been sufficiently braced to prevent damage by the backfill.
  - Exception: Bracing is not required for walls supporting less than 4 feet (1219 mm) of unbalanced backfill.





Notes:
- Structural notes on plans have been supplied by building supply company and entered onto plans by draftsman.
- Contractors to comply with current codes.

1 Lower Level
1/4" = 1'-0"

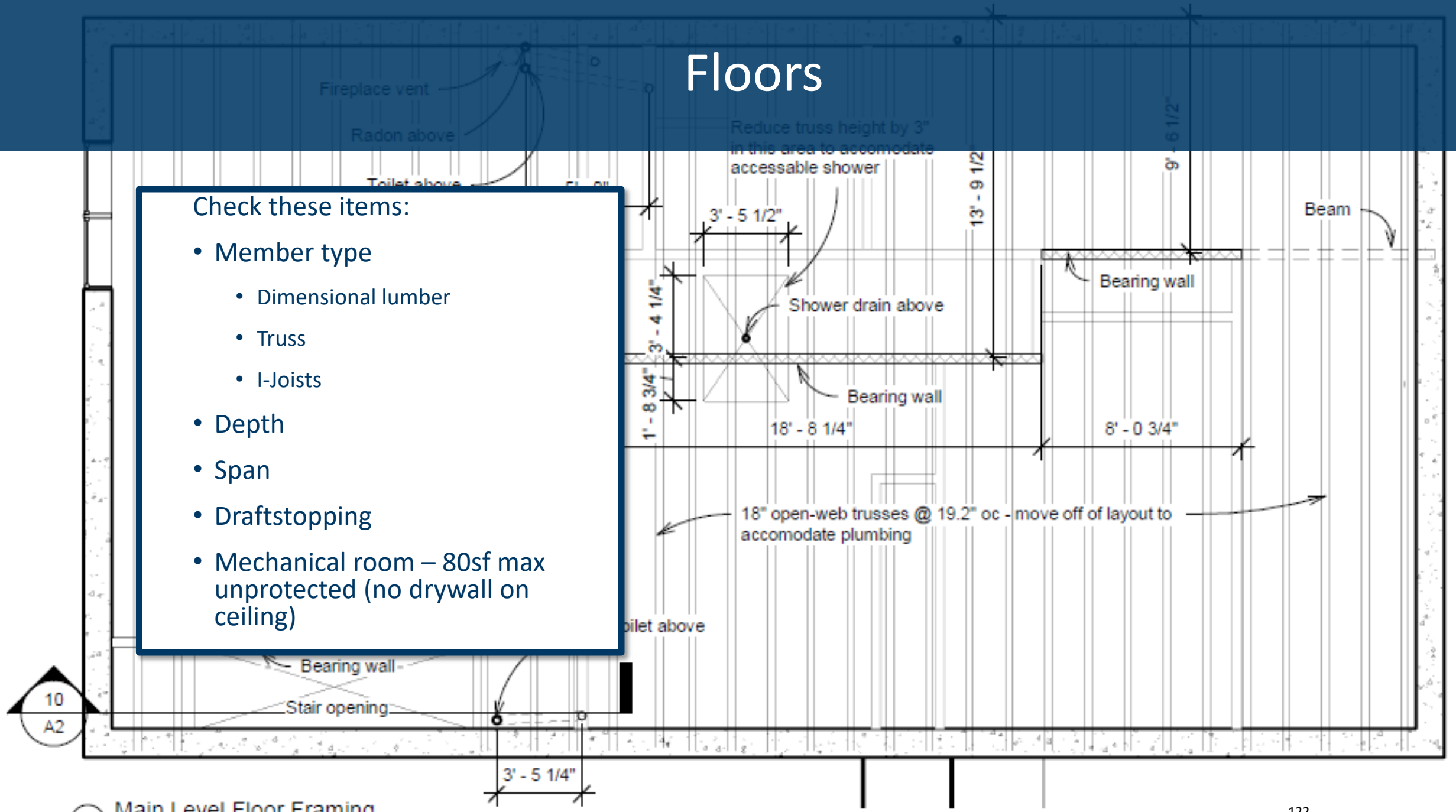


8 Section 1
1/4" = 1'-0"

Floors – Chapter 5

https://andersontrussnc.com/floor-trusses/

Floors



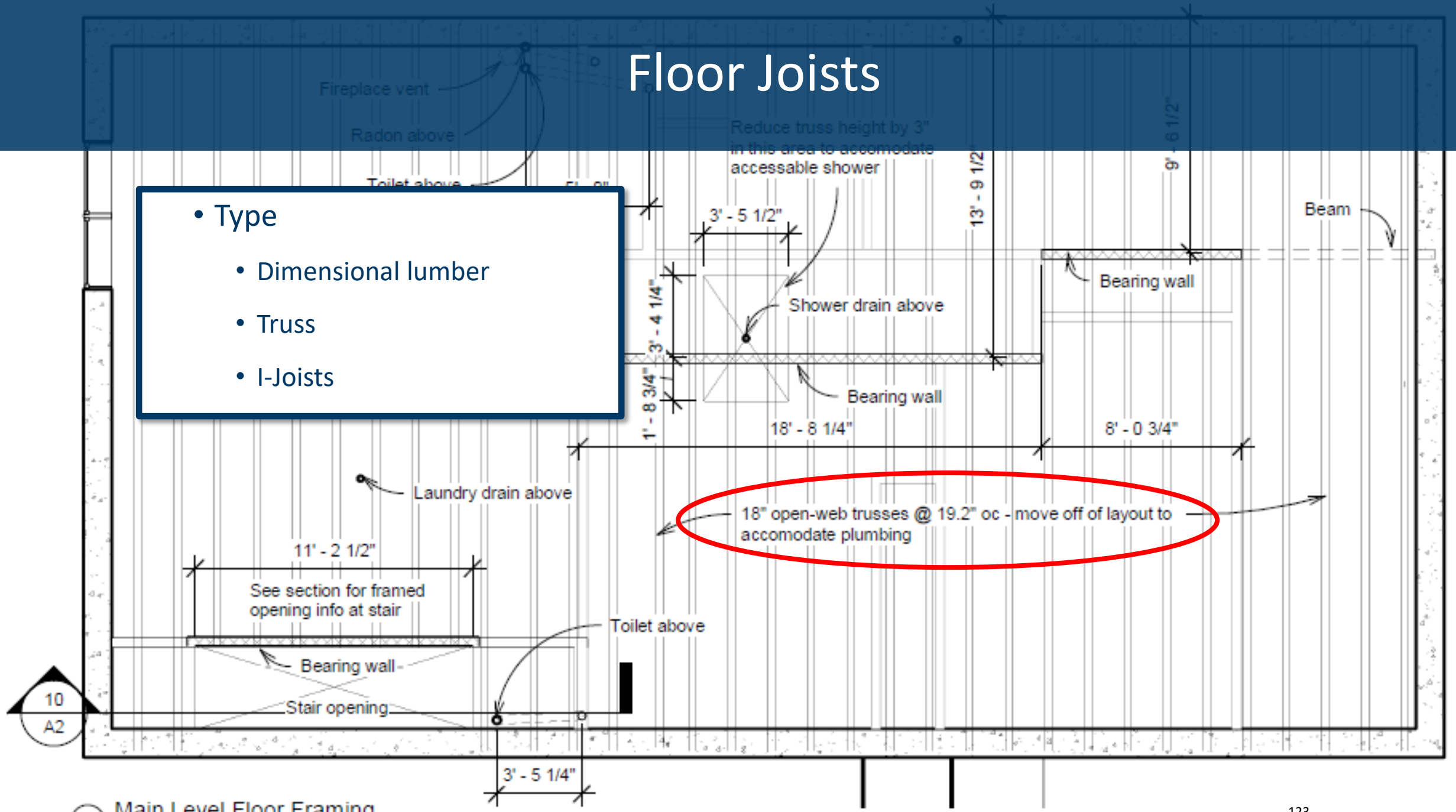
Check these items:

- Member type
  - Dimensional lumber
  - Truss
  - I-Joists
- Depth
- Span
- Draftstopping
- Mechanical room – 80sf max unprotected (no drywall on ceiling)

4 Main Level Floor Framing
3/16" = 1'-0"

Floor Joists

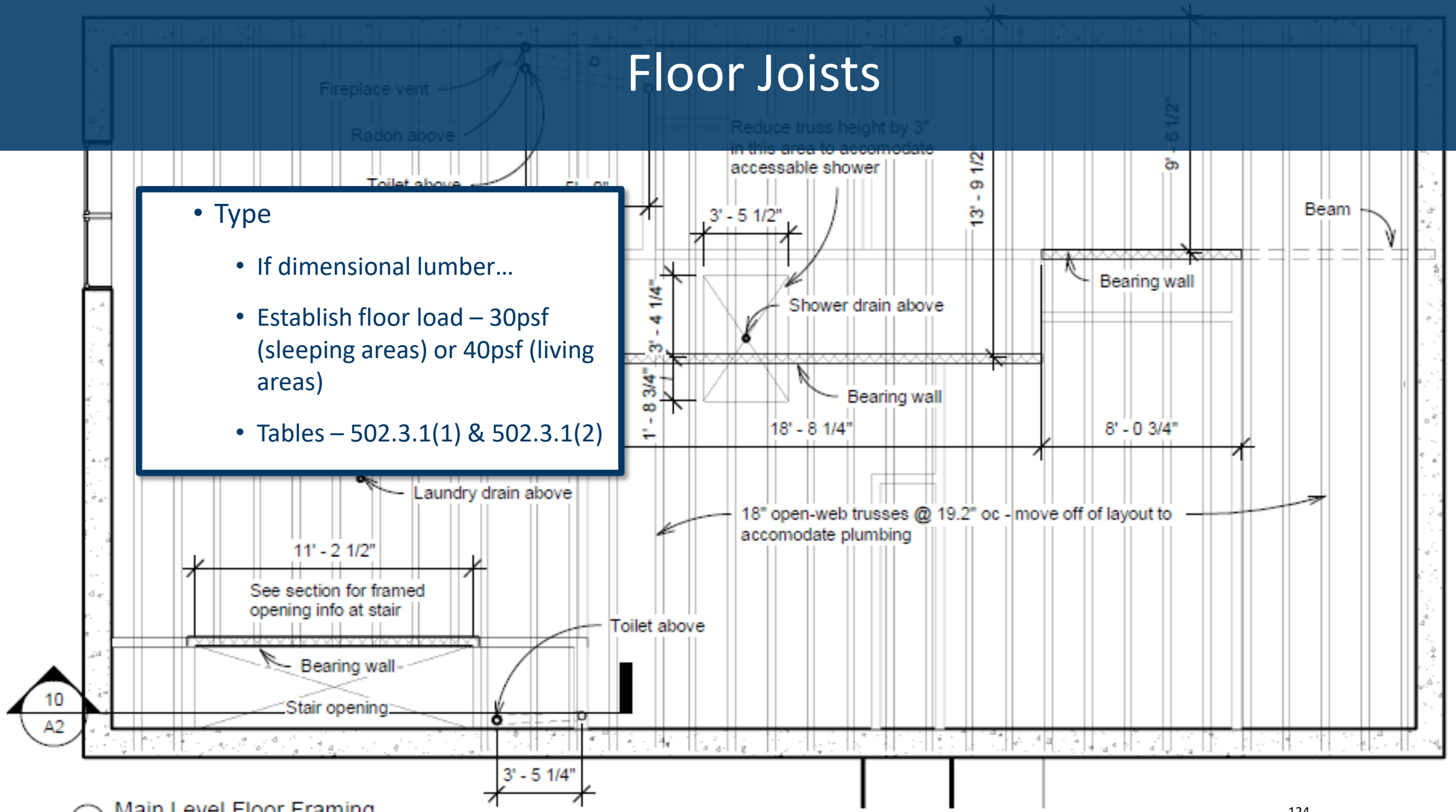
- Type
  - Dimensional lumber
  - Truss
  - I-Joists



4 Main Level Floor Framing
3/16" = 1'-0"

Floor Joists

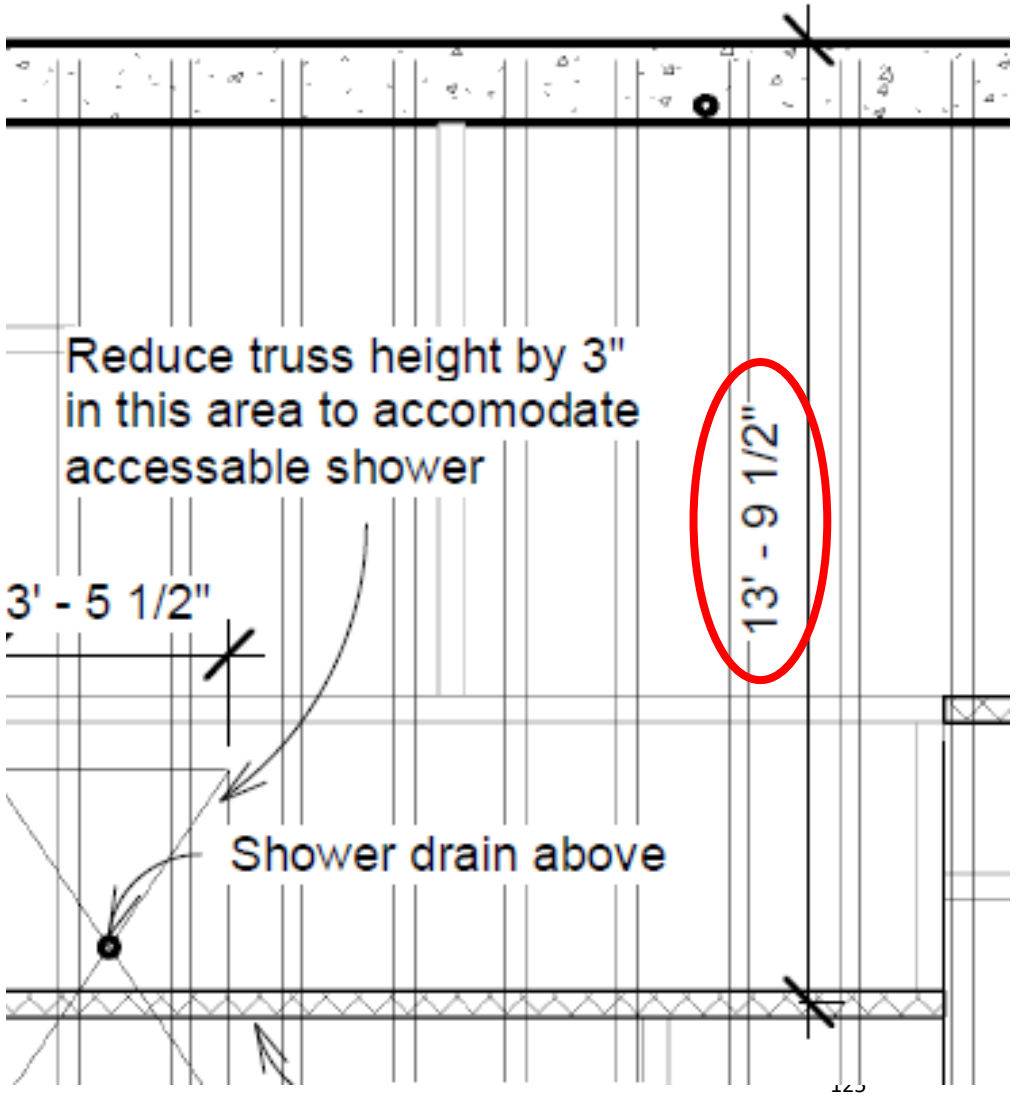
- Type
  - If dimensional lumber…
  - Establish floor load – 30psf (sleeping areas) or 40psf (living areas)
  - Tables – 502.3.1(1) & 502.3.1(2)



4 Main Level Floor Framing
3/16" = 1'-0"

Floors

- Tables – 502.3.1(1) & 502.3.1(2)
- Main floor – 40psf
  - Table 502.3.1(2)
  - Let's imagine plans specified dimensional lumber floor joists for the example. Check span.



- Tables – 502.3.1(1) & 502.3.1(2)
- Main floor – 40psf
  - Table 502.3.1(2)
  - Let's imagine plans said 2x10 #2 SPF floor joists, 16" oc.
  - Check span.
- Plans indicated span of 13'-9$\frac{1}{2}$"
  - 2x10 #2 SPF floor joists, 16" oc complies with a 10psf dead load.
  - Still complies if the load increases to a 20psf dead load.

TABLE R502.3.1(2)
FLOOR JOIST SPANS FOR COMMON LUMBER SPECIES
(Residential living areas, live load = 40 psf, L/Δ = 360)[b]

JOIST SPACING (inches)	SPECIES AND GRADE		DEAD LOAD = 10 psf				DEAD LOAD = 20 psf			
			2 × 6	2 × 8	2 × 10	2 × 12	2 × 6	2 × 8	2 × 10	2 × 12
			Maximum floor joist spans							
			(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)
12	Douglas fir-larch	SS	11-4	15-0	19-1	23-3	11-4	15-0	19-1	23-3
	Douglas fir-larch	#1	10-11	14-5	18-5	22-0	10-11	14-2	17-4	20-1
	Douglas fir-larch	#2	10-9	14-2	18-0	20-11	10-8	13-6	16-5	19-1
	Douglas fir-larch	#3	8-11	11-3	13-9	16-0	8-1	10-3	12-7	14-7
	Hem-fir	SS	10-9	14-2	18-0	21-11	10-9	14-2	18-0	21-11
	Hem-fir	#1	10-6	13-10	17-8	21-6	10-6	13-10	17-1	19-10
	Hem-fir	#2	10-0	13-2	16-10	20-4	10-0	13-1	16-0	18-6
	Hem-fir	#3	8-8	11-0	13-5	15-7	7-11	10-0	12-3	14-3
	Southern pine	SS	11-2	14-8	18-9	22-10	11-2	14-8	18-9	22-10
	Southern pine	#1	10-9	14-2	18-0	21-11	10-9	14-2	16-11	20-1
	Southern pine	#2	10-3	13-6	16-2	19-1	9-10	12-6	14-9	17-5
	Southern pine	#3	8-2	10-3	12-6	14-9	7-5	9-5	11-5	13-6
	Spruce-pine-fir	SS	10-6	13-10	17-8	21-6	10-6	13-10	17-8	21-6
	Spruce-pine-fir	#1	10-3	13-6	17-3	20-7	10-3	13-3	16-3	18-10
	Spruce-pine-fir	#2	10-3	13-6	17-3	20-7	10-3	13-3	16-3	18-10
	Spruce-pine-fir	#3	8-8	11-0	13-5	15-7	7-11	10-0	12-3	14-3
16	Douglas fir-larch	SS	10-4	13-7	17-4	21-1	10-4	13-7	17-4	21-1
	Douglas fir-larch	#1	9-11	13-1	16-5	19-1	9-8	12-4	15-0	17-5
	Douglas fir-larch	#2	9-9	12-9	15-7	18-1	9-3	11-8	14-3	16-6
	Douglas fir-larch	#3	7-8	9-9	11-11	13-10	7-0	8-11	10-11	12-7
	Hem-fir	SS	9-9	12-10	16-5	19-11	9-9	12-10	16-5	19-11
	Hem-fir	#1	9-6	12-7	16-0	18-10	9-6	12-2	14-10	17-2
	Hem-fir	#2	9-1	12-0	15-2	17-7	8-11	11-4	13-10	16-1
	Hem-fir	#3	7-6	9-6	11-8	13-6	6-10	8-8	10-7	12-4
	Southern pine	SS	10-2	13-4	17-0	20-9	10-2	13-4	17-0	20-9
	Southern pine	#1	9-9	12-10	16-1	19-1	9-9	12-7	14-8	17-5
	Southern pine	#2	9-4	11-10	14-0	16-6	8-6	10-10	12-10	15-1
	Southern pine	#3	7-1	8-11	10-10	12-10	6-5	8-2	9-10	11-8
	Spruce-pine-fir	SS	9-6	12-7	16-0	19-6	9-6	12-7	16-0	19-6
	Spruce-pine-fir	#1	9-4	12-3	15-5	17-10	9-1	11-6	14-1	16-3
	Spruce-pine-fir	#2	9-4	12-3	15-5	17-10	9-1	11-6	14-1	16-3
	Spruce-pine-fir	#3	7-6	9-6	11-8	13-6	6-10	8-8	10-7	12-4

Floors

- Plans indicate 18” open web truss.
- Truss specs will need to be reviewed, and may or may not be included with submittal.

https://www.midwestmanufacturing.com/MidwestWebsite/productType.do?productGroupId=7

Floors

https://www.fp-supply.com/kansas-city-tji-i-joist.html

- Plan submittals indicating I-Joists should include the spec book and installation instructions, along with the size and model of the members to be used.
- Cross check spans on drawings with allowable spans in spec book.

Floors - Draftstopping

- A simple note or stamp would be well to add to the plans…

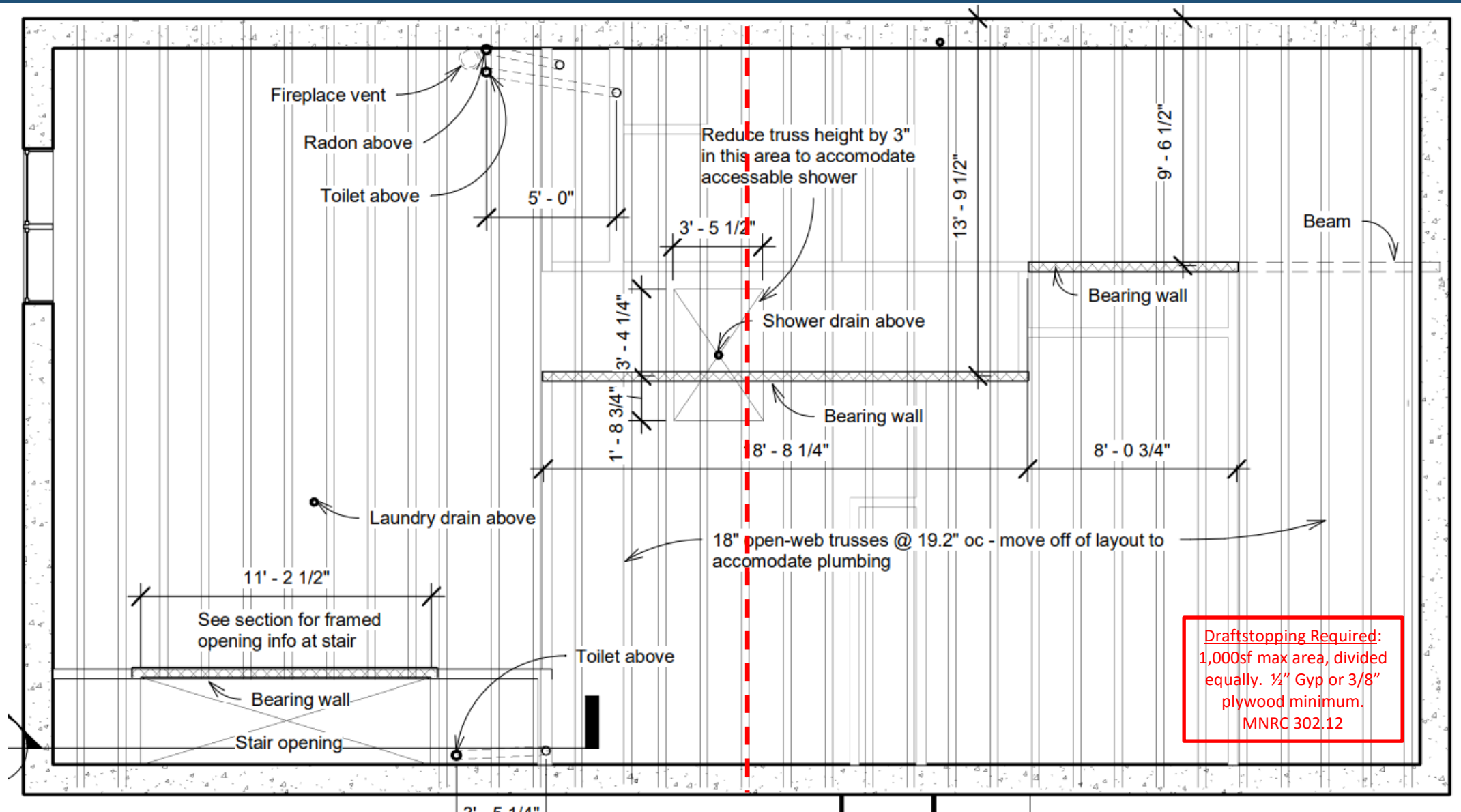
Draftstopping Required:
1,000sf max area, divided equally. ½" Gyp or 3/8" plywood minimum.
MNRC 302.12

R302.12 Draftstopping. In combustible construction where there is usable space both above and below the concealed space of a floor-ceiling assembly, draftstops shall be installed so that the area of the concealed space does not exceed 1,000 square feet (92.9 m^2). Draftstopping shall divide the concealed space into approximately equal areas. Where the assembly is enclosed by a floor membrane above and a ceiling membrane below, draftstopping shall be provided in floor-ceiling assemblies under the following circumstances:

1. Ceiling is suspended under the floor framing.
2. Floor framing is constructed of truss-type open-web or perforated members.

R302.12.1 Materials. Draftstopping materials shall be not less than $^1/_2$-inch (12.7 mm) gypsum board, $^3/_8$-inch (9.5 mm) wood structural panels or other *approved* materials adequately supported. Draftstopping shall be installed parallel to the floor framing members unless otherwise *approved* by the *building official*. The integrity of the draftstops shall be maintained.

Floors - Draftstopping



Floors - Fire Protection

R302.13 Fire protection of floors. Floor assemblies that are not required elsewhere in this code to be fire-resistance rated, shall be provided with a $^{1}/_{2}$-inch (12.7 mm) gypsum wallboard membrane, $^{5}/_{8}$-inch (16 mm) wood structural panel membrane, or equivalent on the underside of the floor framing member. Penetrations or openings for ducts, vents, electrical outlets, lighting, devices, luminaires, wires, speakers, drainage, piping and similar openings or penetrations shall be permitted.

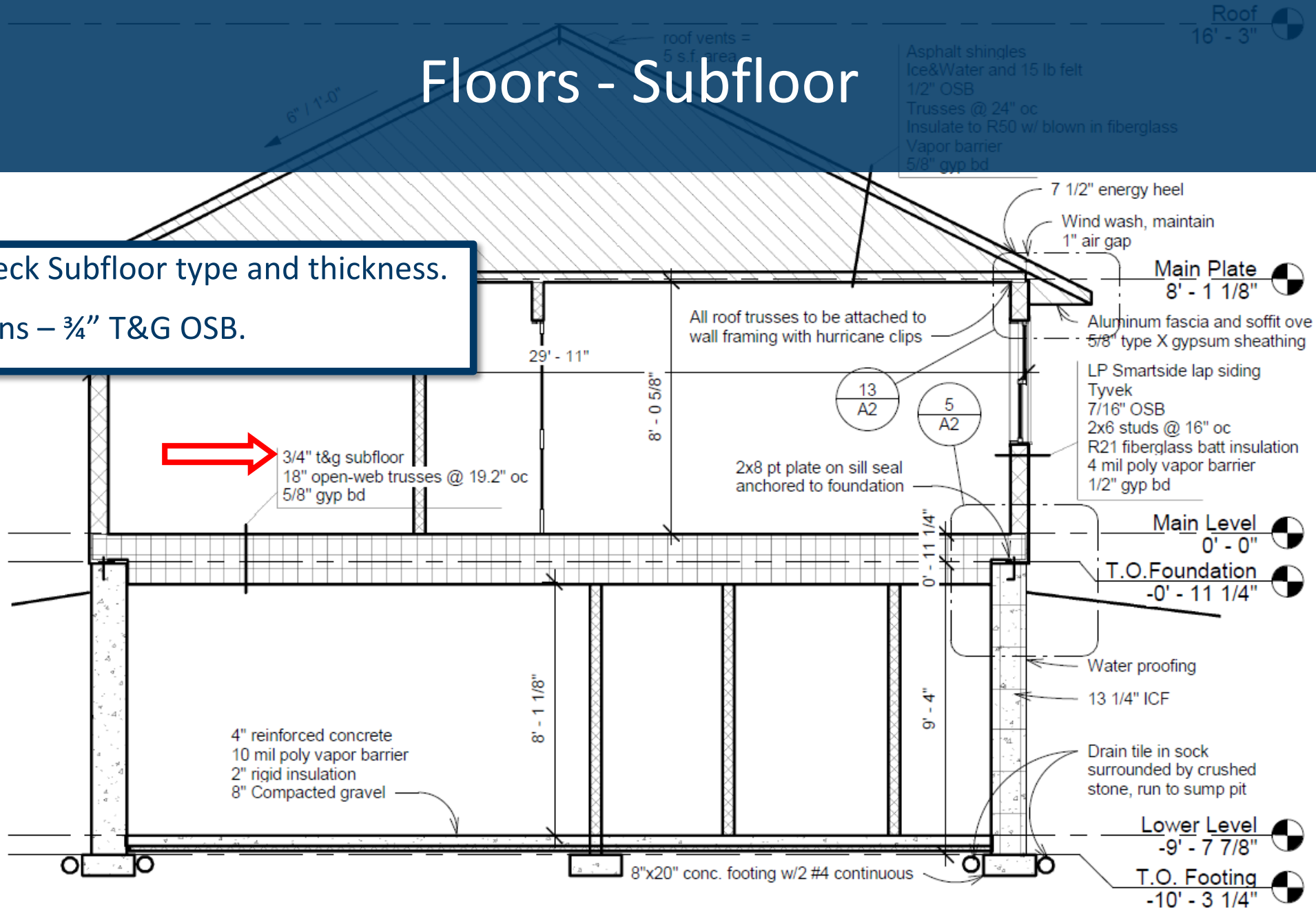
Exceptions:

1. Floor assemblies located directly over a space protected by an automatic sprinkler system in accordance with Section P2904, NFPA 13D, or other approved equivalent sprinkler system.
2. Floor assemblies located directly over a crawl space not intended for storage or for the installation of fuel-fired or electric-powered heating appliances.
3. Portions of floor assemblies shall be permitted to be unprotected where complying with the following:
   - 3.1. The aggregate area of the unprotected portions does not exceed 80 square feet (7.4 m^2) per story.
   - 3.2. Fireblocking in accordance with Section R302.11.1 is installed along the perimeter of the unprotected portion to separate the unprotected portion from the remainder of the floor assembly.
4. Wood floor assemblies using dimension lumber or structural composite lumber equal to or greater than 2-inch by 10-inch (50.8 mm by 254 mm) nominal dimension, or other approved floor assemblies demonstrating equivalent fire performance.

Fire Protection Required – ½" Gyp:
Max 80sf unprotected when perimeter is blocked to subfloor.
Exception: 2x10 lumber joists.
MNRC 302.12

Floors - Subfloor

- Check Subfloor type and thickness.
- Plans – ¾” T&G OSB.



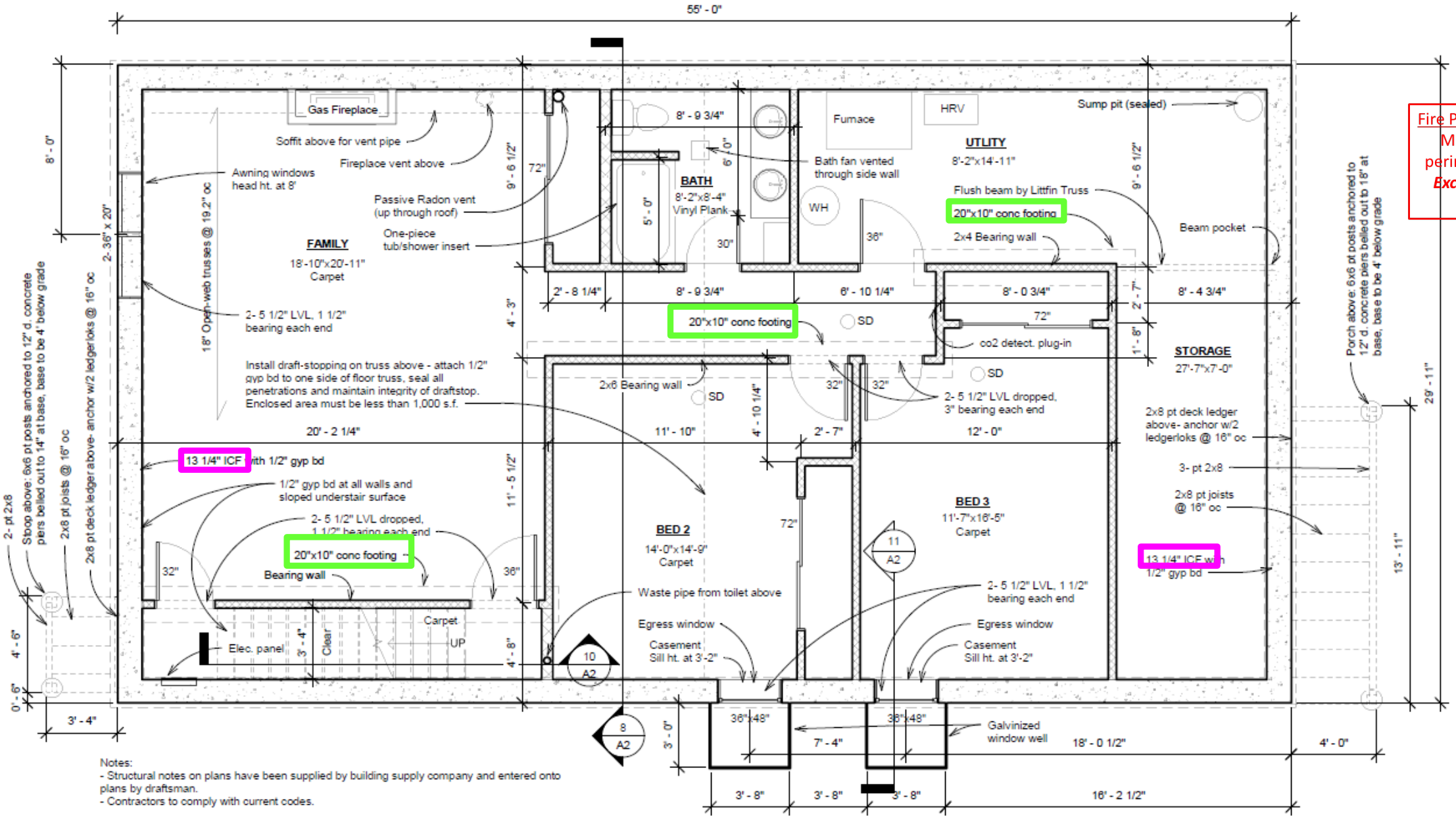
8 Section 1
1/4" = 1'-0"

Floors - Subfloor

- Check Subfloor type and thickness.
- Plans – ¾” T&G OSB.
- Floor truss are 19.2” oc – complies.

TABLE R503.2.1.1(1)
ALLOWABLE SPANS AND LOADS FOR WOOD STRUCTURAL PANELS FOR ROOF AND SUBFLOOR SHEATHING AND COMBINATION SUBFLOOR UNDERLAYMENT[a, b, c]

SPAN RATING	MINIMUM NOMINAL PANEL THICKNESS (inch)	ALLOWABLE LIVE LOAD (psf)[h, i]		MAXIMUM SPAN (inches)		LOAD (pounds per square foot, at maximum span)		MAXIMUM SPAN (inches)
		SPAN @ 16″ o.c.	SPAN @ 24″ o.c.	With edge support[d]	Without edge support	Total load	Live load	
Sheathing[e]				Roof[f]				Subfloor[j]
16/0	3/8	30	—	16	16	40	30	0
20/0	3/8	50	—	20	20	40	30	0
24/0	3/8	100	30	24	20[g]	40	30	0
24/16	7/16	100	40	24	24	50	40	16
32/16	15/32, 1/2	180	70	32	28	40	30	16[h]
40/20	19/32, 5/8	305	130	40	32	40	30	20[h, i]
48/24	23/32, 3/4	—	175	48	36	45	35	24
60/32	7/8	—	305	60	48	45	35	32
Underlayment, C-C plugged, single floor[e]				Roof[f]				Combination subfloor underlayment[k]
16 o.c.	19/32, 5/8	100	40	24	24	50	40	16[i]
20 o.c.	19/32, 5/8	150	60	32	32	40	30	20[i, j]
24 o.c.	23/32, 3/4	240	100	48	36	35	25	24
32 o.c.	7/8	—	185	48	40	50	40	32
48 o.c.	1 3/32, 1 1/8	—	290	60	48	50	40	48

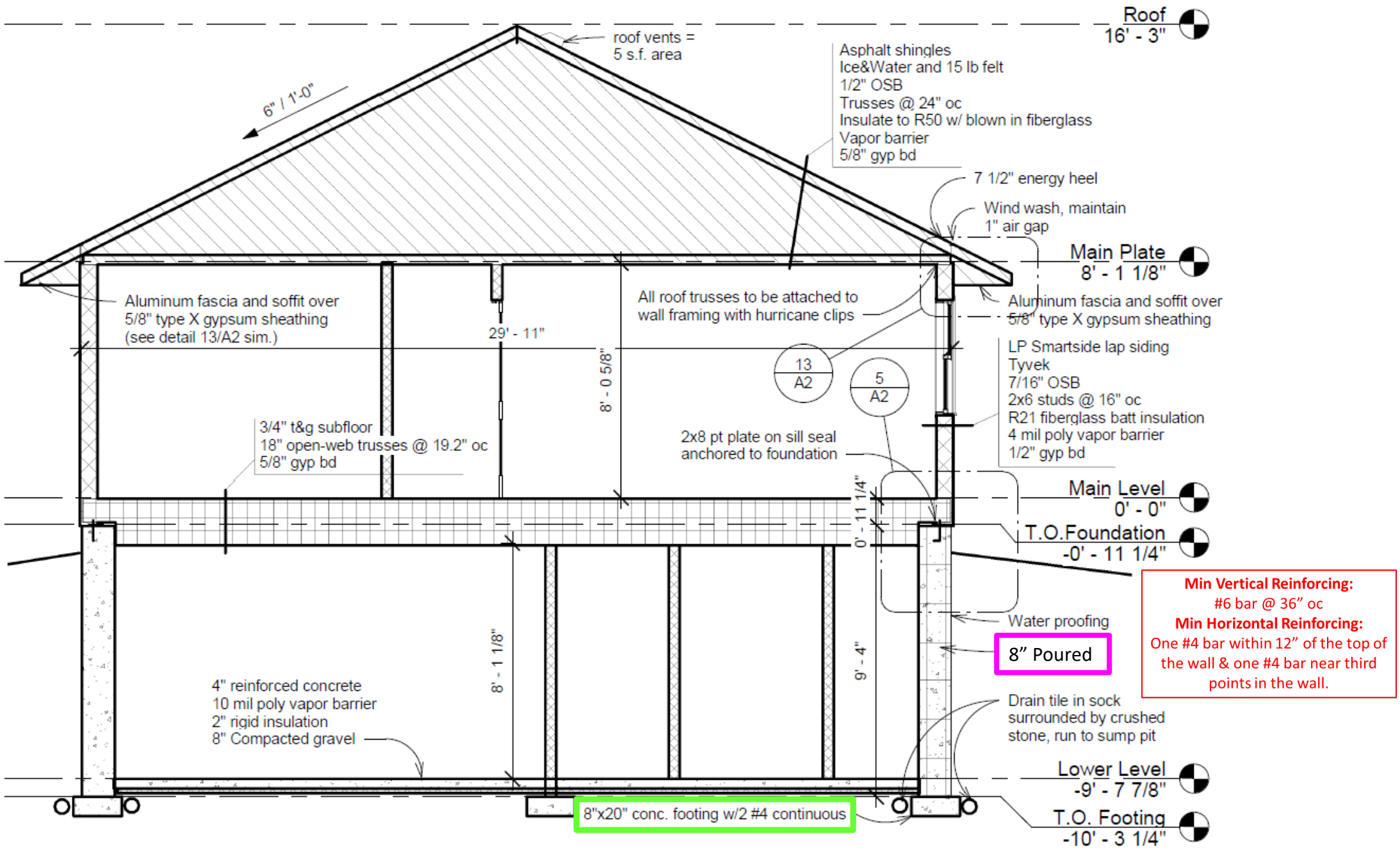


Notes:
- Structural notes on plans have been supplied by building supply company and entered onto plans by draftsman.
- Contractors to comply with current codes.

① Lower Level
1/4" = 1'-0"

Draftstopping Required: 1,000sf max area, divided equally. ½" Gyp or 3/8" plywood minimum. MNRC 302.12

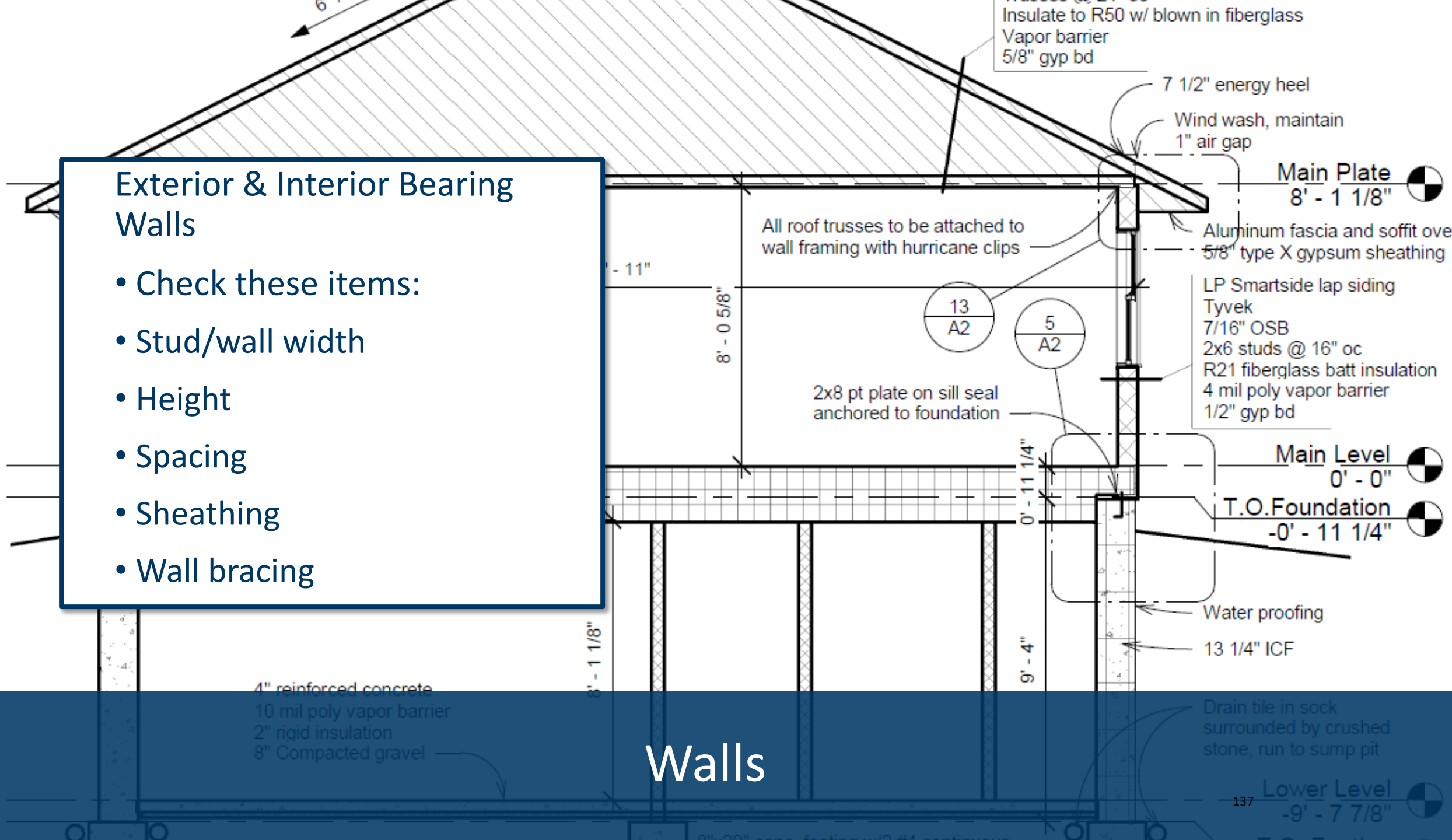
Fire Protection Required – ½" Gyp: Max 80sf unprotected when perimeter is blocked to subfloor. ***Exception:*** 2x10 lumber joists. MNRC 302.12



8 Section 1
1/4" = 1'-0"

http://www.pfconstructionservices.com/our-services/home-framing-services/

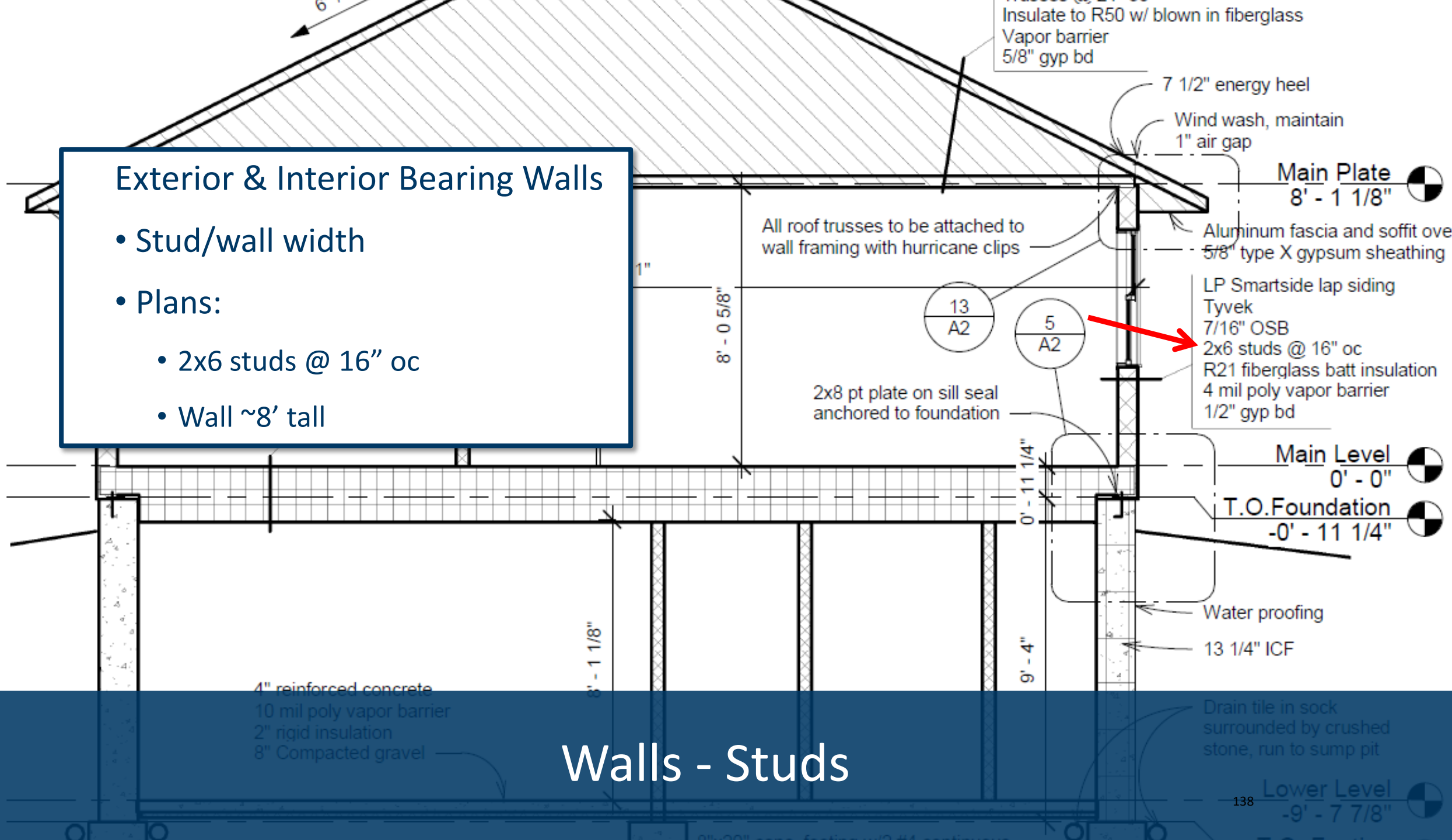
Walls – Chapter 6



Exterior & Interior Bearing Walls

- Check these items:
- Stud/wall width
- Height
- Spacing
- Sheathing
- Wall bracing

Walls



Exterior & Interior Bearing Walls

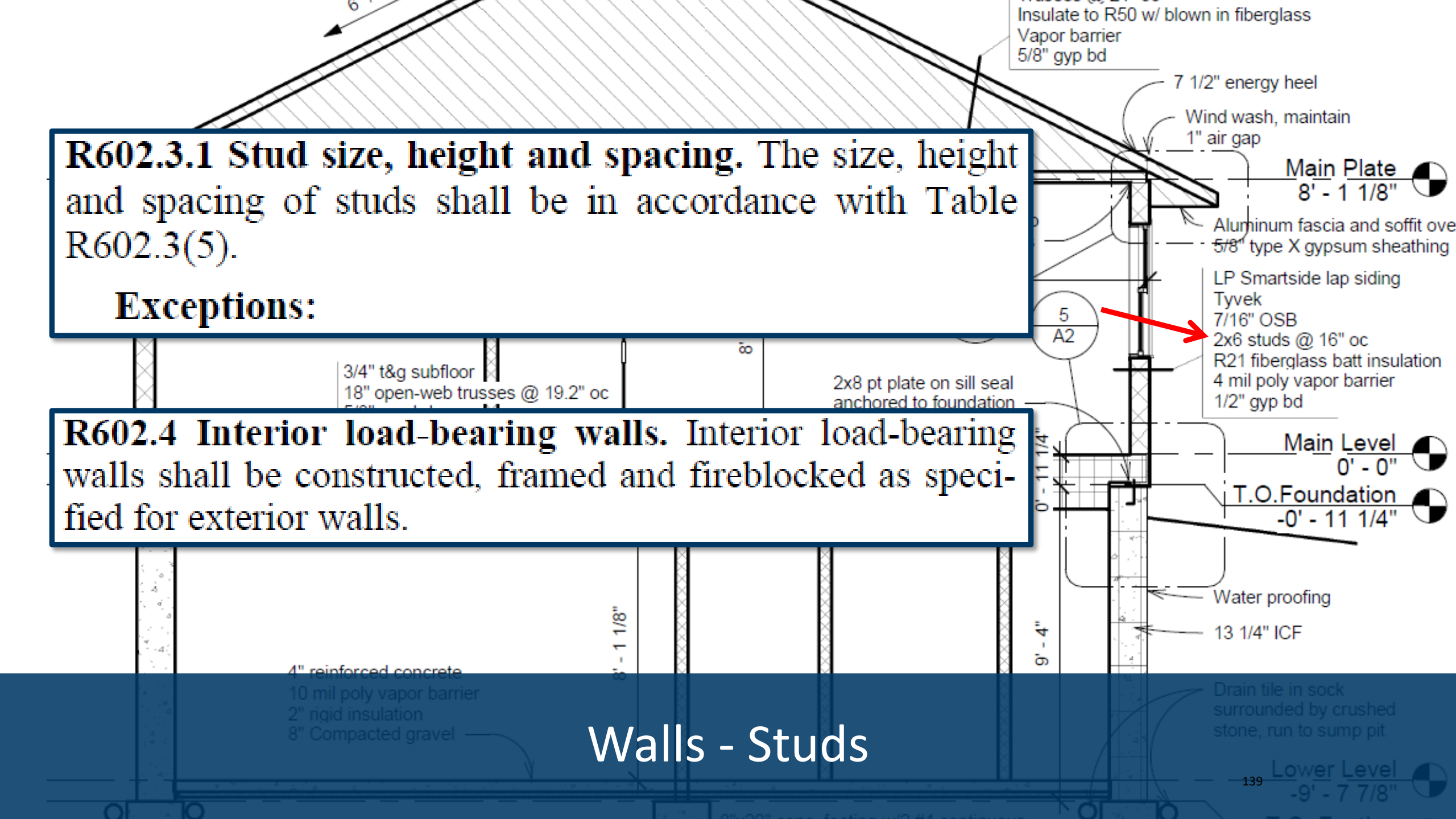
- Stud/wall width
- Plans:
  - 2x6 studs @ 16” oc
  - Wall ~8’ tall

Walls - Studs

R602.3.1 Stud size, height and spacing. The size, height and spacing of studs shall be in accordance with Table R602.3(5).

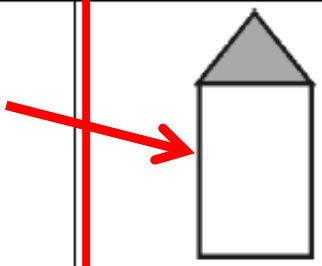
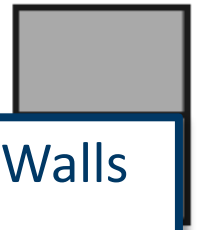
Exceptions:

R602.4 Interior load-bearing walls. Interior load-bearing walls shall be constructed, framed and fireblocked as specified for exterior walls.



Walls - Studs

TABLE R602.3(5)
SIZE, HEIGHT AND SPACING OF WOOD STUDS[a]

STUD SIZE (inches)	BEARING WALLS					NONBEARING WALLS	
	Laterally unsupported stud height[a] (feet)	Maximum spacing where supporting a roof-ceiling assembly or a habitable attic assembly, only (inches)	Maximum spacing where supporting one floor, plus a roof-ceiling assembly or a habitable attic assembly (inches)	Maximum spacing where supporting two floors, plus a roof-ceiling assembly or a habitable attic assembly (inches)	Maximum spacing where supporting one floor height[a] (inches)	Laterally unsupported stud height[a] (feet)	Maximum spacing (inches)
							
2 × 3[b]	—	—				10	16
2 × 4	10	24[c]				14	24
3 × 4	10	24				14	24
2 × 5	10	24				16	24
2 × 6	10	24				20	24

Exterior & Interior Bearing Walls

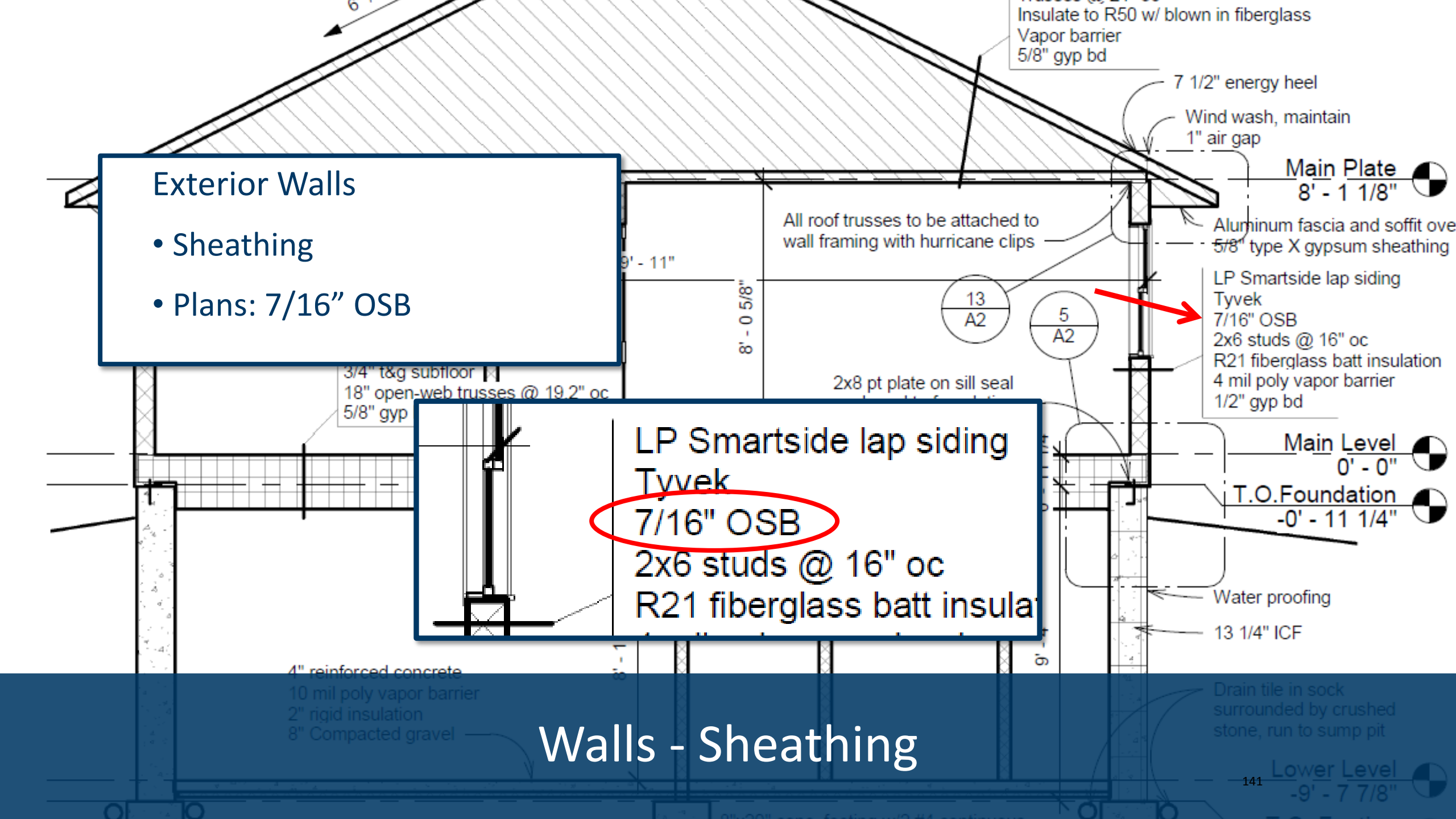
- Stud/wall width
- Plans:
  - 2x6 studs @ 16” oc **OK**
  - Wall ~8’ tall **OK**

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

a. Listed heights are distances between points of lateral support placed perpendicular to the plane of the wall. Bearing walls shall be sheathed on not less than one side or bridging shall be installed not greater than 4 feet apart measured vertically from either end of the stud. Increases in unsupported height are permitted where in compliance with Exception 2 of Section R602.3.1 or designed in accordance with accepted engineering practice.

b. Shall not be used in exterior walls.

c. A habitable attic assembly supported by 2 × 4 studs is limited to a roof span of 32 feet. Where the roof span exceeds 32 feet, the wall studs shall be increased



Walls - Sheathing

TABLE R602.3(3)
REQUIREMENTS FOR WOOD STRUCTURAL PANEL WALL SHEATHING USED TO RESIST WIND PRESSURES[a, b, c]

MINIMUM NAIL		MINIMUM WOOD STRUCTURAL PANEL SPAN RATING	MINIMUM NOMINAL PANEL THICKNESS (inches)	MAXIMUM WALL STUD SPACING (inches)	PANEL NAIL SPACING		ULTIMATE DESIGN WIND SPEED V_{ult} (mph)		
Size	Penetration (inches)				Edges (inches o.c.)	Field (inches o.c.)	Wind exposure category		
							B	C	D
6d Common (2.0″ × 0.113″)	1.5	24/0	3/8	16	6	12	140	115	110
8d Common (2.5″ × 0.131″)	1.75	24/16	7/16	16	6	12	170	140	135
				24	6	12	140	115	110

For SI: 1 inch = 25.4 mm, 1 mile per hour = 0.447 m/s.

a. Panel strength axis parallel or perpendicular to supports. Three-ply plywood sheathing with studs spaced more than 16 inches on center shall be applied with panel strength axis perpendicular to supports.

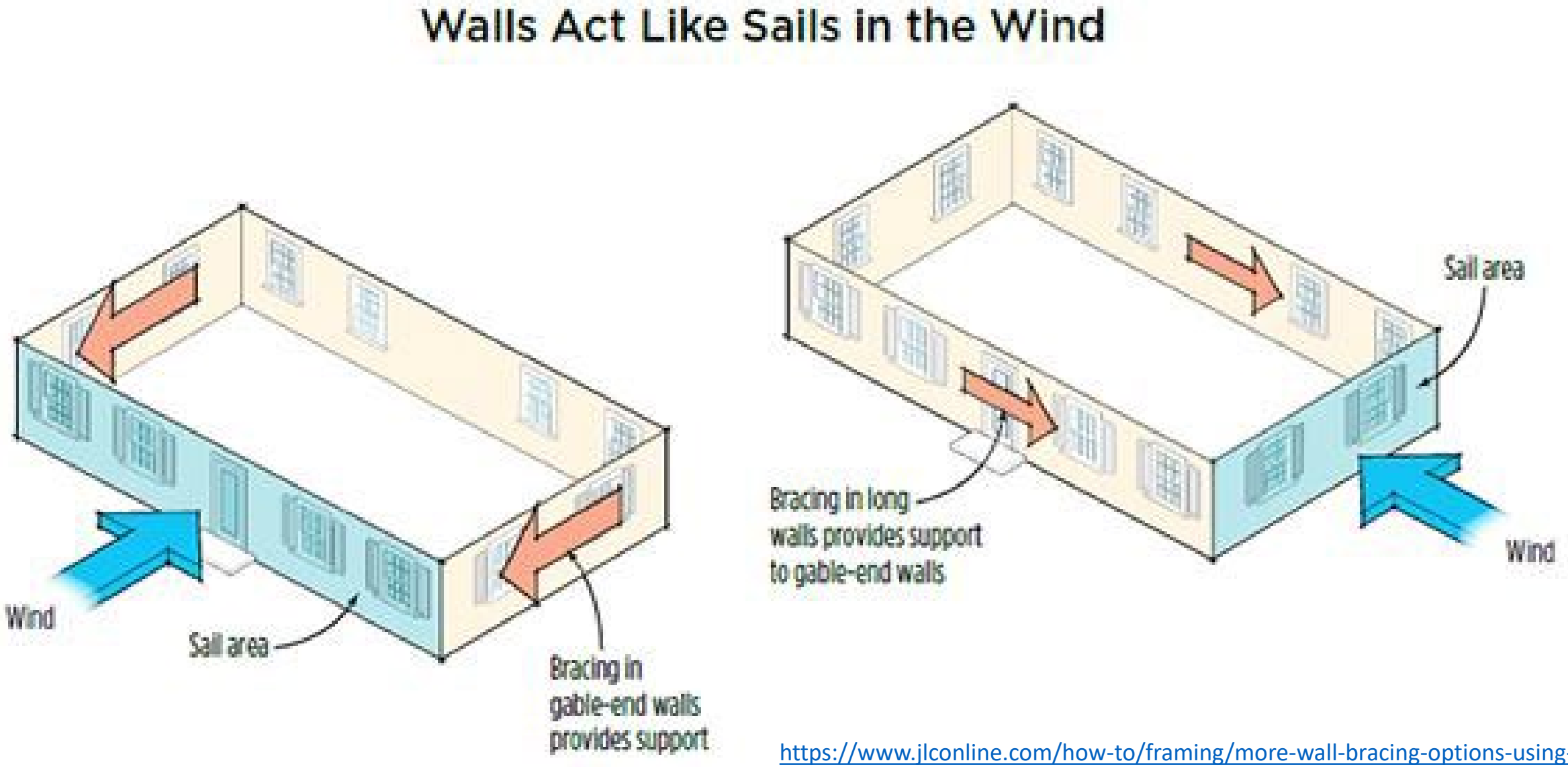
b. Table is based on wind pressu ing surfaces in accordance with Section R301.2. Lateral bracing requirements shall be in accordance with Section R602.10.

c. Wood structural panels with span ratings of Wall-16 or Wall-24 shall be permitted as an alternate to panels with a 24/0 span rating. Plywood siding rated 16 o.c. or 24 o.c. shall be permitted as an alternate to panels with a 24/16 span rating. Wall-16 and Plywood siding 16 o.c. shall be used with studs spaced not

B – Urban Area

Sheathing span | Floor span

Walls - Sheathing



https://www.jlconline.com/how-to/framing/more-wall-bracing-options-using-osb_o

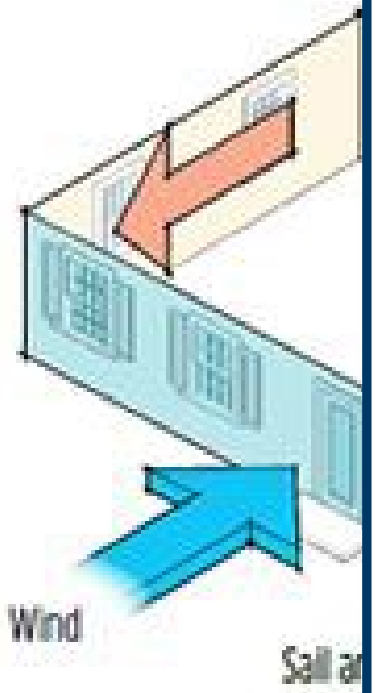
Walls - Bracing

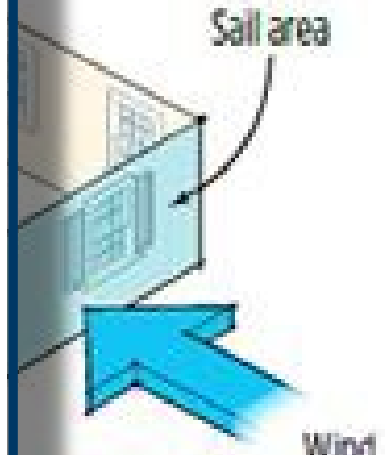
Walls Act Like Sails in the Wind

[RB] BRACED WALL LINE. A straight line through the building plan that represents the location of the lateral resistance provided by the wall bracing.

[RB] BRACED WALL LINE, CONTINUOUSLY SHEATHED. A *braced wall line* with structural sheathing applied to all sheathable surfaces including the areas above and below openings.

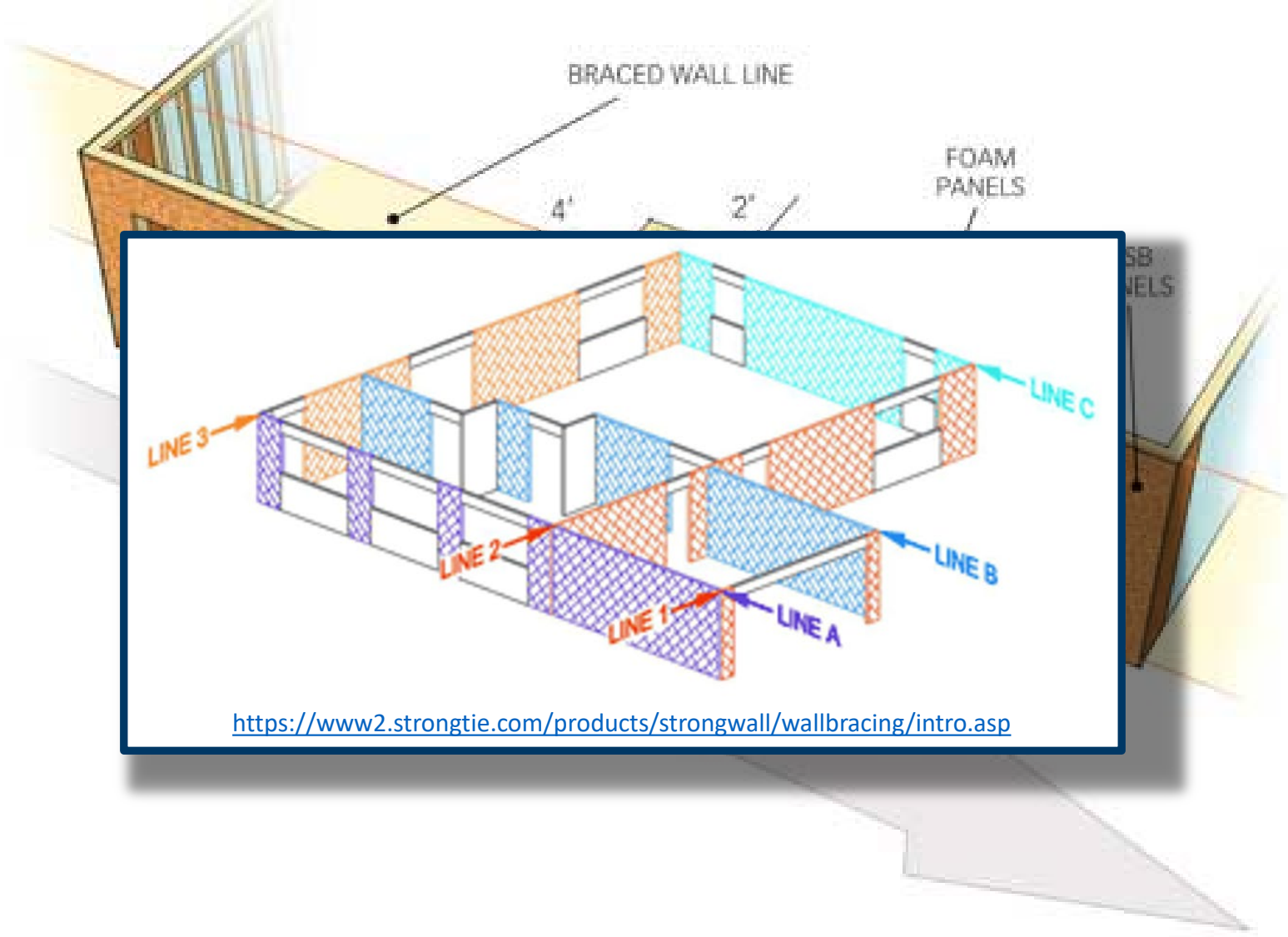
[RB] BRACED WALL PANEL. A full-height section of wall constructed to resist in-plane shear loads through interaction of framing members, sheathing material and anchors. The panel's length meets the requirements of its particular bracing method, and contributes toward the total amount of bracing required along its *braced wall line* in accordance with Section R602.10.1.





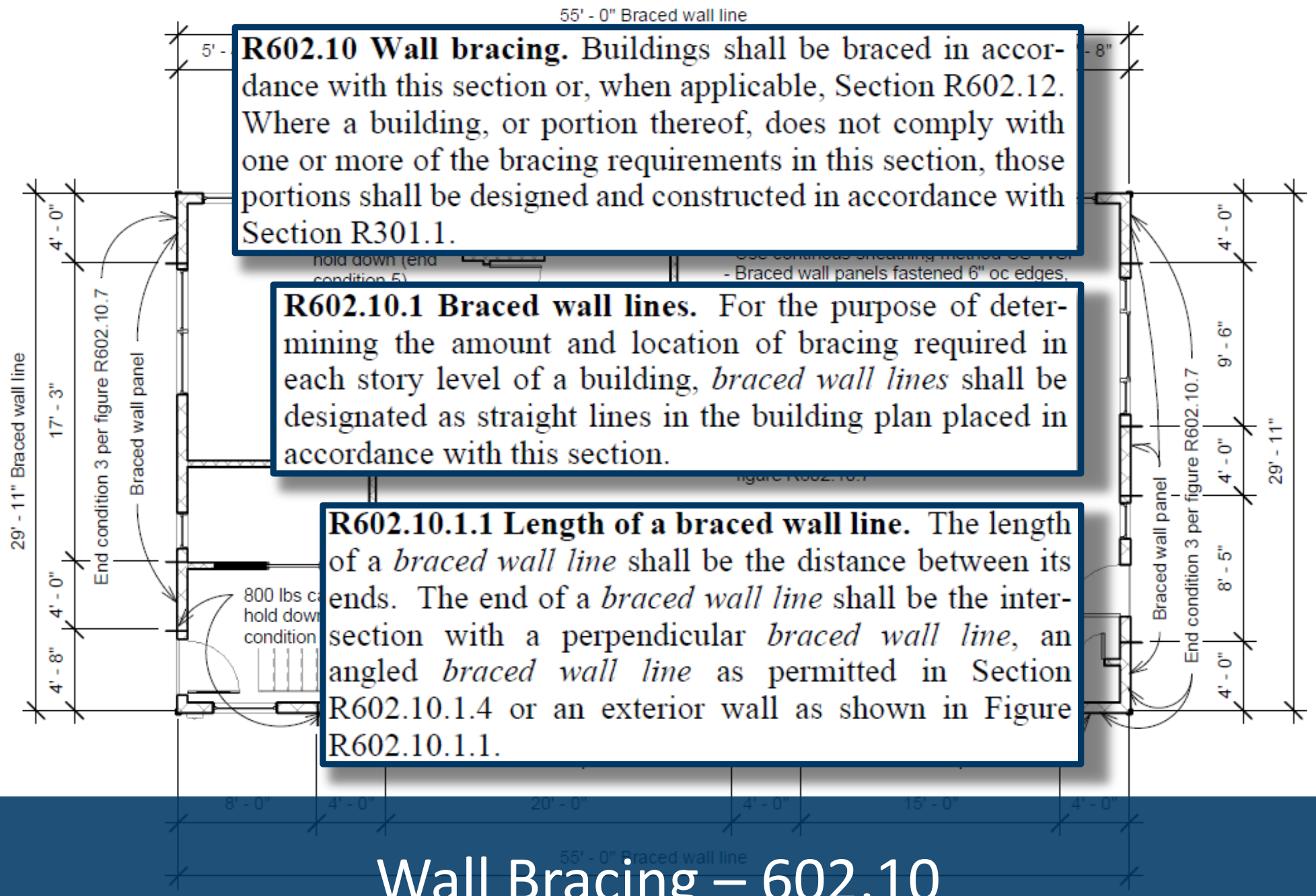
https://www.jlconline.com/how-to/framing/more-wall-bracing-options-using-osb_o

Walls - Bracing



https://www.prosalesmagazine.com/news/industry-trends/build-it-right-bracing-walls-for-wind_o

Walls - Bracing



R602.10 Wall bracing. Buildings shall be braced in accordance with this section or, when applicable, Section R602.12. Where a building, or portion thereof, does not comply with one or more of the bracing requirements in this section, those portions shall be designed and constructed in accordance with Section R301.1.

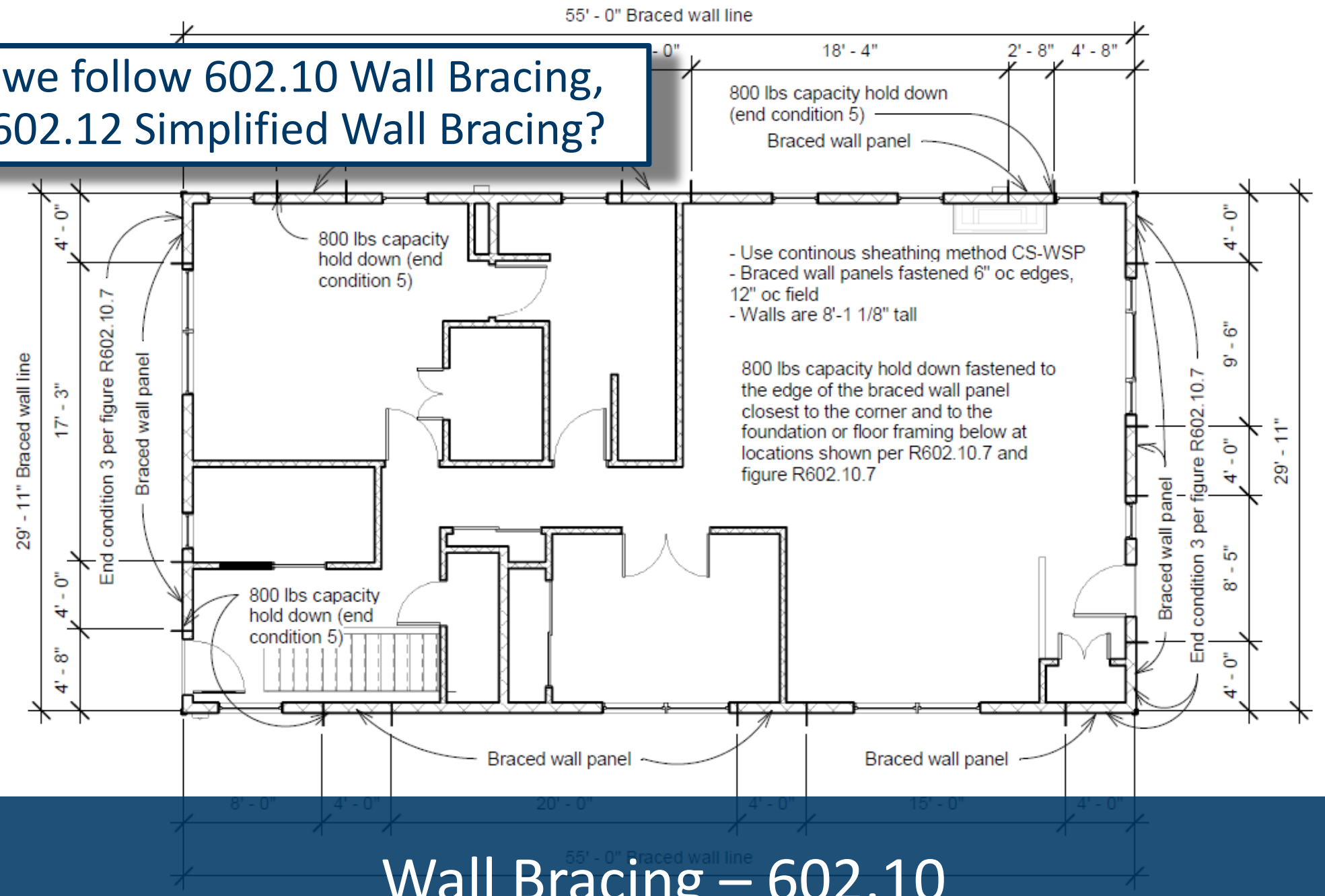
R602.10.1 Braced wall lines. For the purpose of determining the amount and location of bracing required in each story level of a building, *braced wall lines* shall be designated as straight lines in the building plan placed in accordance with this section.

R602.10.1.1 Length of a braced wall line. The length of a *braced wall line* shall be the distance between its ends. The end of a *braced wall line* shall be the intersection with a perpendicular *braced wall line*, an angled *braced wall line* as permitted in Section R602.10.1.4 or an exterior wall as shown in Figure R602.10.1.1.

Wall Bracing – 602.10

10 Main Level Braced
1/8" = 1'-0"

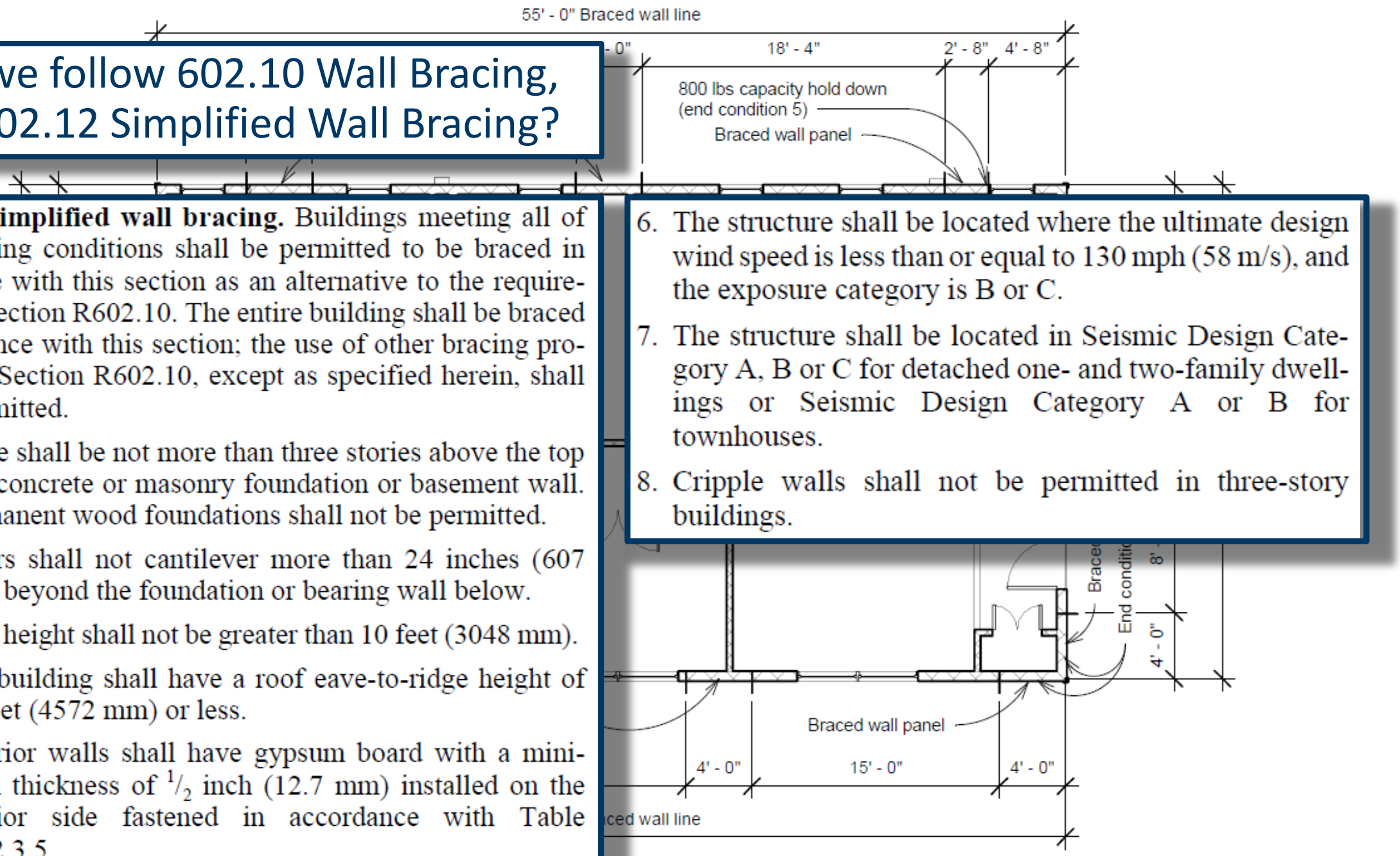
Do we follow 602.10 Wall Bracing, or 602.12 Simplified Wall Bracing?



Wall Bracing – 602.10

10 Main Level Braced
1/8" = 1'-0"

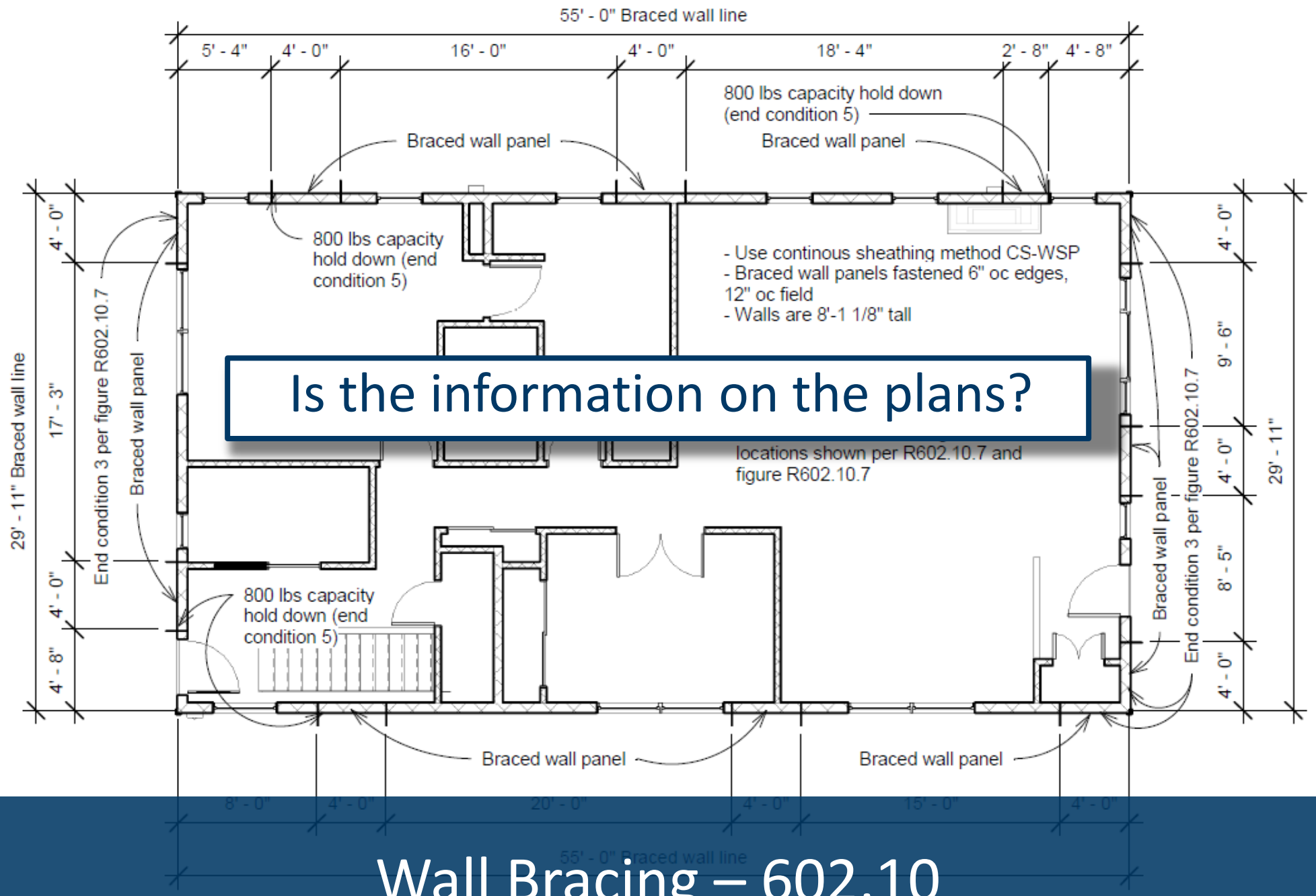
Do we follow 602.10 Wall Bracing, or 602.12 Simplified Wall Bracing?



R602.12 Simplified wall bracing. Buildings meeting all of the following conditions shall be permitted to be braced in accordance with this section as an alternative to the requirements of Section R602.10. The entire building shall be braced in accordance with this section; the use of other bracing provisions of Section R602.10, except as specified herein, shall not be permitted.

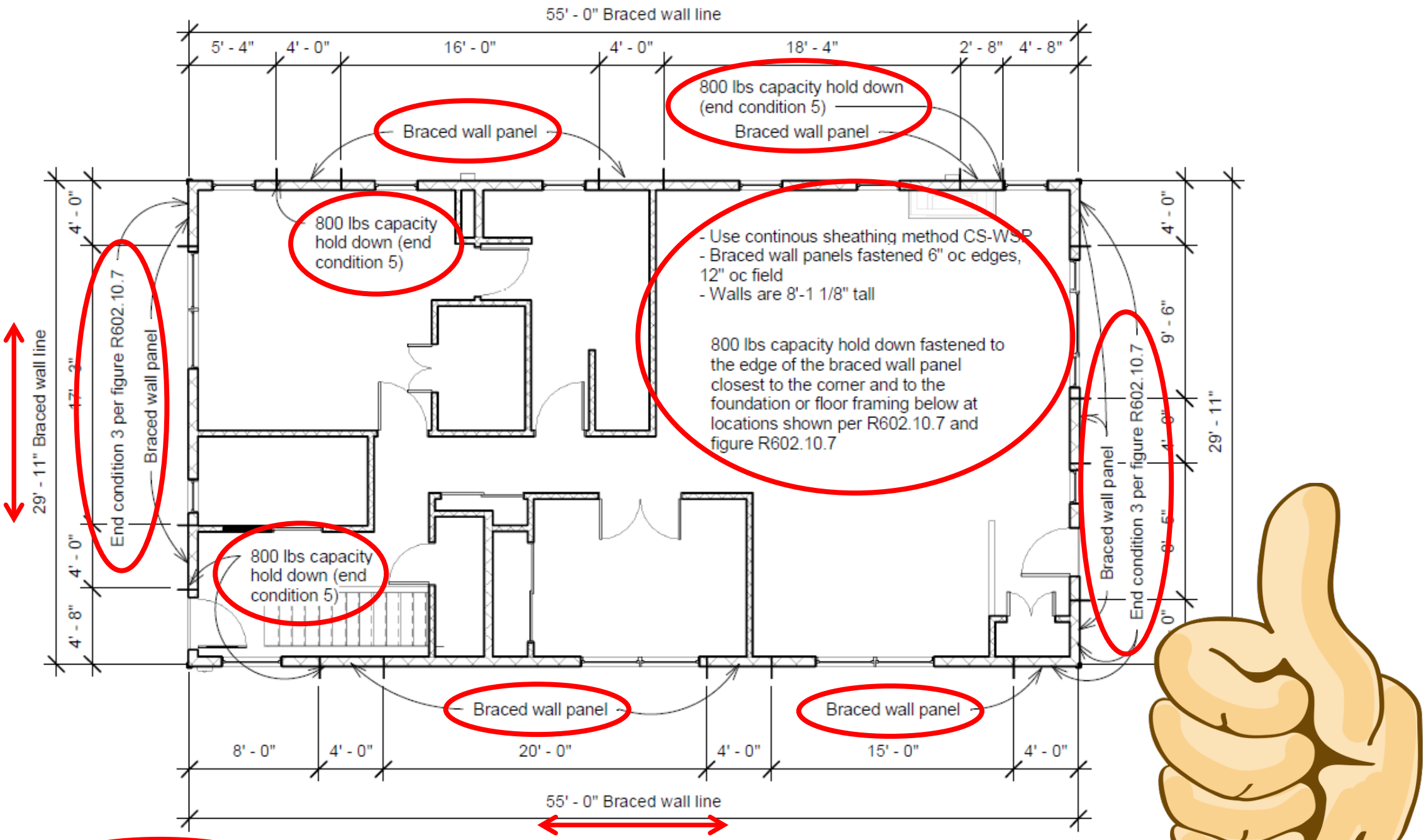
1. There shall be not more than three stories above the top of a concrete or masonry foundation or basement wall. Permanent wood foundations shall not be permitted.
2. Floors shall not cantilever more than 24 inches (607 mm) beyond the foundation or bearing wall below.
3. Wall height shall not be greater than 10 feet (3048 mm).
4. The building shall have a roof eave-to-ridge height of 15 feet (4572 mm) or less.
5. Exterior walls shall have gypsum board with a minimum thickness of $^1/_2$ inch (12.7 mm) installed on the interior side fastened in accordance with Table R702.3.5.
6. The structure shall be located where the ultimate design wind speed is less than or equal to 130 mph (58 m/s), and the exposure category is B or C.
7. The structure shall be located in Seismic Design Category A, B or C for detached one- and two-family dwellings or Seismic Design Category A or B for townhouses.
8. Cripple walls shall not be permitted in three-story buildings.

10 Main Level Braced
1/8" = 1'-0"



Wall Bracing – 602.10

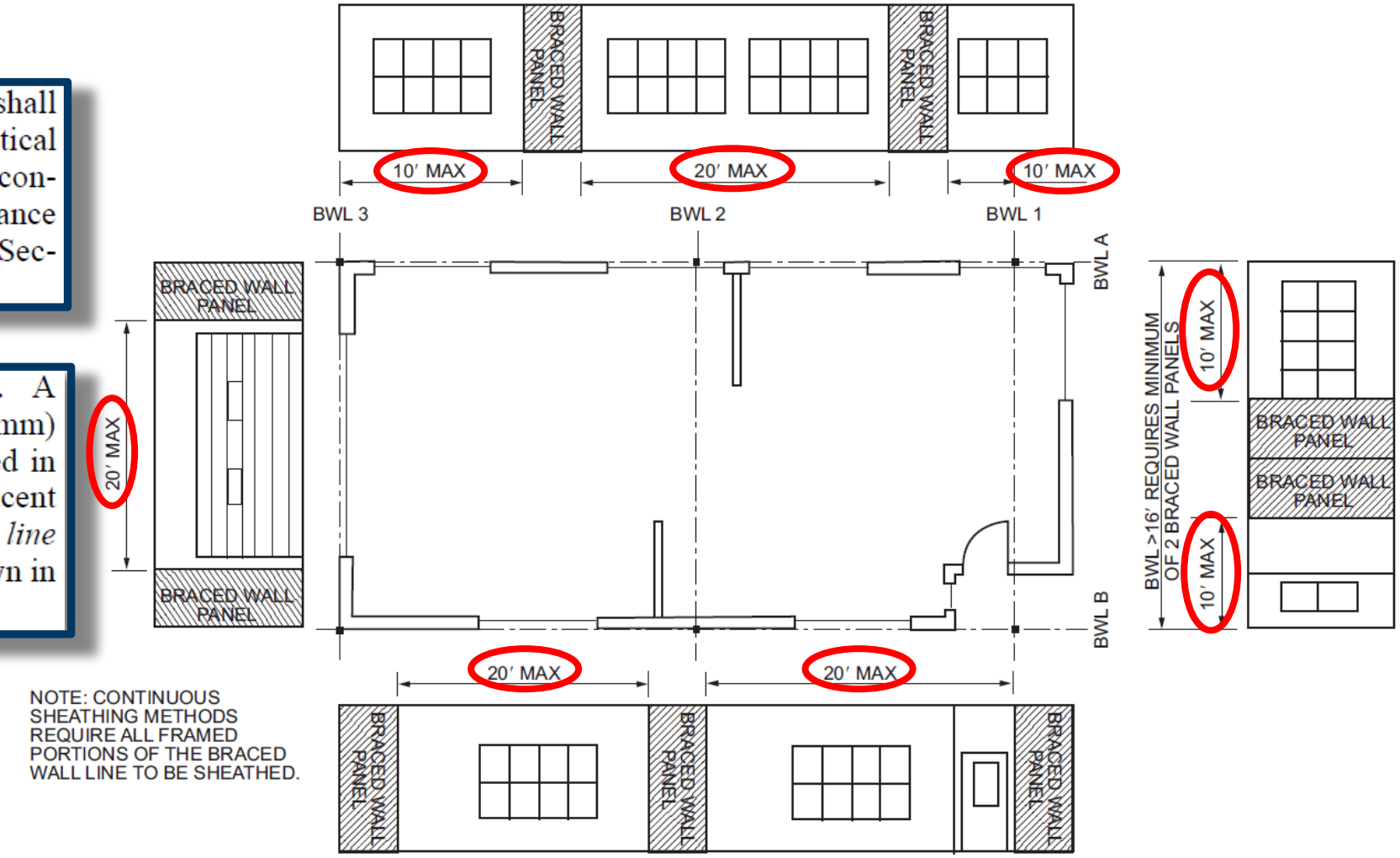
10 Main Level Braced
1/8" = 1'-0"



10 Main Level Braced
1/8" = 1'-0"

R602.10.2 Braced wall panels. *Braced wall panels* shall be full-height sections of wall that shall not have vertical or horizontal offsets. *Braced wall panels* shall be constructed and placed along a *braced wall line* in accordance with this section and the bracing methods specified in Section R602.10.4.

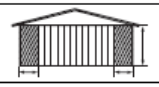
R602.10.2.2 Locations of braced wall panels. A *braced wall panel* shall begin within 10 feet (3810 mm) from each end of a *braced wall line* as determined in Section R602.10.1.1. The distance between adjacent edges of *braced wall panels* along a *braced wall line* shall be not greater than 20 feet (6096 mm) as shown in Figure R602.10.2.2.



For SI: 1 foot = 304.8 mm.

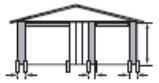
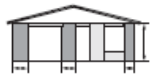
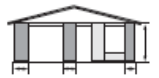
FIGURE R602.10.2.2
LOCATION OF BRACED WALL PANELS

TABLE R602.10.4
BRACING METHODS

METHODS, MATERIAL		MINIMUM THICKNESS	FIGURE	CONNECTION CRITERIA[a]	
				Fasteners	Spacing
Intermittent Bracing Methods	**LIB** Let-in-bracing	1 × 4 wood or approved metal straps at 45° to 60° angles for maximum 16″ stud spacing		Wood: 2-8d common nails or 3-8d ($2^1/_2$″ long x 0.113″ dia.) nails	Wood: per stud and top and bottom plates
				Metal strap: per manufacturer	Metal: per manufacturer
	DWB Diagonal wood boards	$^3/_4$″ (1″ nominal) for maximum 24″ stud spacing		2-8d ($2^1/_2$″ long × 0.113″ dia.) nails or 2 - $1^3/_4$″ long staples	Per stud
	WSP Wood structural panel (See Section R604)	$^3/_8$″		Exterior sheathing per Table R602.3(3)	6″ edges 12″ field
				Interior sheathing per Table R602.3(1) or R602.3(2)	Varies by fastener
	BV-WSP[e] Wood structural panels with stone or masonry veneer (See Section R602.10.6.5)	$^7/_{16}$″	See Figure R602.10.6.5	8d common ($2^1/_2$″ × 0.131) nails	4″ at panel edges 12″ at intermediate supports 4″ at braced wall panel end posts
	SFB Structural fiberboard sheathing	$^1/_2$″ or $^{25}/_{32}$″ for maximum 16″ stud spacing		$1^1/_2$″ long × 0.12″ dia. (for $^1/_2$″ thick sheathing) $1^3/_4$″ long × 0.12″ dia. (for $^{25}/_{32}$″ thick sheathing) galvanized roofing nails	3″ edges 6″ field
	GB Gypsum board	$^1/_2$″		Nails or screws per Table R602.3(1) for exterior locations	For all braced wall panel locations: 7″ edges (including top and bottom plates) 7″ field
				Nails or screws per Table R702.3.5 for interior locations	
	PBS Particleboard sheathing (See Section R605)	$^3/_8$″ or $^1/_2$″ for maximum 16″ stud spacing		For $^3/_8$″, 6d common (2″ long × 0.113″ dia.) nails For $^1/_2$″, 8d common ($2^1/_2$″ long × 0.131″ dia.) nails	3″ edges 6″ field
	PCP Portland cement plaster	See Section R703.7 for maximum 16″ stud spacing		$1^1/_2$″ long, 11 gage, $^7/_{16}$″ dia. head nails or $^7/_8$″ long, 16 gage staples	6″ o.c. on all framing members
	HPS Hardboard panel siding	$^7/_{16}$″ for maximum 16″ stud spacing		0.092″ dia., 0.225″ dia. head nails with length to accommodate $1^1/_2$″ penetration into studs	4″ edges 8″ field
	ABW Alternate braced wall	$^3/_8$″		See Section R602.10.6.1	See Section R602.10.6.1

(continued)

TABLE R602.10.4—continued
BRACING METHODS

METHODS, MATERIAL		MINIMUM THICKNESS	FIGURE	CONNECTION CRITERIA[a]	
				Fasteners	Spacing
Intermittent Bracing Methods	★ **PFH** Portal frame with hold-downs	$^3/_8$″		See Section R602.10.6.2	See Section R602.10.6.2
	★ **PFG** Portal frame at garage	$^7/_{16}$″		See Section R602.10.6.3	See Section R602.10.6.3
Continuous Sheathing Methods	★ **CS-WSP** Continuously sheathed wood structural panel	$^3/_8$″		Exterior sheathing per Table R602.3(3)	6″ edges 12″ field
				Interior sheathing per Table R602.3(1) or R602.3(2)	Varies by fastener
	★ **CS-G**[b,c] Continuously sheathed wood structural panel adjacent to garage openings	$^3/_8$″		See Method CS-WSP	See Method CS-WSP
	★ **CS-PF** Continuously sheathed portal frame	$^7/_{16}$″		See Section R602.10.6.4	See Section R602.10.6.4
	CS-SFB[d] Continuously sheathed structural fiberboard	$^1/_2$″ or $^{25}/_{32}$″ for maximum 16″ stud spacing		$1^1/_2$″ long × 0.12″ dia. (for $^1/_2$″ thick sheathing) $1^3/_4$″ long × 0.12″ dia. (for $^{25}/_{32}$″ thick sheathing) galvanized roofing nails	3″ edges 6″ field

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 degree = 0.0175 rad, 1 pound per square foot = 47.8 N/m², 1 mile per hour = 0.447 m/s.

a. Adhesive attachment of wall sheathing, including Method GB, shall not be permitted in Seismic Design Categories C, D_0, D_1 and D_2.

b. Applies to panels next to garage door opening where supporting gable end wall or roof load only. Shall only be used on one wall of the garage. In Seismic Design Categories D_0, D_1 and D_2 roof covering dead load shall not exceed 3 psf.

c. Garage openings adjacent to a Method CS-G panel shall be provided with a header in accordance with Table R602.7(1). A full-height clear opening shall not be permitted adjacent to a Method CS-G panel.

d. Method CS-SFB does not apply in Seismic Design Categories D_0, D_1 and D_2.

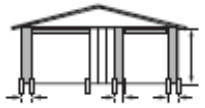
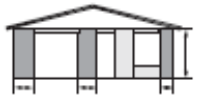
e. Method applies to detached one- and two-family dwellings in Seismic Design Categories D_0 through D_2 only.

★ Most commonly seen methods

Wall Bracing Method

- Listed in Table 602.10.4?
- Plans:
  - CS-WSP ✓
  - 7/16” OSB (3/8” min) ✓
- 7/16” OSB complies with Table 602.3(3) (checked earlier) ✓

TABLE R602.10.4—continued
BRACING METHODS

	METHODS, MATERIAL	MINIMUM THICKNESS	FIGURE	CONNECTION CRITERIA[a]	
				Fasteners	Spacing
Intermittent Bracing Methods	**PFH** Portal frame with hold-downs	3/8″		See Section R602.10.6.2	See Section R602.10.6.2
	PFG Portal frame at garage	7/16″		See Section R602.10.6.3	See Section R602.10.6.3
Continuous Sheathing Methods	**CS-WSP** Continuously sheathed wood structural panel	3/8″		Exterior sheathing per Table R602.3(3)	6″ edges 12″ field
				Interior sheathing per Table R602.3(1) or R602.3(2)	Varies by fastener
	CS-G[b, c] Continuously sheathed wood structural panel adjacent to garage openings	3/8″		See Method CS-WSP	See Method CS-WSP
	CS-PF Continuously sheathed portal frame	7/16″		See Section R602.10.6.4	See Section R602.10.6.4
	CS-SFB[d] Continuously sheathed structural fiberboard	1/2″ or 25/32″ for maximum 16" stud spacing		1 1/2″ long × 0.12″ dia. (for 1/2″ thick sheathing) 1 3/4″ long × 0.12″ dia. (for 25/32″ thick sheathing) galvanized roofing nails	3″ edges 6″ field

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 degree = 0.0175 rad, 1 pound per square foot = 47.8 N/m^2, 1 mile per hour = 0.447 m/s.

a. Adhesive attachment of wall sheathing, including Method GB, shall not be permitted in Seismic Design Categories C, D_0, D_1 and D_2.

b. Applies to panels next to garage door opening where supporting gable end wall or roof load only. Shall only be used on one wall of the garage. In Seismic Design Categories D_0, D_1 and D_2 roof covering dead load shall not exceed 3 psf.

c. Garage openings adjacent to a Method CS-G panel shall be provided with a header in accordance with Table R602.7(1). A full-height clear opening shall not be permitted adjacent to a Method CS-G panel.

d. Method CS-SFB does not apply in Seismic Design Categories D_0, D_1 and D_2.

e. Method applies to detached one- and two-family dwellings in Seismic Design Categories D_0 through D_2 only.

Do the walls fall within the requirements of Table 602.10.1.3?

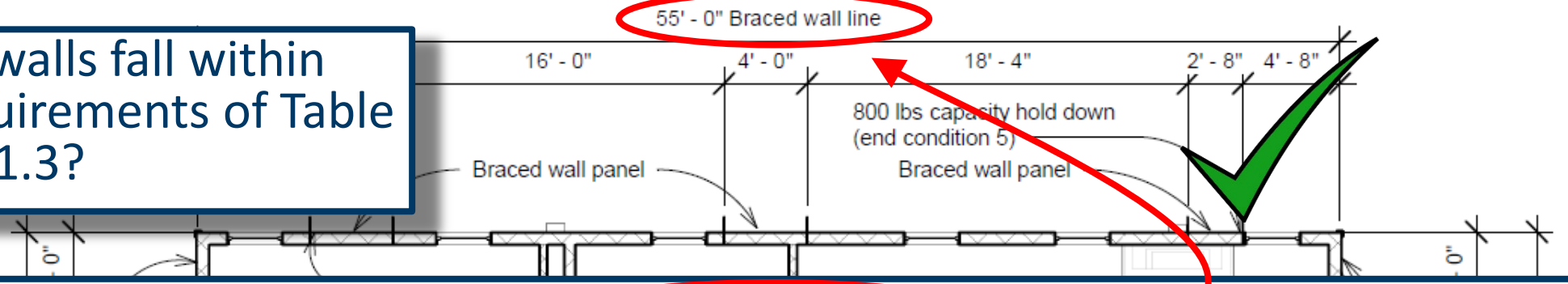


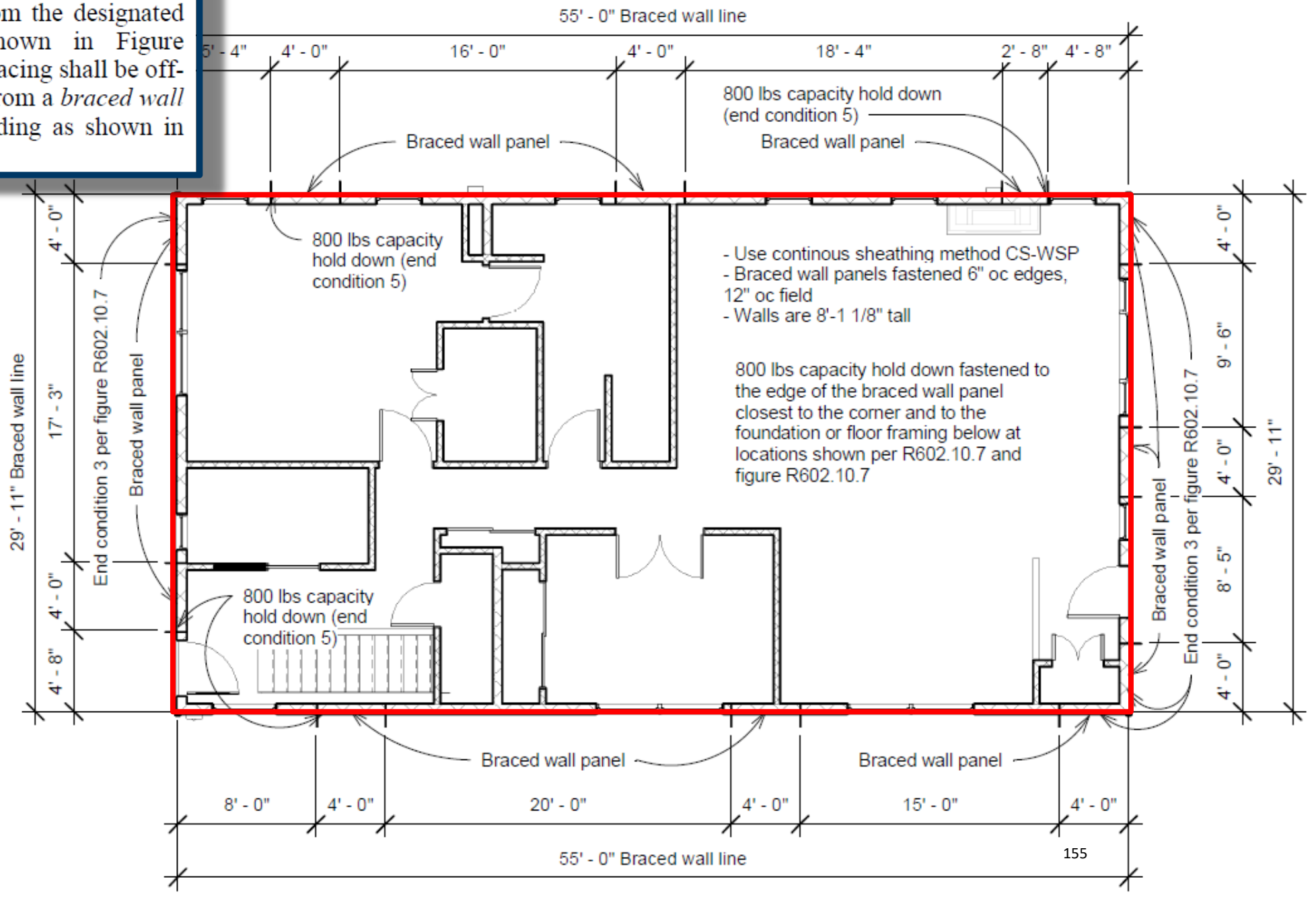
TABLE R602.10.1.3
BRACED WALL LINE SPACING

APPLICATION	CONDITION	BUILDING TYPE	BRACED WALL LINE SPACING CRITERIA	
			Maximum Spacing	Exception to Maximum Spacing
Wind bracing	Ultimate design wind speed 100 mph to ≤ 140 mph	Detached, townhouse	60 feet	None
Seismic bracing	SDC A – C	Detached	Use wind bracing	
	SDC A – B	Townhouse	Use wind bracing	
	SDC C	Townhouse	35 feet	Up to 50 feet when length of required bracing per Table R602.10.3(3) is adjusted in accordance with Table R602.10.3(4).
	SDC D_0, D_1, D_2	Detached, townhouses, one- and two-story only	25 feet	Up to 35 feet to allow for a single room not to exceed 900 square feet. Spacing of all other braced wall lines shall not exceed 25 feet.
	SDC D_0, D_1, D_2	Detached, townhouse	25 feet	Up to 35 feet when length of required bracing per Table R602.10.3(3) is adjusted in accordance with Table R602.10.3(4).

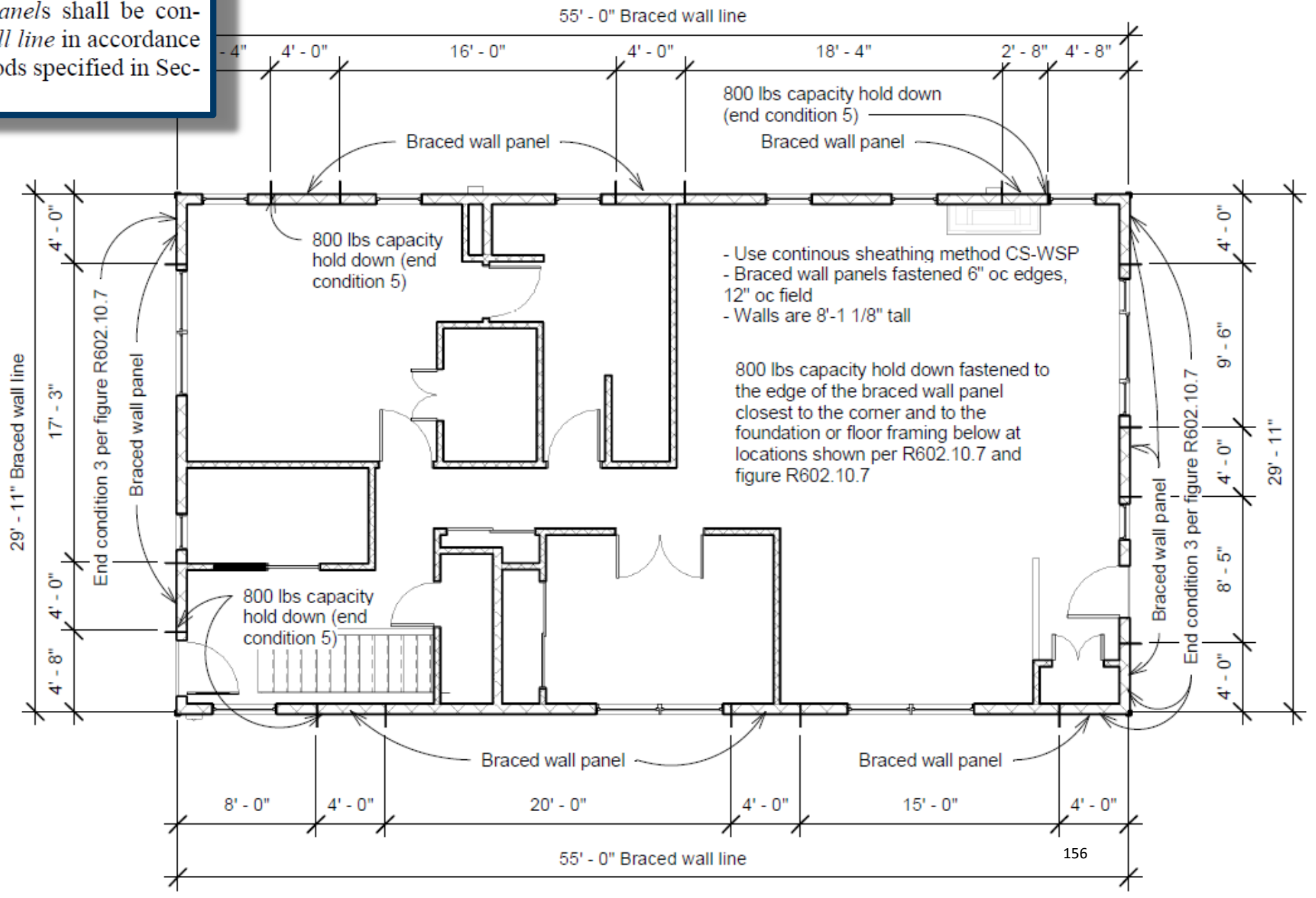
For SI: 1 foot = 304.8 mm, 1 square foot = 0.0929 m^2, 1 mile per hour = 0.447 m/s.

10 Main Level Braced
1/8" = 1'-0"

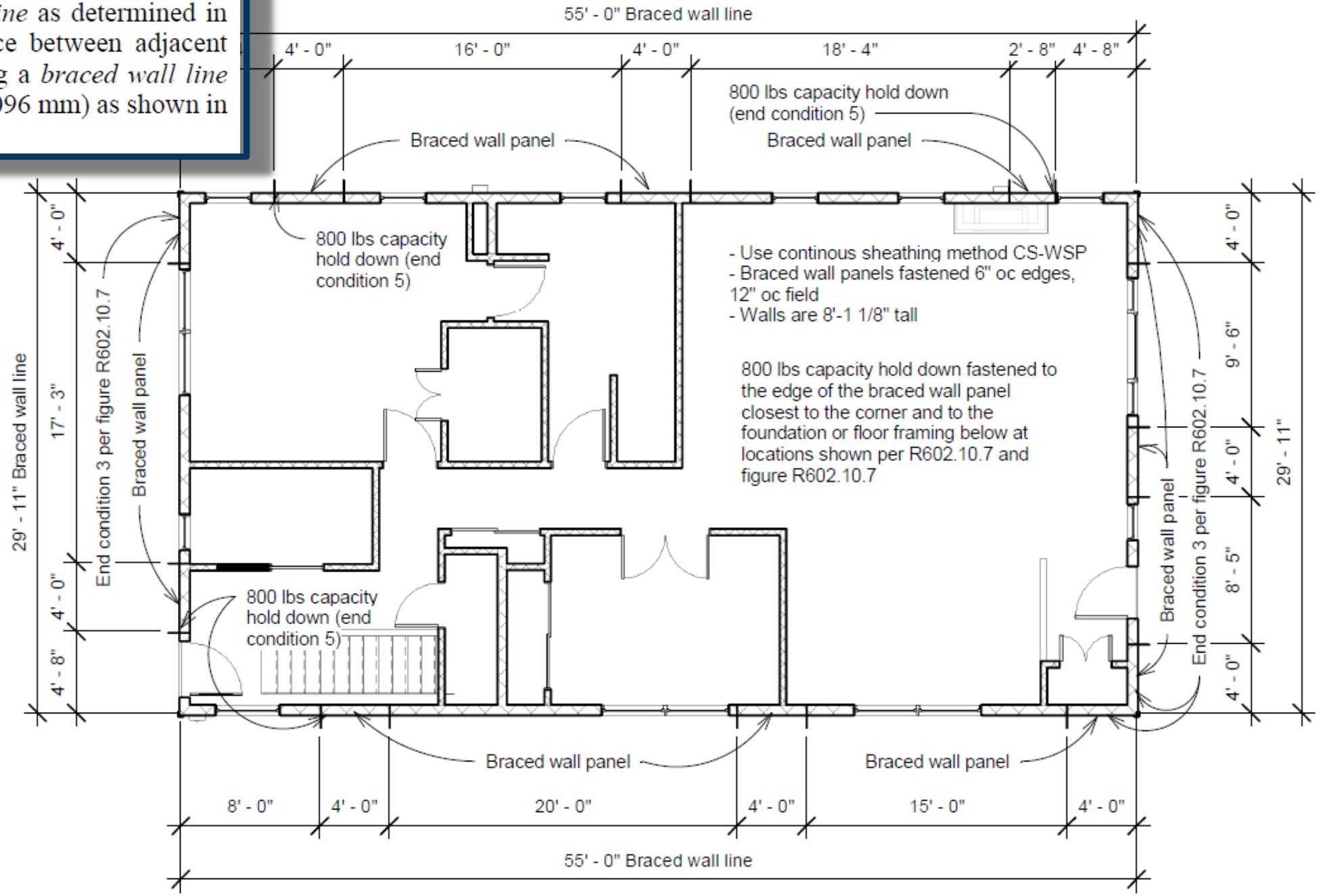
R602.10.1.2 Offsets along a braced wall line. Exterior walls parallel to a *braced wall line* shall be offset not more than 4 feet (1219 mm) from the designated *braced wall line* location as shown in Figure R602.10.1.1. Interior walls used as bracing shall be offset not more than 4 feet (1219 mm) from a *braced wall line* through the interior of the building as shown in Figure R602.10.1.1.



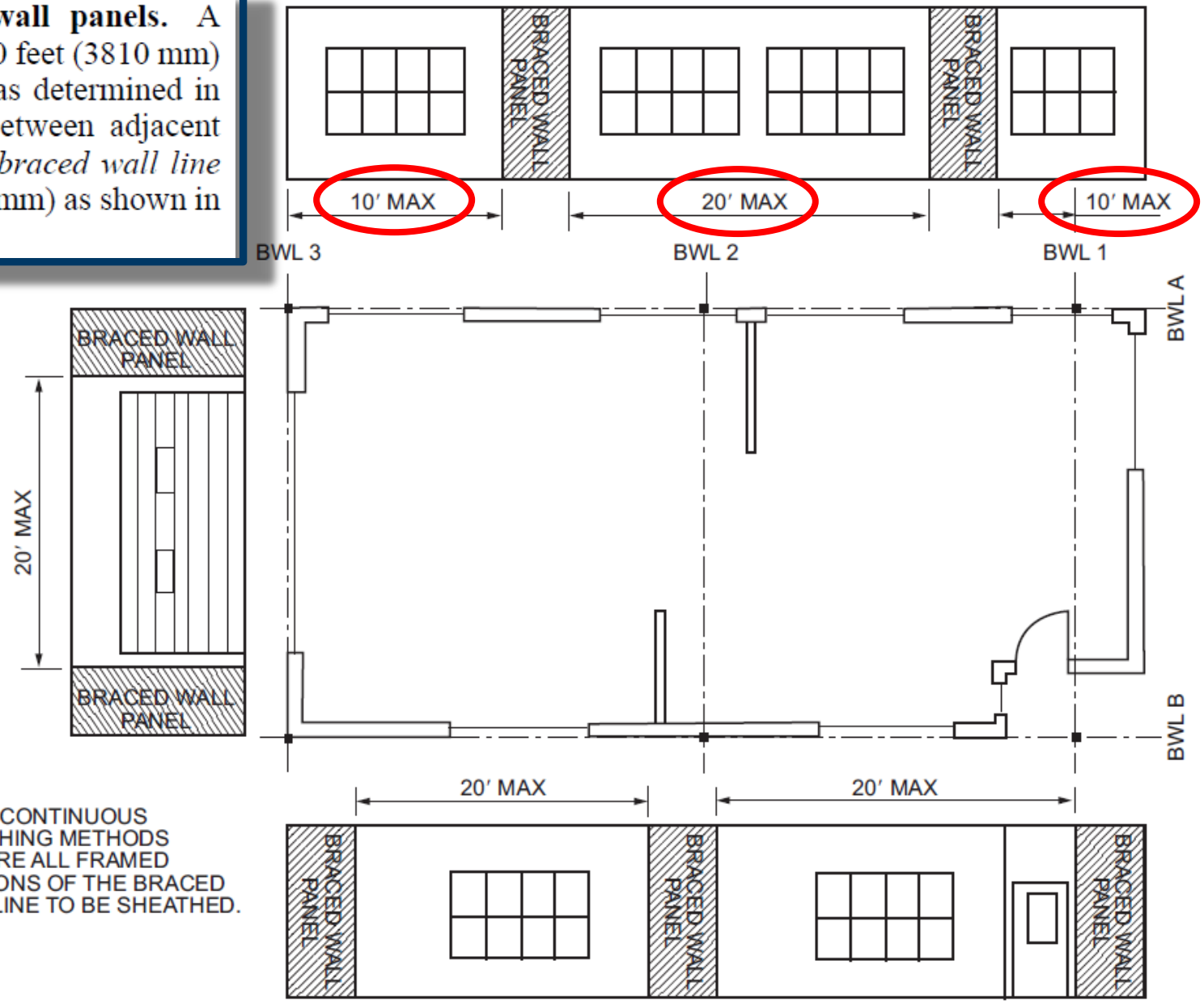
R602.10.2 Braced wall panels. *Braced wall panels* shall be full-height sections of wall that shall not have vertical or horizontal offsets. *Braced wall panels* shall be constructed and placed along a *braced wall line* in accordance with this section and the bracing methods specified in Section R602.10.4.

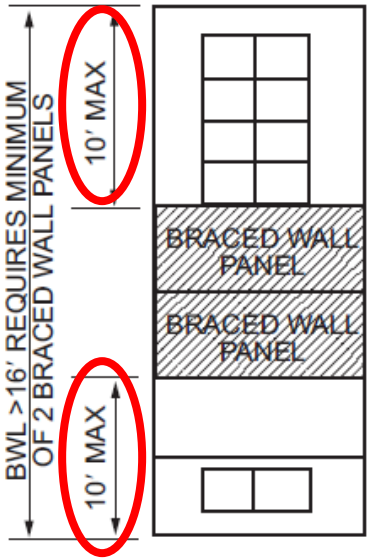


R602.10.2.2 Locations of braced wall panels. A *braced wall panel* shall begin within 10 feet (3810 mm) from each end of a *braced wall line* as determined in Section R602.10.1.1. The distance between adjacent edges of *braced wall panels* along a *braced wall line* shall be not greater than 20 feet (6096 mm) as shown in Figure R602.10.2.2.



R602.10.2.2 Locations of braced wall panels. A *braced wall panel* shall begin within 10 feet (3810 mm) from each end of a *braced wall line* as determined in Section R602.10.1.1. The distance between adjacent edges of *braced wall panels* along a *braced wall line* shall be not greater than 20 feet (6096 mm) as shown in Figure R602.10.2.2.



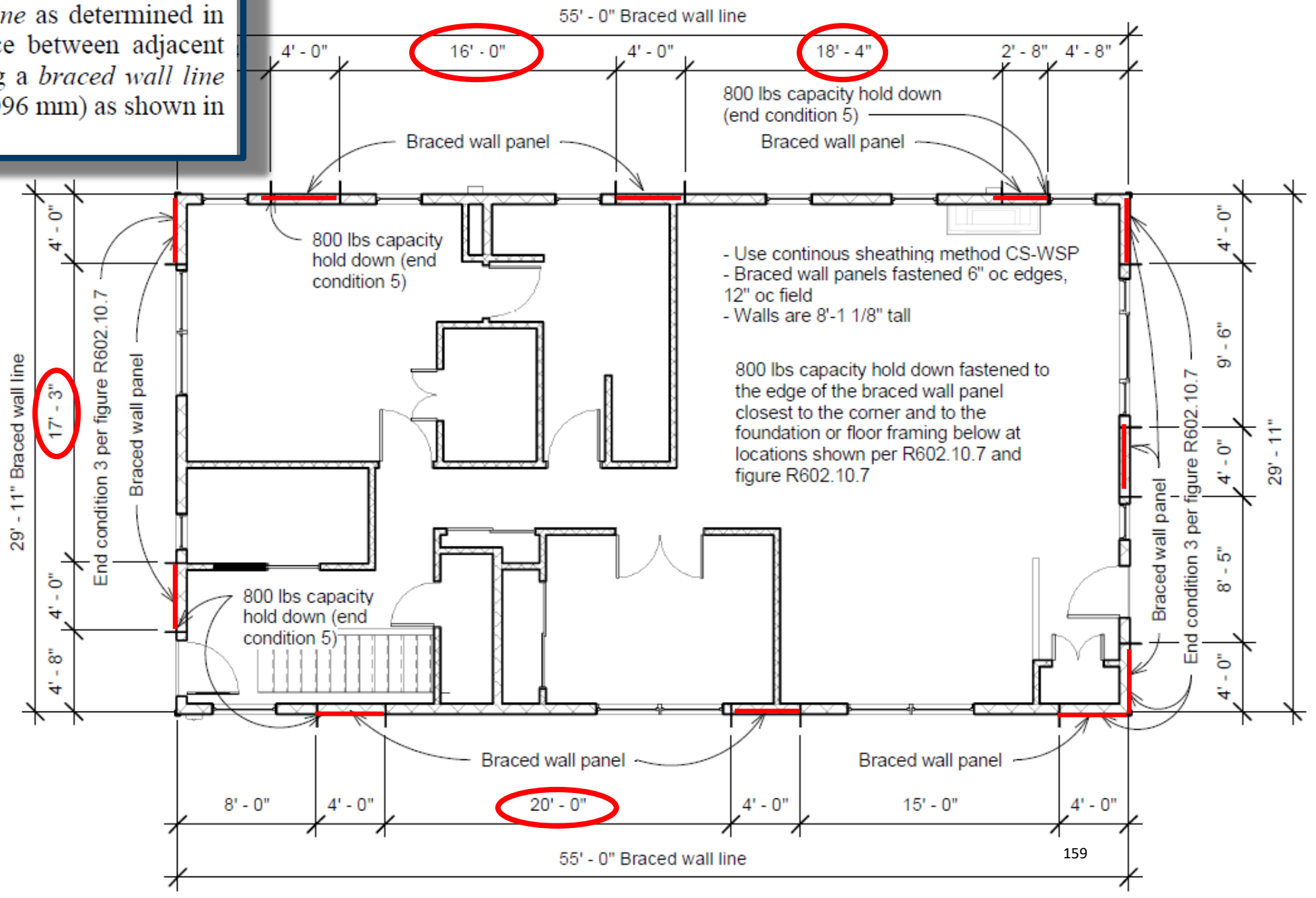


For SI: 1 foot = 304.8 mm.

FIGURE R602.10.2.2
LOCATION OF BRACED WALL PANELS

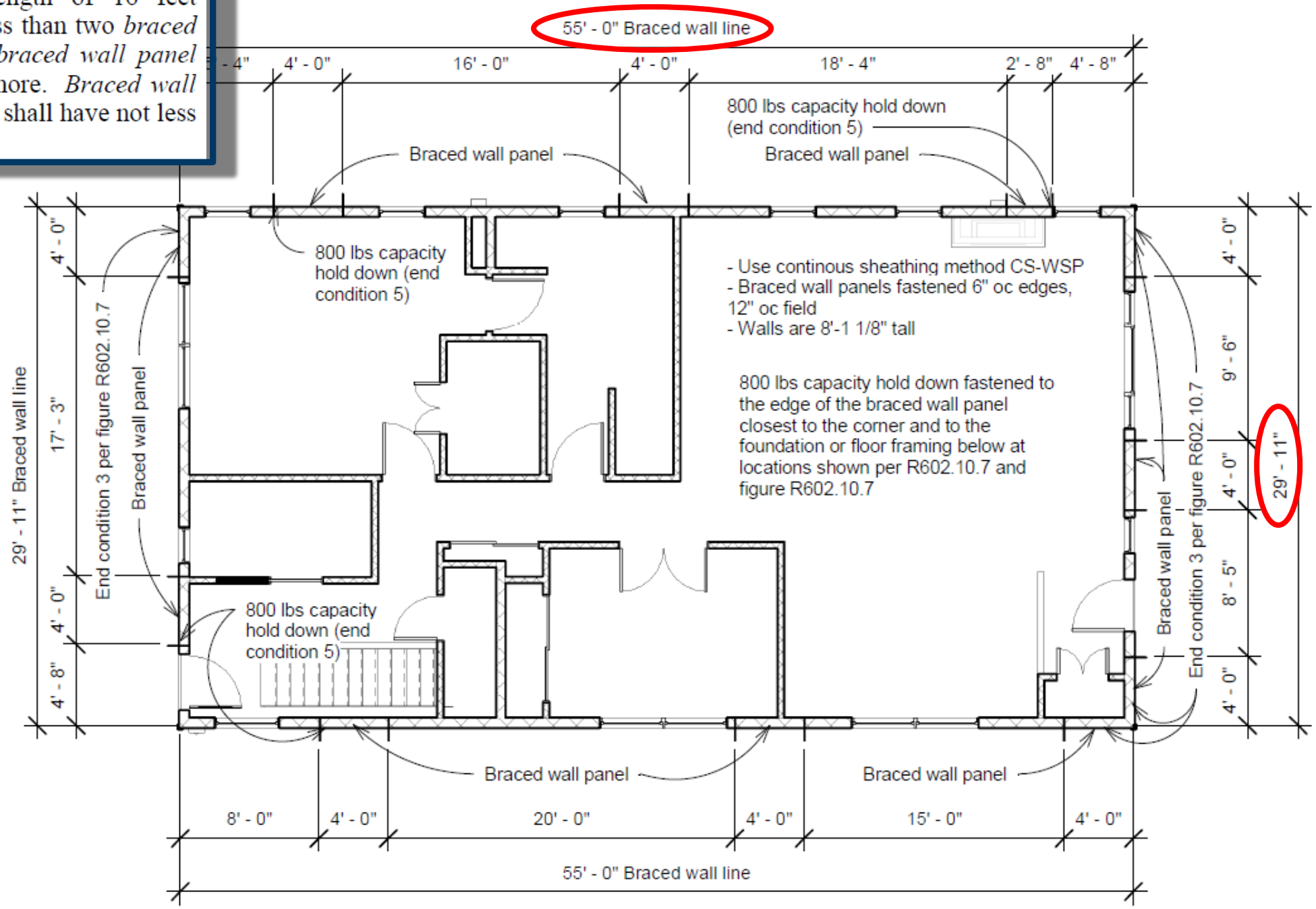
R602.10.2.2 Locations of braced wall panels. A *braced wall panel* shall begin within 10 feet (3810 mm) from each end of a *braced wall line* as determined in Section R602.10.1.1. The distance between adjacent edges of *braced wall panels* along a *braced wall line* shall be not greater than 20 feet (6096 mm) as shown in Figure R602.10.2.2.

Within 10’ from ends?
Max 20’ apart?



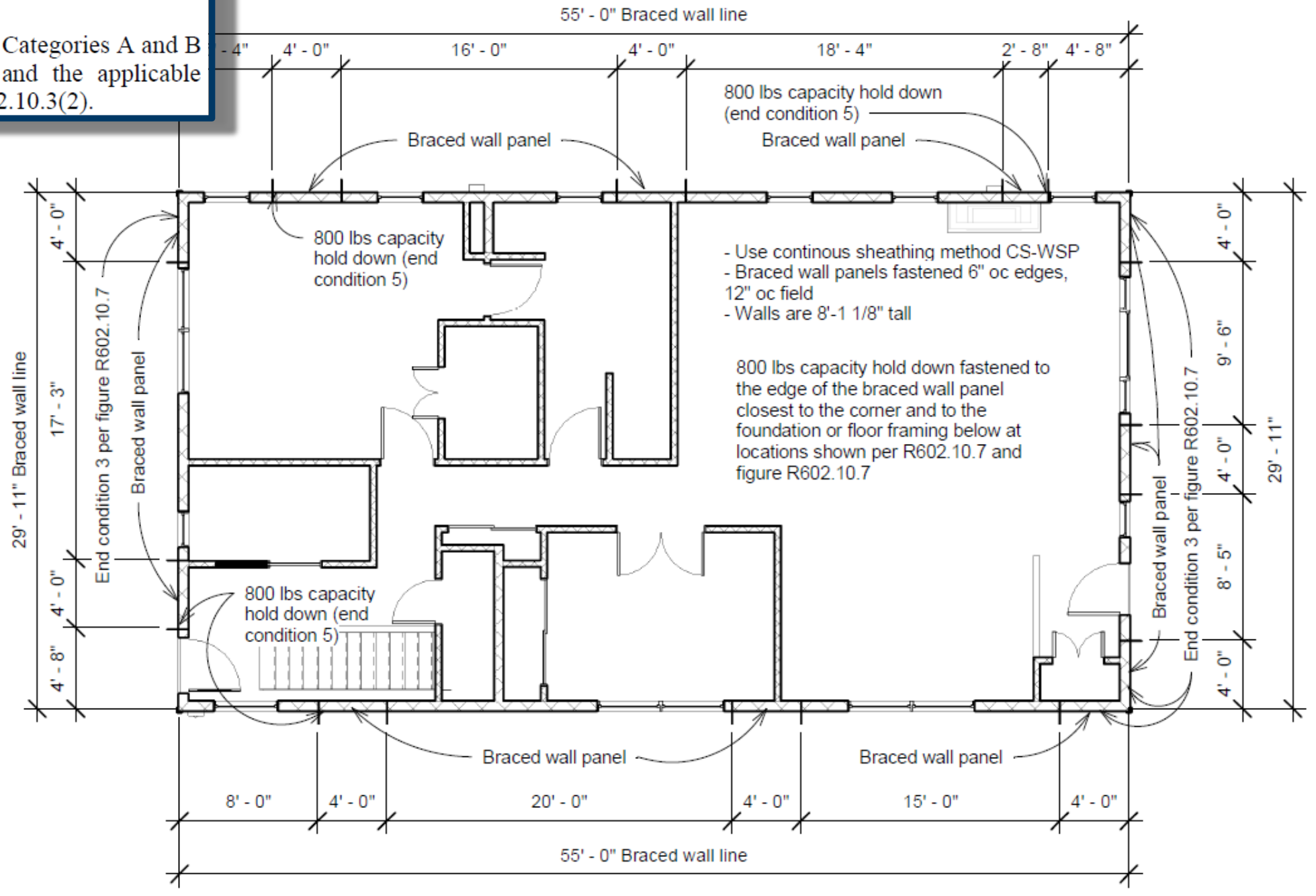
R602.10.2.3 Minimum number of braced wall panels. *Braced wall lines* with a length of 16 feet (4877 mm) or less shall have not less than two *braced wall panels* of any length or one *braced wall panel* equal to 48 inches (1219 mm) or more. *Braced wall lines* greater than 16 feet (4877 mm) shall have not less than two *braced wall panels*.

Not Applicable



R602.10.3 Required length of bracing. The required length of bracing along each *braced wall line* shall be determined as follows:

1. All buildings in Seismic Design Categories A and B shall use Table R602.10.3(1) and the applicable adjustment factors in Table R602.10.3(2).



R602.10.3 Required length of bracing. The required length of bracing along each *braced wall line* shall be determined as follows:

1. All buildings in Seismic Design Categories A and B shall use Table R602.10.3(1) and the applicable adjustment factors in Table R602.10.3(2).

TABLE R602.10.3(1)
BRACING REQUIREMENTS BASED ON WIND SPEED

- EXPOSURE CATEGORY B
- 30-FOOT MEAN ROOF HEIGHT
- 10-FOOT WALL HEIGHT
- 2 BRACED WALL LINES

Ultimate Design Wind Speed (mph)	Story Location	Braced Wall Line Spacing[c] (feet)	MINIMUM TOTAL LENGTH (FEET) OF BRACED WALL PANELS REQUIRED ALONG EACH BRACED WALL LINE[a]			
			Method LIB[b]	Method GB	Methods DWB, WSP, SFB, PBS, PCP, HPS, BV-WSP, ABW, PFH, PFC, CS-SFB	Methods CS-WSP, CS-G, CS-PF
		10	3.5	3.5	2.0	1.5
		20	6.0	6.0	3.5	3.0
		30	8.5	8.5	5.0	4.5
		40	11.5	11.5	6.5	5.5
		50	14.0	14.0	8.0	7.0
		60	16.5	16.5	9.5	8.0
		10	5.5	5.5	3.5	3.0
		20	9.5	9.5	6.0	5.0
		30	13.5	13.5	8.5	7.0
		40	17.5	17.5	11.0	9.0
		50	21.5	21.5	13.5	11.0
		60	25.5	25.5	16.0	13.0
		10	3.5	3.5	2.0	1.5
		20	6.0	6.0	3.5	3.0
		30	8.5	8.5	5.0	4.5
		40	11.5	11.5	6.5	5.5
		50	14.0	14.0	8.0	7.0
		60	16.5	16.5	9.5	8.0
		10	7.0	7.0	4.0	3.5
		20	12.5	12.5	7.5	6.5
		30	18.0	18.0	10.5	9.0
		40	23.5	23.5	13.5	11.5
		50	29.0	29.0	16.5	14.0
		60	34.5	34.5	20.0	17.0
		10	NP	10.0	6.0	5.0
		20	NP	18.5	11.0	9.0
		30	NP	27.0	15.5	13.0
		40	NP	35.0	20.0	17.0
		50	NP	43.0	24.5	21.0
		60	NP	51.0	29.0	25.0

(continued)

TABLE R602.10.3(1)
BRACING REQUIREMENTS BASED ON WIND SPEED

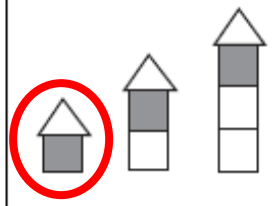
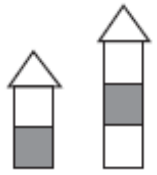
- EXPOSURE CATEGORY B
- 30-FOOT MEAN ROOF HEIGHT
- 10-FOOT WALL HEIGHT
- 2 BRACED WALL LINES

Ultimate Design Wind Speed (mph)	Story Location	Braced Wall Line Spacing[c] (feet)	MINIMUM TOTAL LENGTH (FEET) OF BRACED WALL PANELS REQUIRED ALONG EACH BRACED WALL LINE[a]			
			Method LIB[b]	Method GB	Methods DWB, WSP, SFB, PBS, PCP, HPS, BV-WSP, ABW, PFH, PFC, CS-SFB	Methods CS-WSP, CS-G, CS-PF

R602.10.3 Required length of bracing. The required length of bracing along each *braced wall line* shall be determined as follows:

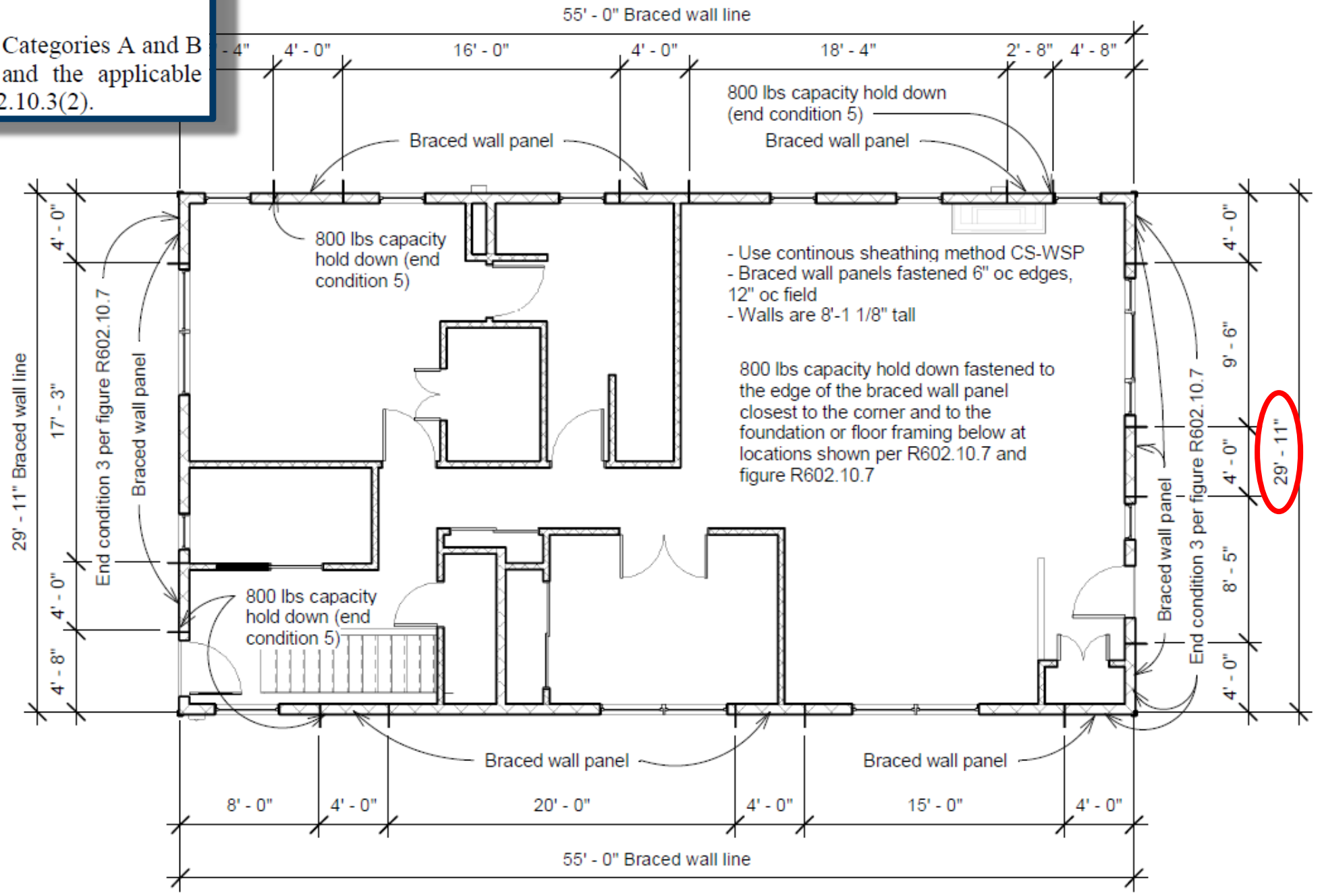
1. All buildings in Seismic Design Categories A and B shall use Table R602.10.3(1) and the applicable adjustment factors in Table R602.10.3(2).

TABLE R602.10.3(1)
BRACING REQUIREMENTS BASED ON WIND SPEED

• EXPOSURE CATEGORY B • 30-FOOT MEAN ROOF HEIGHT • 10-FOOT WALL HEIGHT • 2 BRACED WALL LINES			MINIMUM TOTAL LENGTH (FEET) OF BRACED WALL PANELS REQUIRED ALONG EACH BRACED WALL LINE[a]			
Ultimate Design Wind Speed (mph)	Story Location	Braced Wall Line Spacing[c] (feet)	Method LIB[b]	Method GB	Methods DWB, WSP, SFB, PBS, PCP, HPS, BV-WSP, ABW, PFH, PFC, CS-SFB	Methods CS-WSP, CS-G, CS-PF
≤ 115		10	3.5	3.5	2.0	2.0
		20	6.5	6.5	3.5	3.5
		30	9.5	9.5	5.5	4.5
		40	12.5	12.5	7.0	6.0
		50	15.0	15.0	9.0	7.5
		60	18.0	18.0	10.5	9.0
		10	7.0	7.0	4.0	3.5
		20	12.5	12.5	7.5	6.5
		30	18.0	18.0	10.5	9.0
		40	23.5	23.5	13.5	11.5
		50	29.0	29.0	16.5	14.0
		60	34.5	34.5	20.0	17.0
		10	NP	10.0	6.0	5.0
		20	NP	18.5	11.0	9.0
		30	NP	27.0	15.5	13.0
		40	NP	35.0	20.0	17.0
		50	NP	43.0	24.5	21.0
		60	NP	51.0	29.0	25.0

R602.10.3 Required length of bracing. The required length of bracing along each *braced wall line* shall be determined as follows:

1. All buildings in Seismic Design Categories A and B shall use Table R602.10.3(1) and the applicable adjustment factors in Table R602.10.3(2).

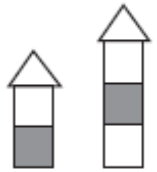


R602.10.3 Required length of bracing. The required length of bracing along each *braced wall line* shall be determined as follows:

1. All buildings in Seismic Design Categories A and B shall use Table R602.10.3(1) and the applicable adjustment factors in Table R602.10.3(2).

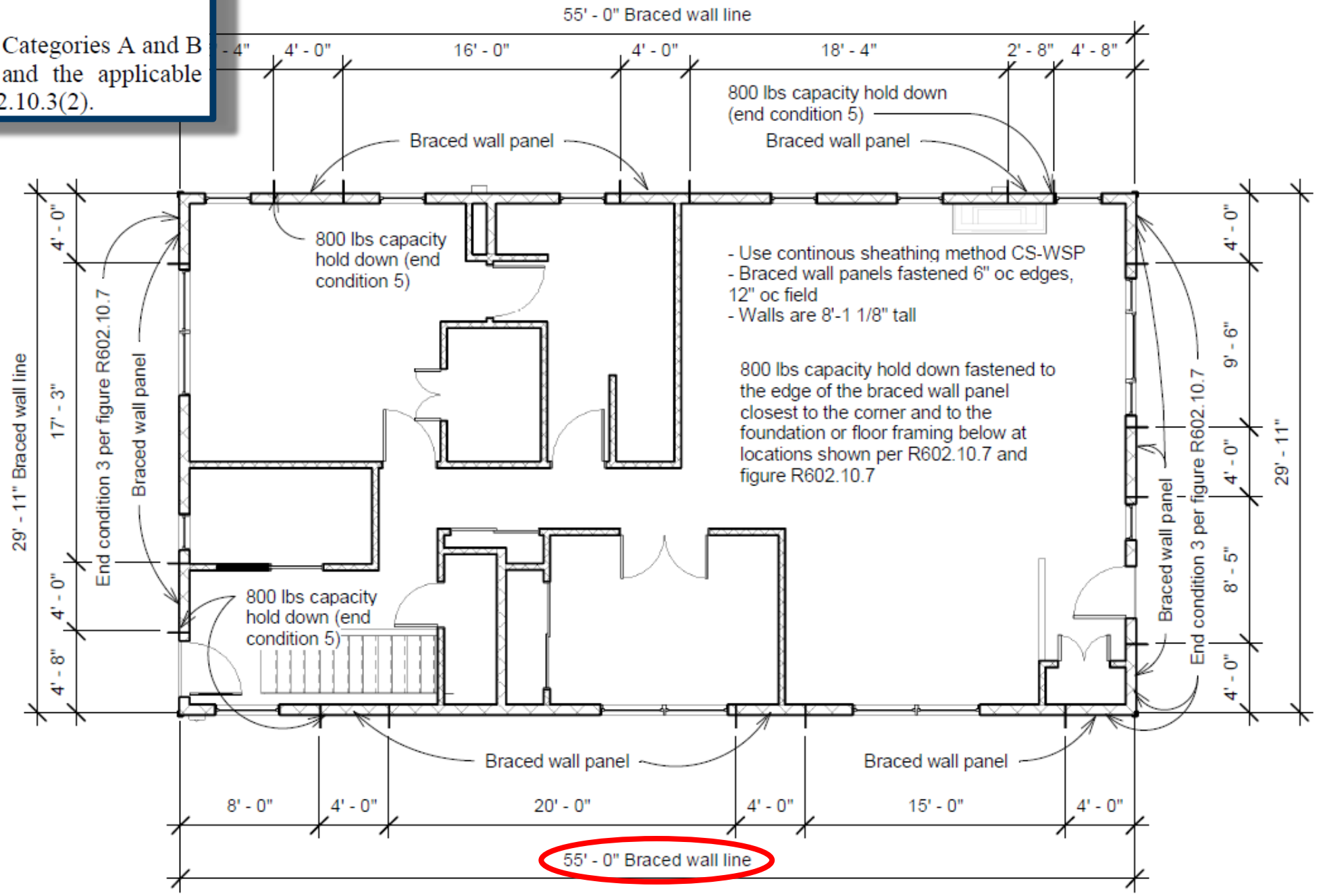
TABLE R602.10.3(1)
BRACING REQUIREMENTS BASED ON WIND SPEED

- EXPOSURE CATEGORY B
- 30-FOOT MEAN ROOF HEIGHT
- 10-FOOT WALL HEIGHT
- 2 BRACED WALL LINES

Ultimate Design Wind Speed (mph)	Story Location	Braced Wall Line Spacing[c] (feet)	MINIMUM TOTAL LENGTH (FEET) OF BRACED WALL PANELS REQUIRED ALONG EACH BRACED WALL LINE[a]			
			Method LIB[b]	Method GB	Methods DWB, WSP, SFB, PBS, PCP, HPS, BV-WSP, ABW, PFH, PFC, CS-SFB	Methods CS-WSP, CS-G, CS-PF
≤ 115		10	3.5	3.5	2.0	2.0
		20	6.5	6.5	3.5	3.5
		30	9.5	9.5	5.5	4.5
		40	12.5	12.5	7.0	6.0
		50	15.0	15.0	9.0	7.5
		60	18.0	18.0	10.5	9.0
		10	7.0	7.0	4.0	3.5
		20	12.5	12.5	7.5	6.5
		30	18.0	18.0	10.5	9.0
		40	23.5	23.5	13.5	11.5
		50	29.0	29.0	16.5	14.0
		60	34.5	34.5	20.0	17.0
		10	NP	10.0	6.0	5.0
		20	NP	18.5	11.0	9.0
		30	NP	27.0	15.5	13.0
		40	NP	35.0	20.0	17.0
		50	NP	43.0	24.5	21.0
		60	NP	51.0	29.0	25.0

R602.10.3 Required length of bracing. The required length of bracing along each *braced wall line* shall be determined as follows:

1. All buildings in Seismic Design Categories A and B shall use Table R602.10.3(1) and the applicable adjustment factors in Table R602.10.3(2).

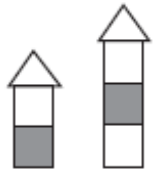


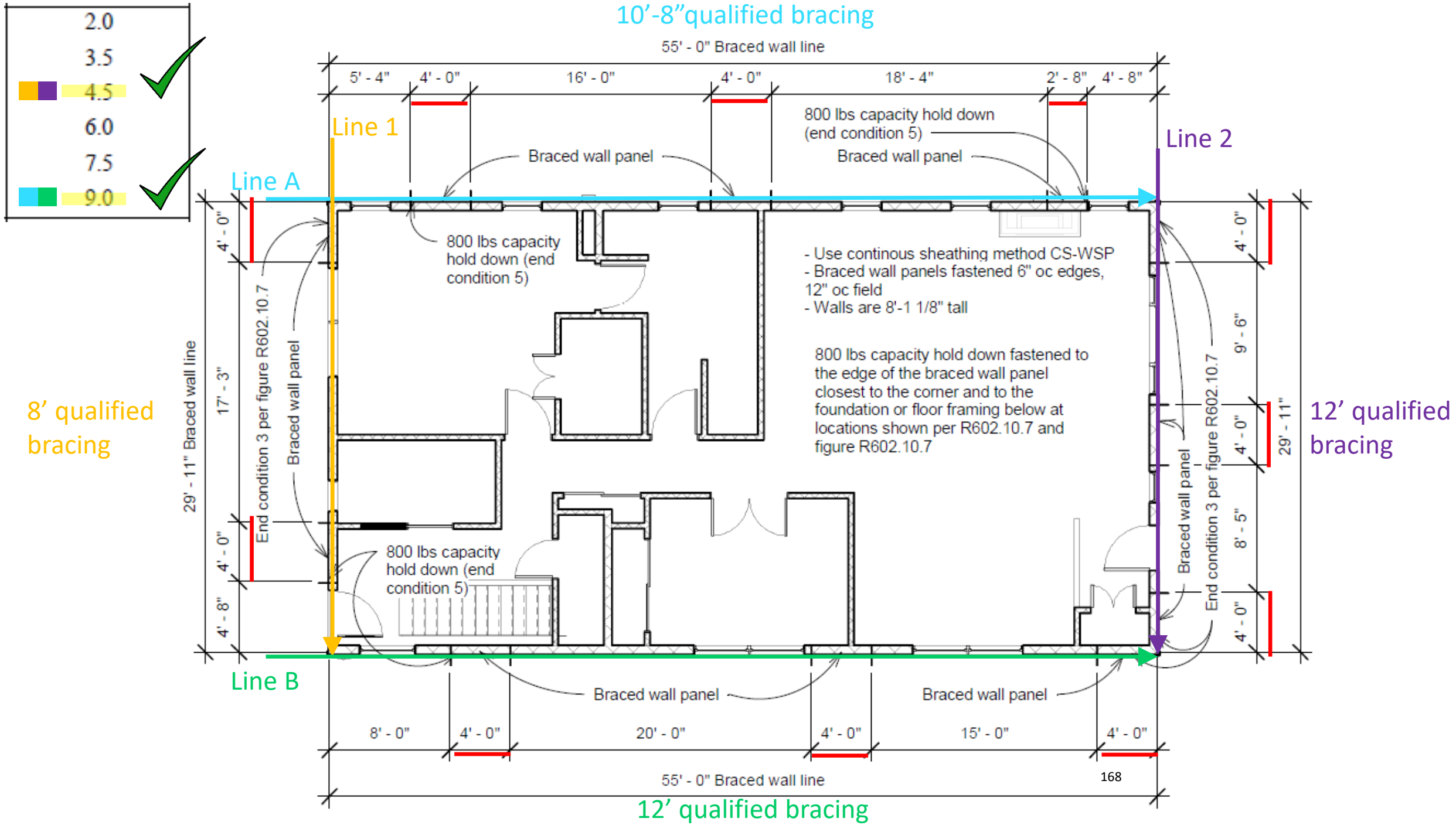
R602.10.3 Required length of bracing. The required length of bracing along each *braced wall line* shall be determined as follows:

1. All buildings in Seismic Design Categories A and B shall use Table R602.10.3(1) and the applicable adjustment factors in Table R602.10.3(2).

TABLE R602.10.3(1)
BRACING REQUIREMENTS BASED ON WIND SPEED

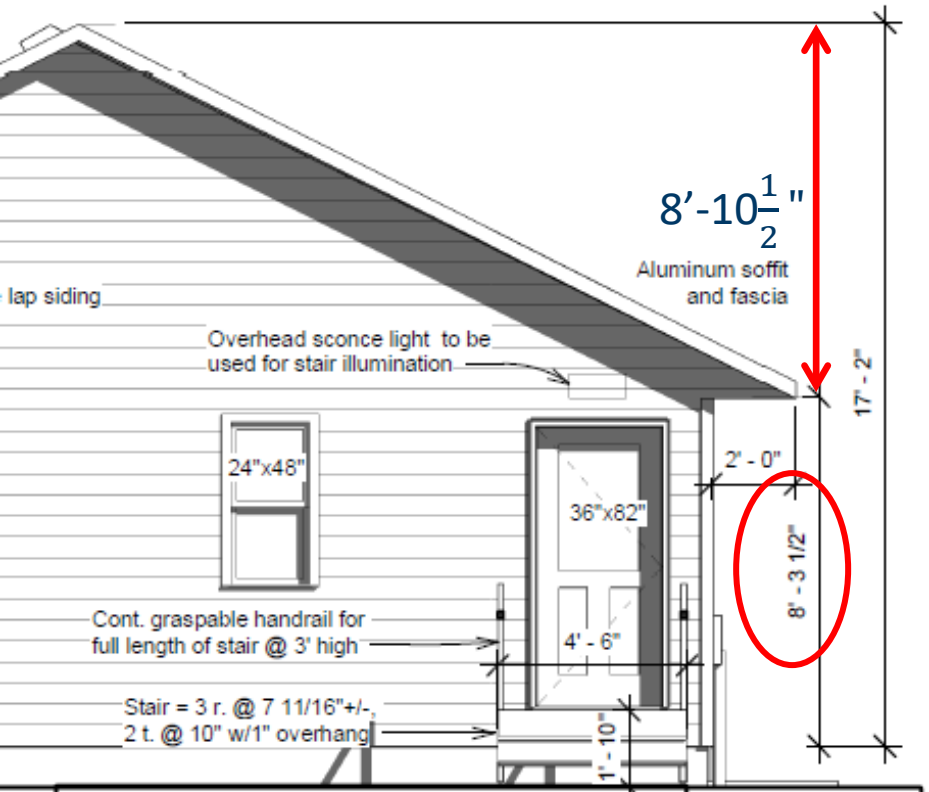
- EXPOSURE CATEGORY B
- 30-FOOT MEAN ROOF HEIGHT
- 10-FOOT WALL HEIGHT
- 2 BRACED WALL LINES

Ultimate Design Wind Speed (mph)	Story Location	Braced Wall Line Spacing[c] (feet)	MINIMUM TOTAL LENGTH (FEET) OF BRACED WALL PANELS REQUIRED ALONG EACH BRACED WALL LINE[a]			
			Method LIB[b]	Method GB	Methods DWB, WSP, SFB, PBS, PCP, HPS, BV-WSP, ABW, PFH, PFC, CS-SFB	Methods CS-WSP, CS-G, CS-PF
≤ 115		10	3.5	3.5	2.0	2.0
		20	6.5	6.5	3.5	3.5
		30	9.5	9.5	5.5	4.5
		40	12.5	12.5	7.0	6.0
		50	15.0	15.0	9.0	7.5
		60	18.0	18.0	10.5	9.0
		10	7.0	7.0	4.0	3.5
		20	12.5	12.5	7.5	6.5
		30	18.0	18.0	10.5	9.0
		40	23.5	23.5	13.5	11.5
		50	29.0	29.0	16.5	14.0
		60	34.5	34.5	20.0	17.0
		10	NP	10.0	6.0	5.0
		20	NP	18.5	11.0	9.0
		30	NP	27.0	15.5	13.0
		40	NP	35.0	20.0	17.0
		50	NP	43.0	24.5	21.0
		60	NP	51.0	29.0	25.0


2.0
3.5
4.5
6.0
7.5
9.0
10’-8”qualified bracing
55' - 0" Braced wall line
5' - 4"
4' - 0"
16' - 0"
4' - 0"
18' - 4"
2' - 8"
4' - 8"
Line 1
Line 2
Line A
Braced wall panel
800 lbs capacity hold down (end condition 5)
Braced wall panel
800 lbs capacity hold down (end condition 5)
- Use continous sheathing method CS-WSP
- Braced wall panels fastened 6" oc edges, 12" oc field
- Walls are 8'-1 1/8" tall
800 lbs capacity hold down fastened to the edge of the braced wall panel closest to the corner and to the foundation or floor framing below at locations shown per R602.10.7 and figure R602.10.7
4' - 0"
29' - 11" Braced wall line
17' - 3"
End condition 3 per figure R602.10.7
Braced wall panel
4' - 0"
4' - 8"
8’ qualified bracing
9' - 6"
29' - 11"
4' - 0"
8' - 5"
4' - 0"
Braced wall panel
End condition 3 per figure R602.10.7
12’ qualified bracing
800 lbs capacity hold down (end condition 5)
Line B
Braced wall panel
Braced wall panel
8' - 0"
4' - 0"
20' - 0"
4' - 0"
15' - 0"
4' - 0"
55' - 0" Braced wall line
12’ qualified bracing

R602.10.3 Required length of bracing. The required length of bracing along each *braced wall line* shall be determined as follows:

1. All buildings in Seismic Design Categories A and B shall use Table R602.10.3(1) and the applicable adjustment factors in Table R602.10.3(2).



2 Braced wall lines

2.0
3.5
4.5
6.0
7.5
9.0

TABLE R602.10.3(2)
WIND ADJUSTMENT FACTORS TO THE REQUIRED LENGTH OF WALL BRACING

ITEM NUMBER	ADJUSTMENT BASED ON	STORY/SUPPORTING	CONDITION	ADJUSTMENT FACTOR[a,b] [multiply length from Table R602.10.3(1) by this factor]	APPLICABLE METHODS
1	Exposure category[d]	One-story structure	B	1.00	All methods
			C	1.20	
			D	1.50	
		Two-story structure	B	1.00	
			C	1.30	
			D	1.60	
		Three-story structure	B	1.00	
			C	1.40	
			D	1.70	
2	Roof eave-to-ridge height	Roof only	≤ 5 feet	0.70	
			10 feet	1.00	
			15 feet	1.30	
			20 feet	1.60	
		Roof + 1 floor	≤ 5 feet	0.85	
			10 feet	1.00	
			15 feet	1.15	
			20 feet	1.30	
		Roof + 2 floors	≤ 5 feet	0.90	
			10 feet	1.00	
			15 feet	1.10	
			20 feet	Not permitted	
3	Story height (Section R301.3)	Any story	8 feet	0.90	
			9 feet	0.95	
			10 feet	1.00	
			11 feet	1.05	
			12 feet	1.10	
4	Number of braced wall lines (per plan direction)[c]	Any story	2	1.00	
			3	1.30	
			4	1.45	
			≥ 5	1.60	
5	Additional 800-pound hold-down device	Top story only	Fastened to the end studs of each braced wall panel and to the foundation or framing below	0.80	DWB, WSP, SFB, PBS, PCP, HPS N/A
6	Interior gypsum board finish (or equivalent)	Any story	Omitted from inside face of braced wall panels N/A	1.40	DWB, WSP, SFB, PBS, PCP, HPS, CS-WSP, CS-G, CS-SFB
7	Gypsum board fastening	Any story	4 inches o.c. at panel edges, including top and bottom plates, and all horizontal joints blocked	0.7	GB N/A
8	Horizontal blocking	Any story	Horizontal block is omitted	2.0	WSP, CS-WSP

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound = 4.48 N.

a. Linear interpolation shall be permitted.

b. The total adjustment factor is the product of all applicable adjustment factors.

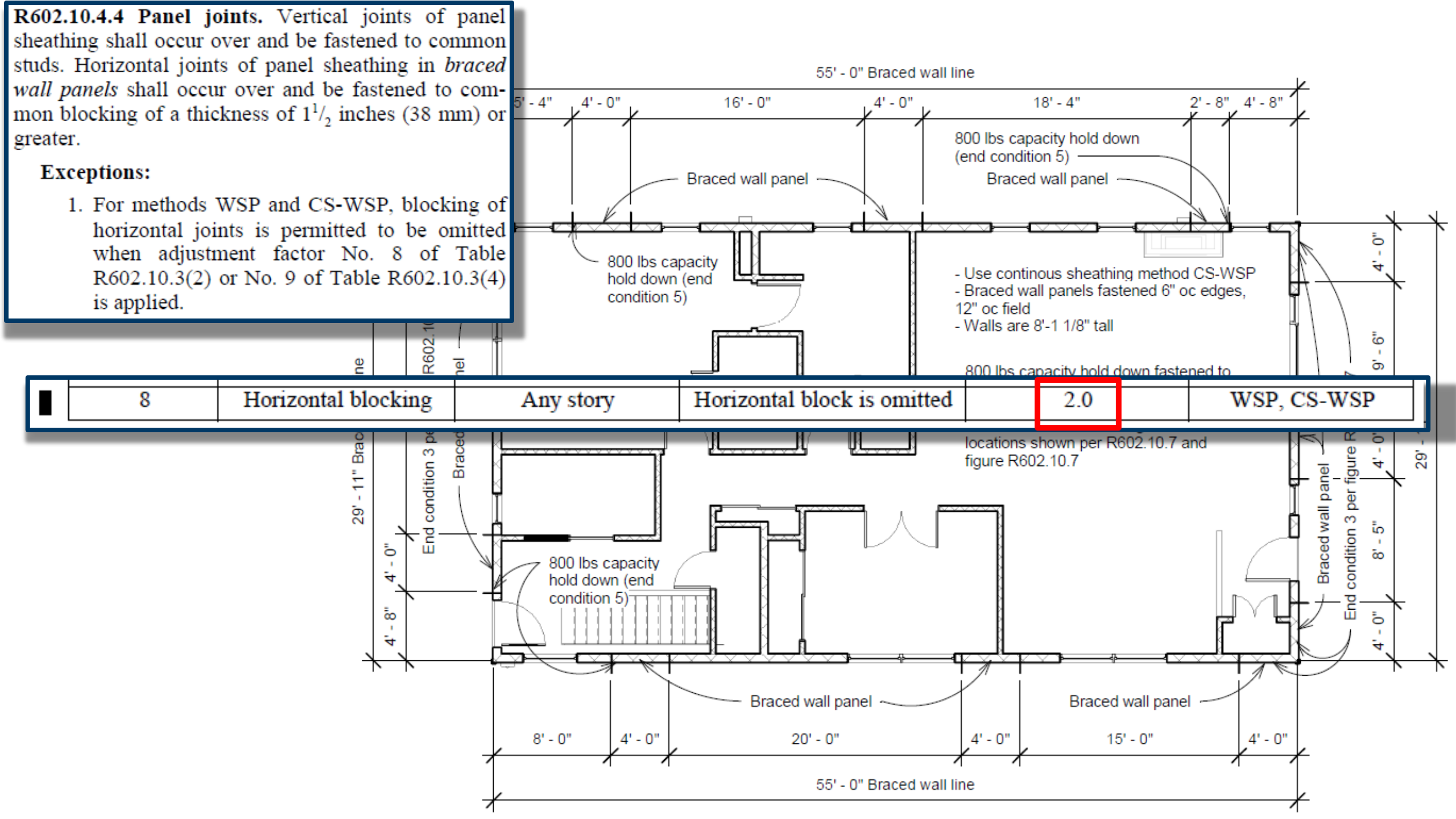
c. The adjustment factor is permitted to be 1.0 when determining bracing amounts for intermediate braced wall lines provided the bracing amounts on adjacent braced wall lines are based on a spacing and number that neglects the intermediate braced wall line.

d. The same adjustment factor shall be applied to all braced wall lines on all floors of the structure, based on the worst-case exposure category.

R602.10.4.4 Panel joints. Vertical joints of panel sheathing shall occur over and be fastened to common studs. Horizontal joints of panel sheathing in *braced wall panels* shall occur over and be fastened to common blocking of a thickness of $1^1/_2$ inches (38 mm) or greater.

Exceptions:

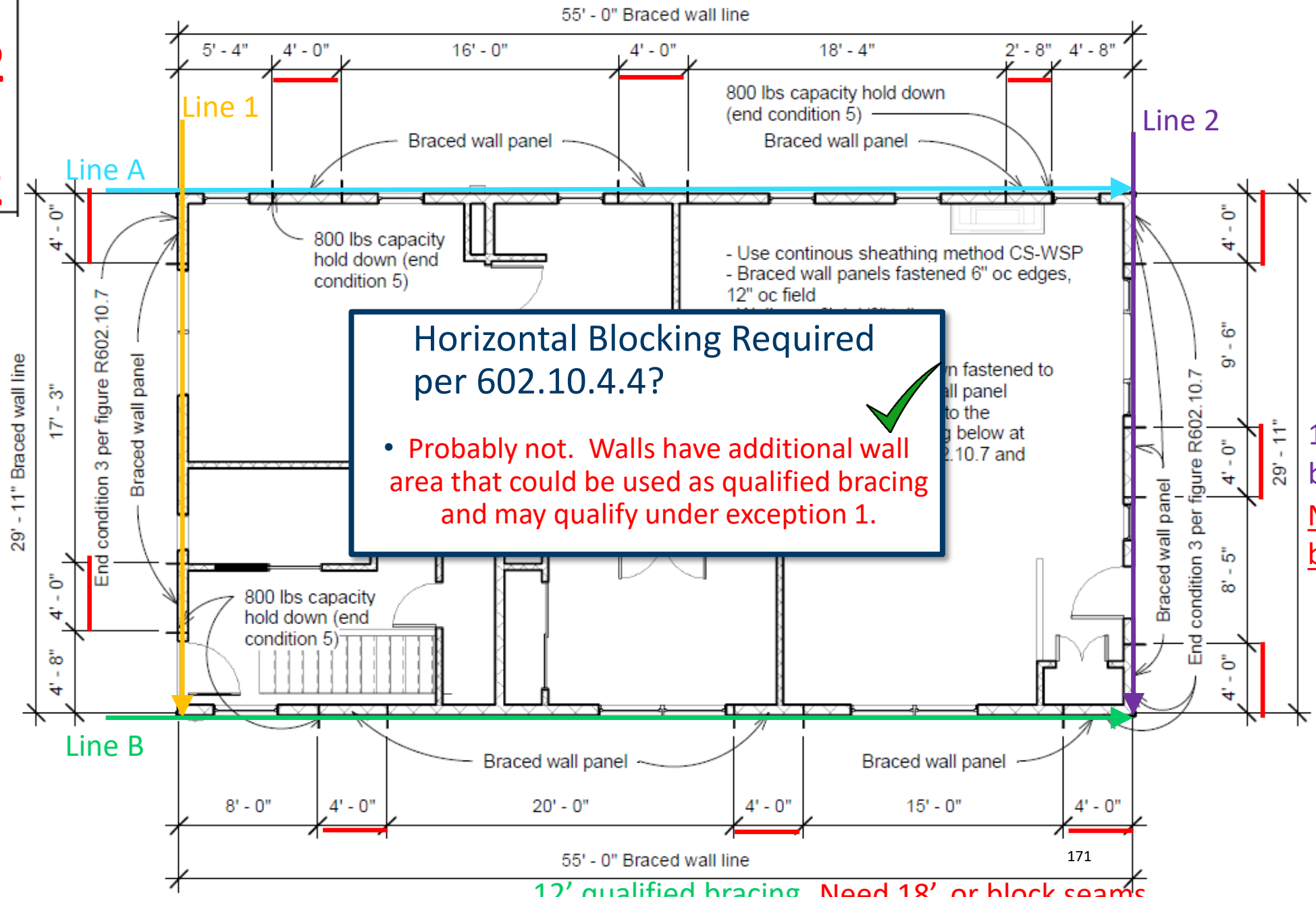
1. For methods WSP and CS-WSP, blocking of horizontal joints is permitted to be omitted when adjustment factor No. 8 of Table R602.10.3(2) or No. 9 of Table R602.10.3(4) is applied.



8	Horizontal blocking	Any story	Horizontal block is omitted	2.0	WSP, CS-WSP

2.0
3.5
4.5 x2
6.0
7.5
9.0 x2

10’-8”qualified bracing Need 18’, or block seams



Horizontal Blocking Required per 602.10.4.4?

- Probably not. Walls have additional wall area that could be used as qualified bracing and may qualify under exception 1.

8’ qualified bracing

Need 9’, or block seams

12’ qualified bracing

Need 9’, or block seams

12’ qualified bracing Need 18’, or block seams

R602.10.5 Minimum length of a braced wall panel. The minimum length of a *braced wall panel* shall comply with Table R602.10.5. For Methods CS-WSP and CS-SFB, the minimum panel length shall be based on the adjacent clear opening height in accordance with Table R602.10.5 and Figure R602.10.5. Where a panel has an opening on either side of differing heights, the taller opening height shall be used to determine the panel length.

R602.10.5.1 Contributing length. For purposes of computing the required length of bracing in Tables R602.10.3(1) and R602.10.3(3), the contributing length of each *braced wall panel* shall be as specified in Table R602.10.5.

TABLE R602.10.5
MINIMUM LENGTH OF BRACED WALL PANELS

METHOD (See Table R602.10.4)		MINIMUM LENGTH[a] (inches) Wall Height 8 feet	9 feet	10 feet	11 feet	12 feet	CONTRIBUTING LENGTH (inches)
DWB, WSP, SFB, PBS, PCP, HPS, BV-WSP		48	48	48	53	58	Actual[b]
GB		48	48	48	53	58	Double sided = Actual Single sided = 0.5 × Actual
LIB		55	62	69	NP	NP	Actual[b]
ABW	SDC A, B and C, ultimate design wind speed < 140 mph	28	32	34	38	42	48
	SDC D_0, D_1 and D_2, ultimate design wind speed < 140 mph	32	32	34	NP	NP	
CS-G		24	27	30	33	36	Actual[b]
CS-WSP, CS-SFB	Adjacent clear opening height (inches)						
	≤ 64	24	27	30	33	36	Actual[b]
	68	26	27	30	33	36	
	72	27	27	30	33	36	
	76	30	29	30	33	36	
	80	32	30	30	33	36	
	84	35	32	32	33	36	
	88	38	35	33	33	36	
	92	43	37	35	35	36	
	96	48	41	38	36	36	
	100	—	44	40	38	38	
	104	—	49	43	40	39	
	108	—	54	46	43	41	
	112	—	—	50	45	43	
	116	—	—	55	48	45	
	120	—	—	60	52	48	
	124	—	—	—	56	51	
	128	—	—	—	61	54	
	132	—	—	—	66	58	
	136	—	—	—	—	62	
	140	—	—	—	—	66	
	144	—	—	—	—	72	
METHOD (See Table R602.10.4)		Portal header height 8 feet	9 feet	10 feet	11 feet	12 feet	
PFH	Supporting roof only	16	16	16	Note c	Note c	48
	Supporting one story and roof	24	24	24	Note c	Note c	
PFG		24	27	30	Note d	Note d	1.5 × Actual[b]
CS-PF	SDC A, B and C	16	18	20	Note e	Note e	1.5 × Actual[b]
	SDC D_0, D_1 and D_2	16	18	20	Note e	Note e	Actual[b]

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mile per hour = 0.447 m/s.
NP = Not Permitted.
a. Linear interpolation shall be permitted.
b. Use the actual length where it is greater than or equal to the minimum length.
c. Maximum header height for PFH is 10 feet in accordance with Figure R602.10.6.2, but wall height shall be permitted to be increased to 12 feet with pony wall.
d. Maximum header height for PFG is 10 feet in accordance with Figure R602.10.6.3, but wall height shall be permitted to be increased to 12 feet with pony wall.
e. Maximum header height for CS-PF is 10 feet in accordance with Figure R602.10.6.4, but wall height shall be permitted to be increased to 12 feet with pony wall.

R602.10.5 Minimum length of a braced wall panel. The minimum length of a *braced wall panel* shall comply with Table R602.10.5. For Methods CS-WSP and CS-SFB, the minimum panel length shall be based on the adjacent clear opening height in accordance with Table R602.10.5 and Figure R602.10.5. Where a panel has an opening on either side of differing heights, the taller opening height shall be used to determine the panel length.

R602.10.5.1 Contributing length. For purposes of computing the required length of bracing in Tables R602.10.3(1) and R602.10.3(3), the contributing length of each *braced wall panel* shall be as specified in Table R602.10.5.

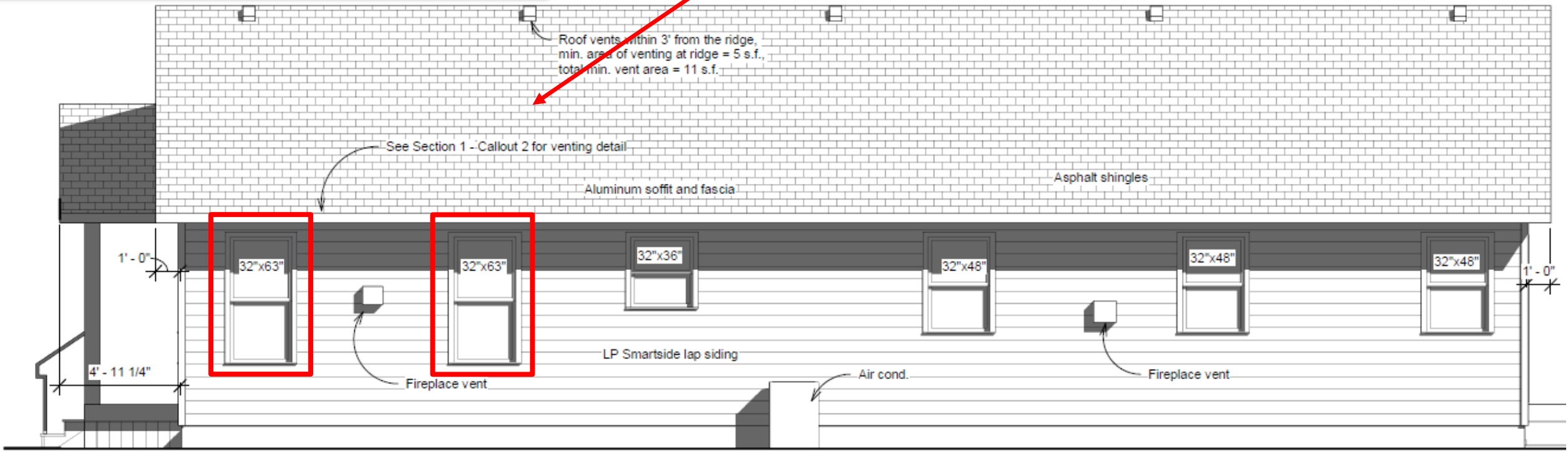
TABLE R602.10.5
MINIMUM LENGTH OF BRACED WALL PANELS

METHOD (See Table R602.10.4)	Adjacent clear opening height (inches)	MINIMUM LENGTH[a] (inches) Wall Height 8 feet	9 feet	10 feet	11 feet	12 feet	CONTRIBUTING LENGTH (inches)
CS-WSP, CS-SFB	≤ 64	24	27	30	33	36	Actual[b]
	68	26	27	30	33	36	
	72	27	27	30	33	36	
	76	30	29	30	33	36	
	80	32	30	30	33	36	
	84	35	32	32	33	36	
	88	38	35	33	33	36	
	92	43	37	35	35	36	
	96	48	41	38	36	36	
	100	—	44	40	38	38	
	104	—	49	43	40	39	
	108	—	54	46	43	41	
	112	—	—	50	45	43	
	116	—	—	55	48	45	
	120	—	—	60	52	48	
	124	—	—	—	56	51	
	128	—	—	—	61	54	
	132	—	—	—	66	58	
	136	—	—	—	—	62	
	140	—	—	—	—	66	
	144	—	—	—	—	72	

R602.10.5 Minimum length of a braced wall panel. The minimum length of a *braced wall panel* shall comply with Table R602.10.5. For Methods CS-WSP and CS-SFB, the minimum panel length shall be based on the adjacent clear opening height in accordance with Table R602.10.5 and Figure R602.10.5. Where a panel has an opening on either side of differing heights, the taller opening height shall be used to determine the panel length.

R602.10.5.1 Contributing length. For purposes of computing the required length of bracing in Tables R602.10.3(1) and R602.10.3(3), the contributing length of each *braced wall panel* shall be as specified in Table R602.10.5.

63" high windows



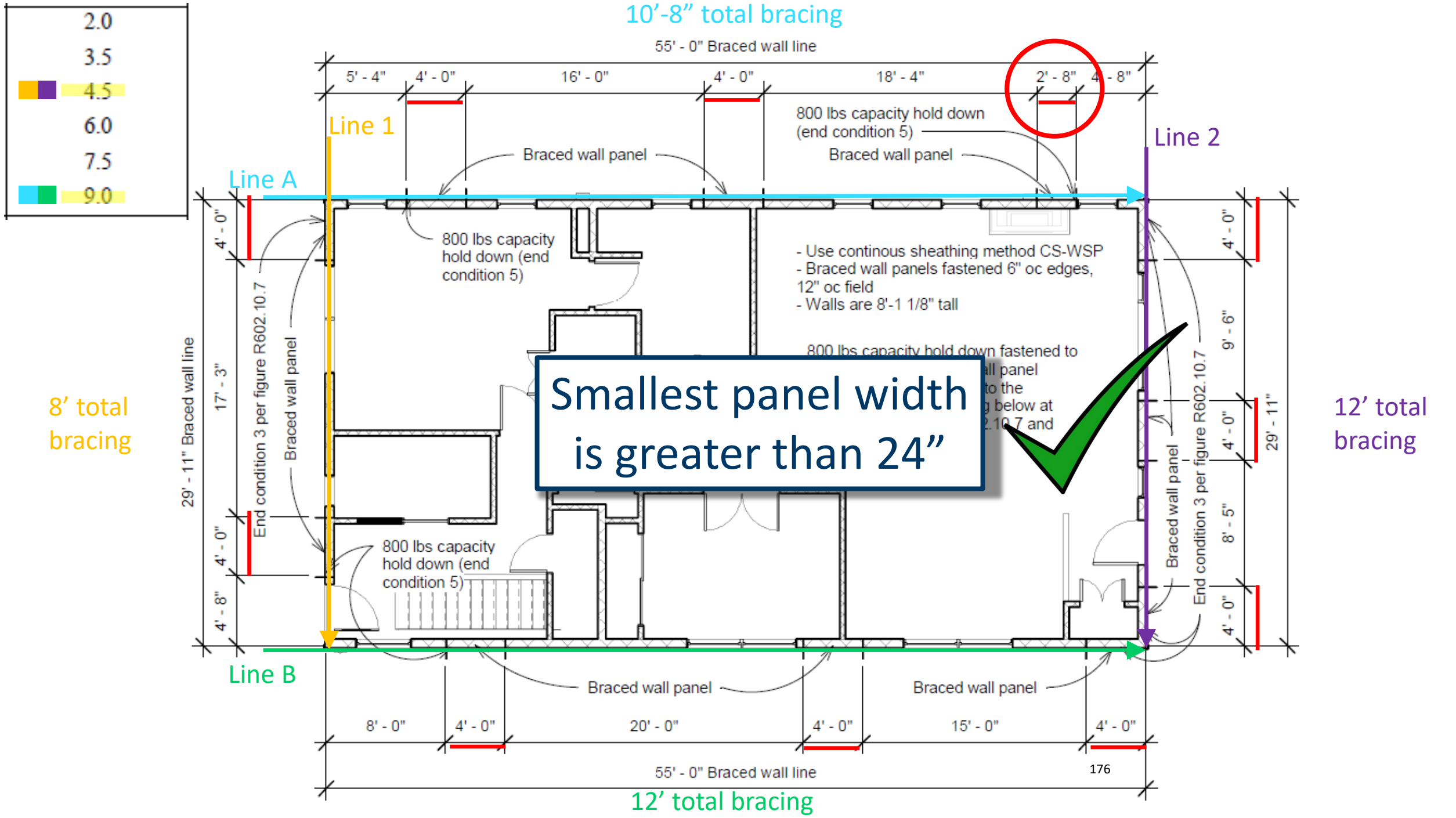
5 North
1/4" = 1'-0"

R602.10.5 Minimum length of a braced wall panel. The minimum length of a *braced wall panel* shall comply with Table R602.10.5. For Methods CS-WSP and CS-SFB, the minimum panel length shall be based on the adjacent clear opening height in accordance with Table R602.10.5 and Figure R602.10.5. Where a panel has an opening on either side of differing heights, the taller opening height shall be used to determine the panel length.

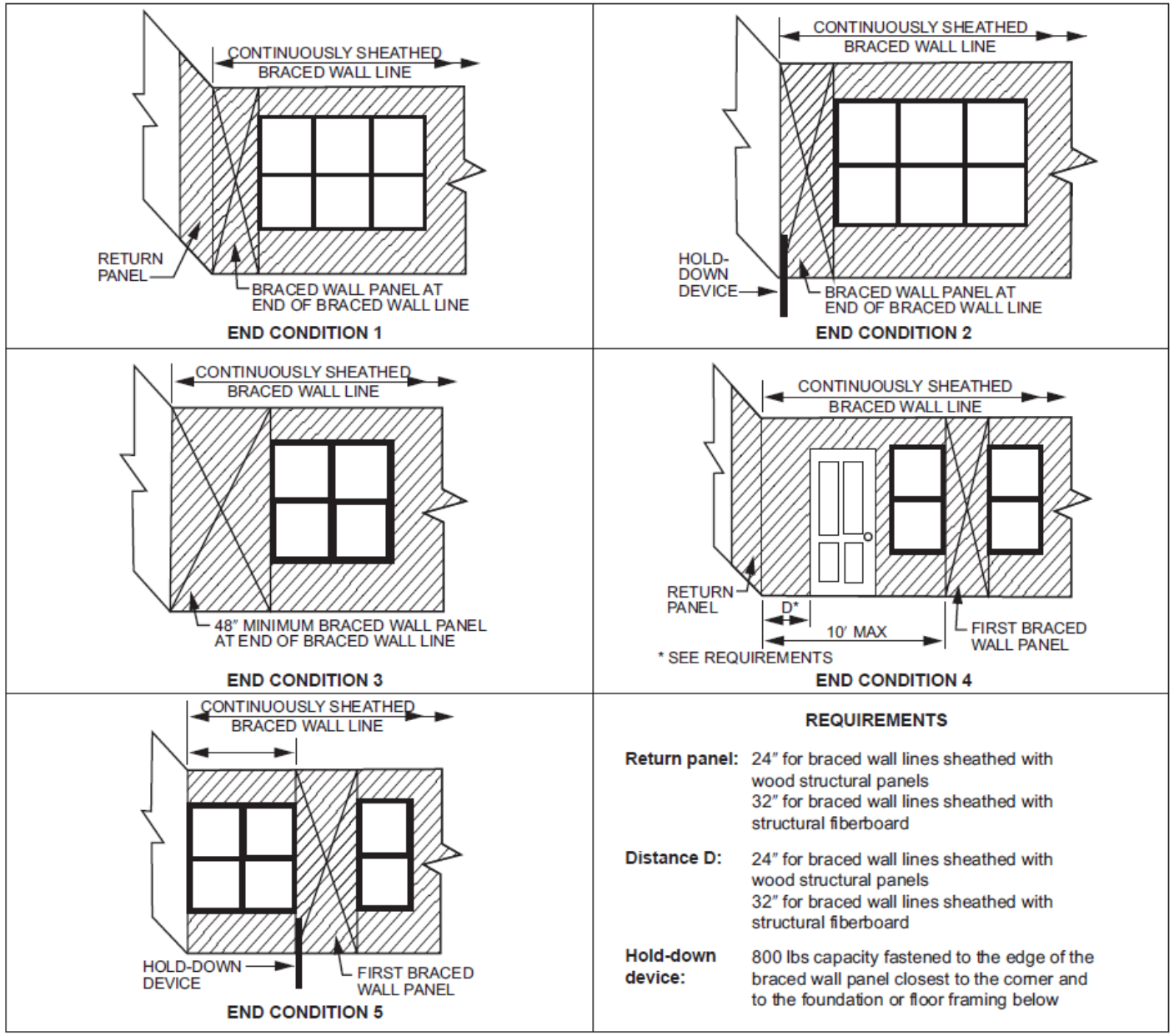
R602.10.5.1 Contributing length. For purposes of computing the required length of bracing in Tables R602.10.3(1) and R602.10.3(3), the contributing length of each *braced wall panel* shall be as specified in Table R602.10.5.

TABLE R602.10.5
MINIMUM LENGTH OF BRACED WALL PANELS

METHOD (See Table R602.10.4)	Adjacent clear opening height (inches)	MINIMUM LENGTH[a] (inches) Wall Height 8 feet	9 feet	10 feet	11 feet	12 feet	CONTRIBUTING LENGTH (inches)
CS-WSP, CS-SFB	≤ 64	24	27	30	33	36	Actual[b]
	68	26	27	30	33	36	
	72	27	27	30	33	36	
	76	30	29	30	33	36	
	80	32	30	30	33	36	
	84	35	32	32	33	36	
	88	38	35	33	33	36	
	92	43	37	35	35	36	
	96	48	41	38	36	36	
	100	—	44	40	38	38	
	104	—	49	43	40	39	
	108	—	54	46	43	41	
	112	—	—	50	45	43	
	116	—	—	55	48	45	
	120	—	—	60	52	48	
	124	—	—	—	56	51	
	128	—	—	—	61	54	
	132	—	—	—	66	58	
	136	—	—	—	—	62	
	140	—	—	—	—	66	
	144	—	—	—	—	72	


2.0
3.5
4.5
6.0
7.5
9.0
10’-8” total bracing
55' - 0" Braced wall line
5' - 4"
4' - 0"
16' - 0"
4' - 0"
18' - 4"
2' - 8"
4' - 8"
Line 1
Line 2
Line A
Line B
Braced wall panel
800 lbs capacity hold down (end condition 5)
800 lbs capacity hold down (end condition 5)
Braced wall panel
- Use continous sheathing method CS-WSP
- Braced wall panels fastened 6" oc edges, 12" oc field
- Walls are 8'-1 1/8" tall
800 lbs capacity hold down fastened to
l panel
to the
below at
2.10.7 and
Smallest panel width is greater than 24”
29' - 11" Braced wall line
17' - 3"
4' - 0"
4' - 0"
4' - 8"
End condition 3 per figure R602.10.7
Braced wall panel
Braced wall panel
End condition 3 per figure R602.10.7
9' - 6"
4' - 0"
8' - 5"
4' - 0"
29' - 11"
4' - 0"
8' - 0"
4' - 0"
20' - 0"
4' - 0"
15' - 0"
4' - 0"
55' - 0" Braced wall line
8’ total bracing
12’ total bracing
12’ total bracing

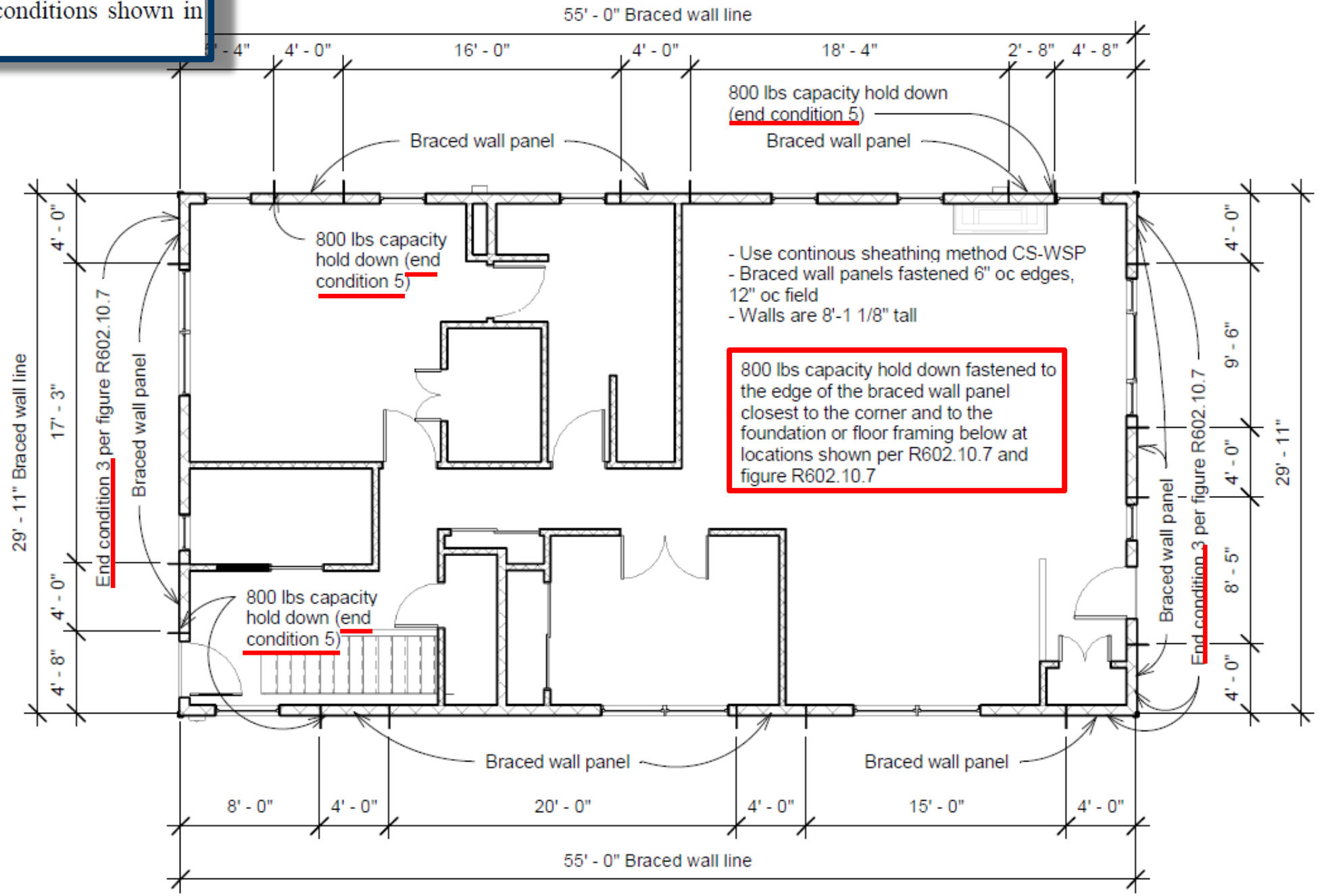
R602.10.7 Ends of braced wall lines with continuous sheathing. Each end of a *braced wall line* with continuous sheathing shall have one of the conditions shown in Figure R602.10.7.



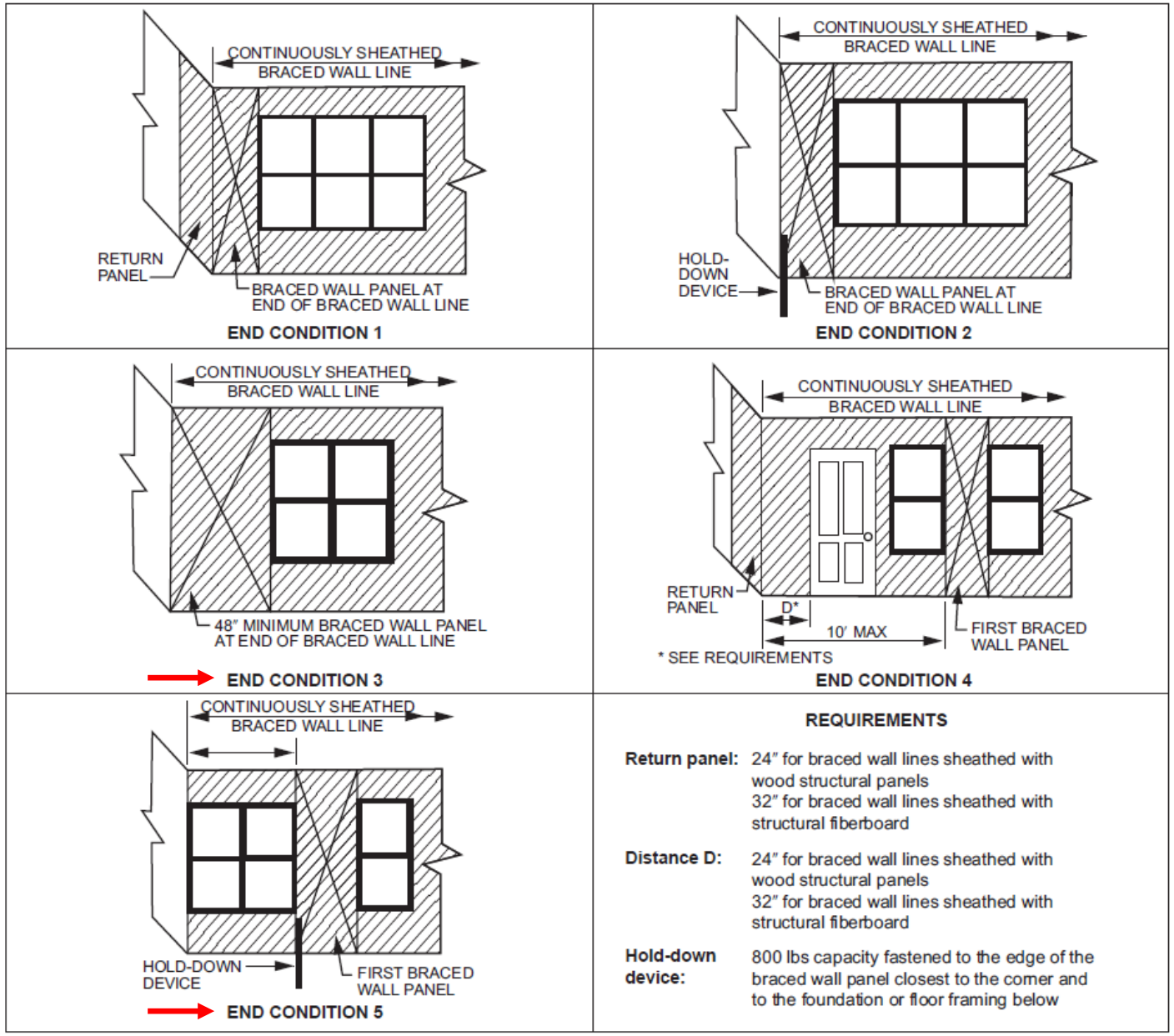
For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound = 4.45 N.

FIGURE R602.10.7
END CONDITIONS FOR BRACED WALL LINES WITH CONTINUOUS SHEATHING

R602.10.7 Ends of braced wall lines with continuous sheathing. Each end of a *braced wall line* with continuous sheathing shall have one of the conditions shown in Figure R602.10.7.



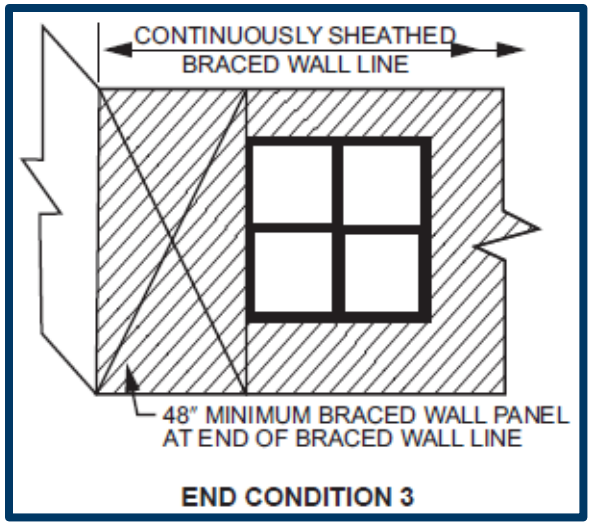
R602.10.7 Ends of braced wall lines with continuous sheathing. Each end of a *braced wall line* with continuous sheathing shall have one of the conditions shown in Figure R602.10.7.



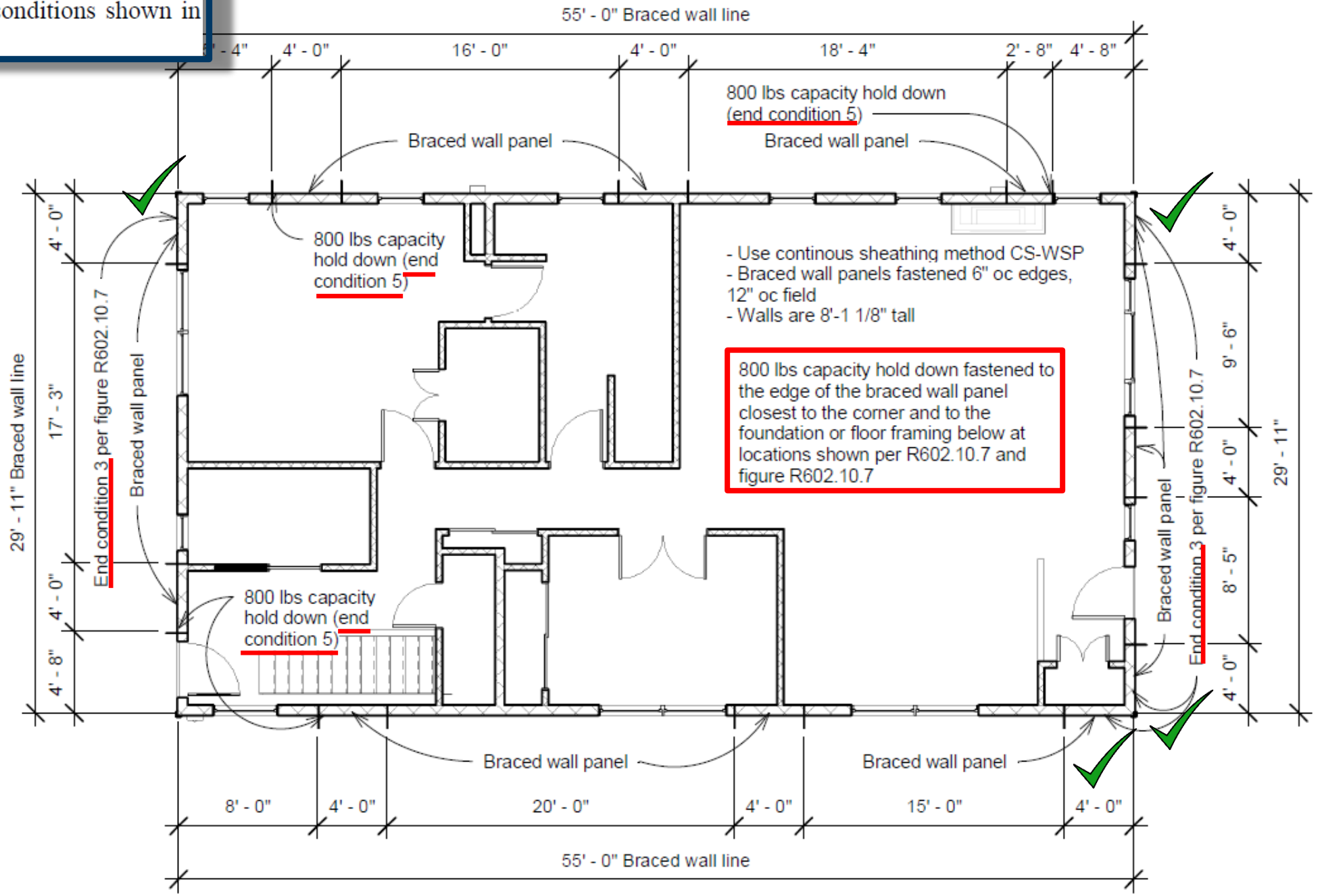
For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound = 4.45 N.

FIGURE R602.10.7
END CONDITIONS FOR BRACED WALL LINES WITH CONTINUOUS SHEATHING

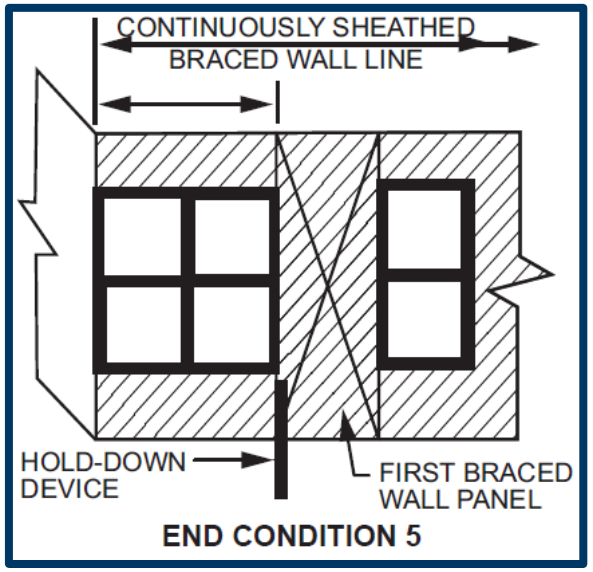
R602.10.7 Ends of braced wall lines with continuous sheathing. Each end of a *braced wall line* with continuous sheathing shall have one of the conditions shown in Figure R602.10.7.

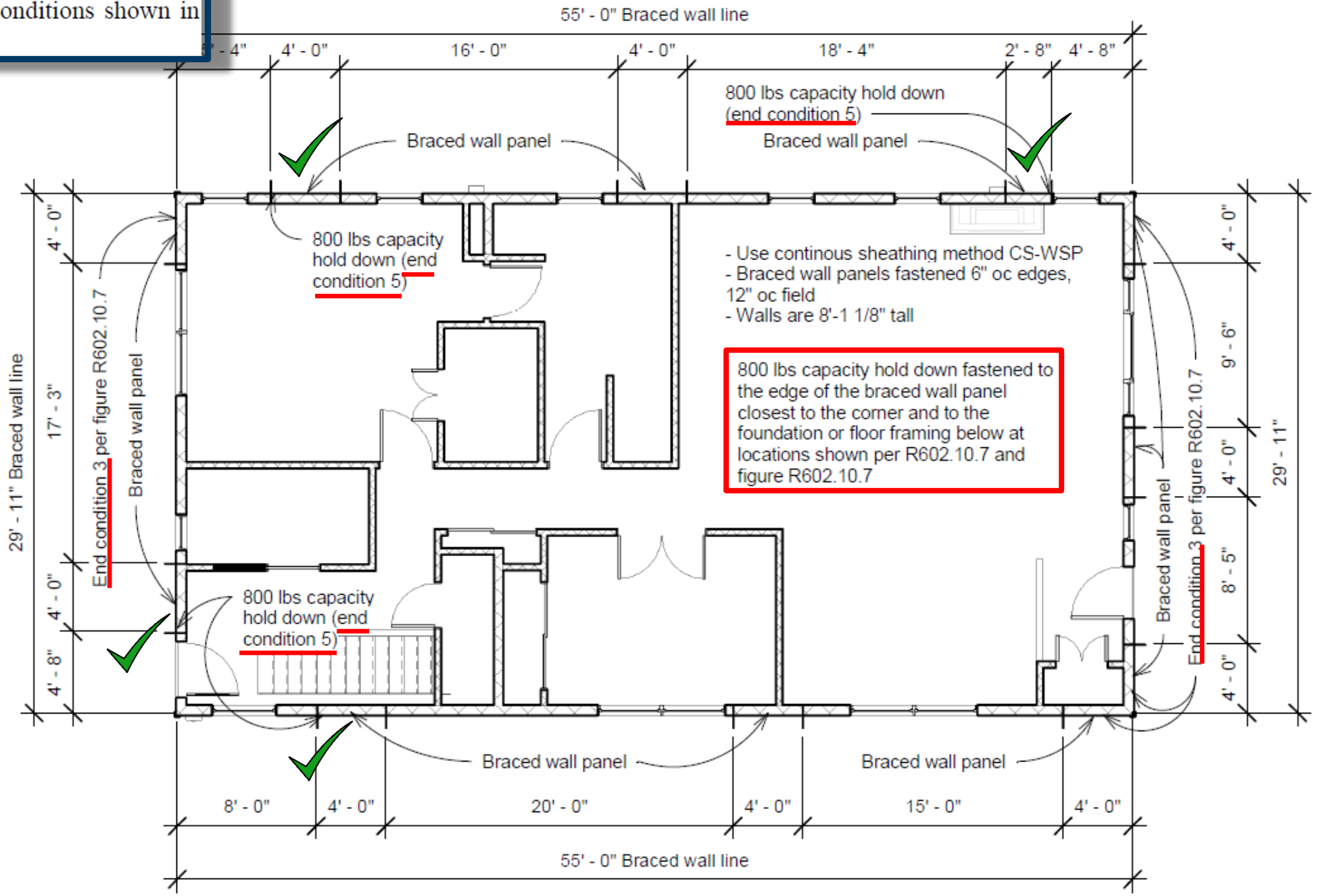


END CONDITION 3

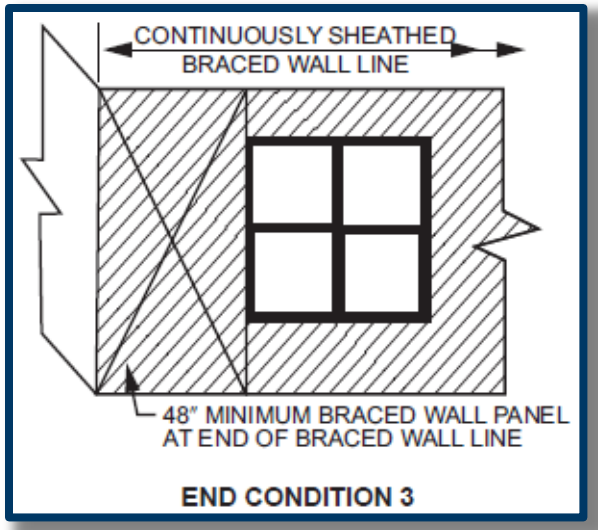


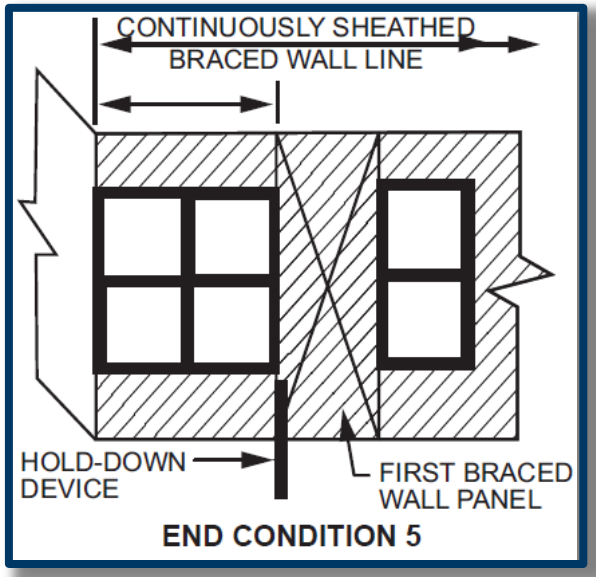
R602.10.7 Ends of braced wall lines with continuous sheathing. Each end of a *braced wall line* with continuous sheathing shall have one of the conditions shown in Figure R602.10.7.

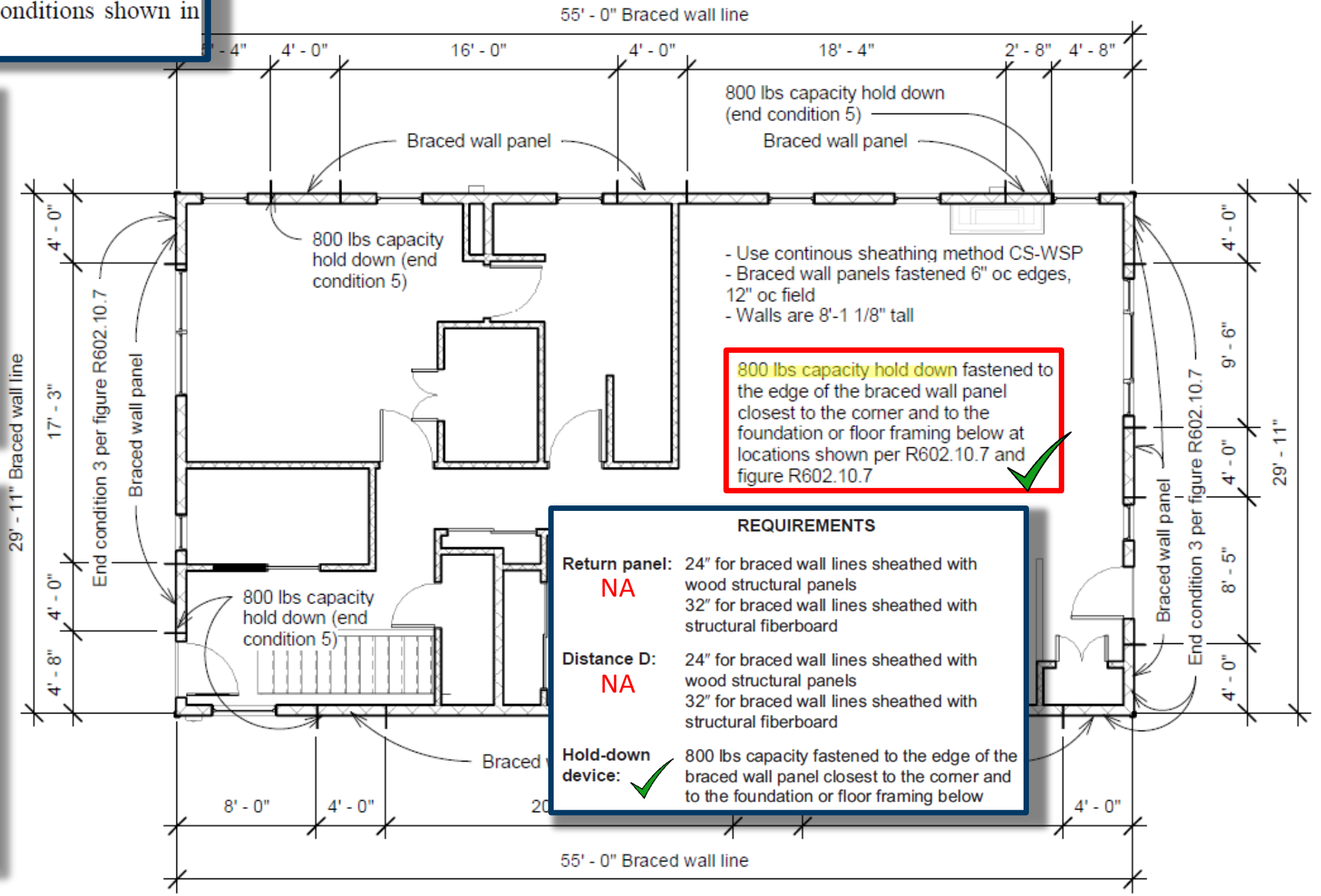




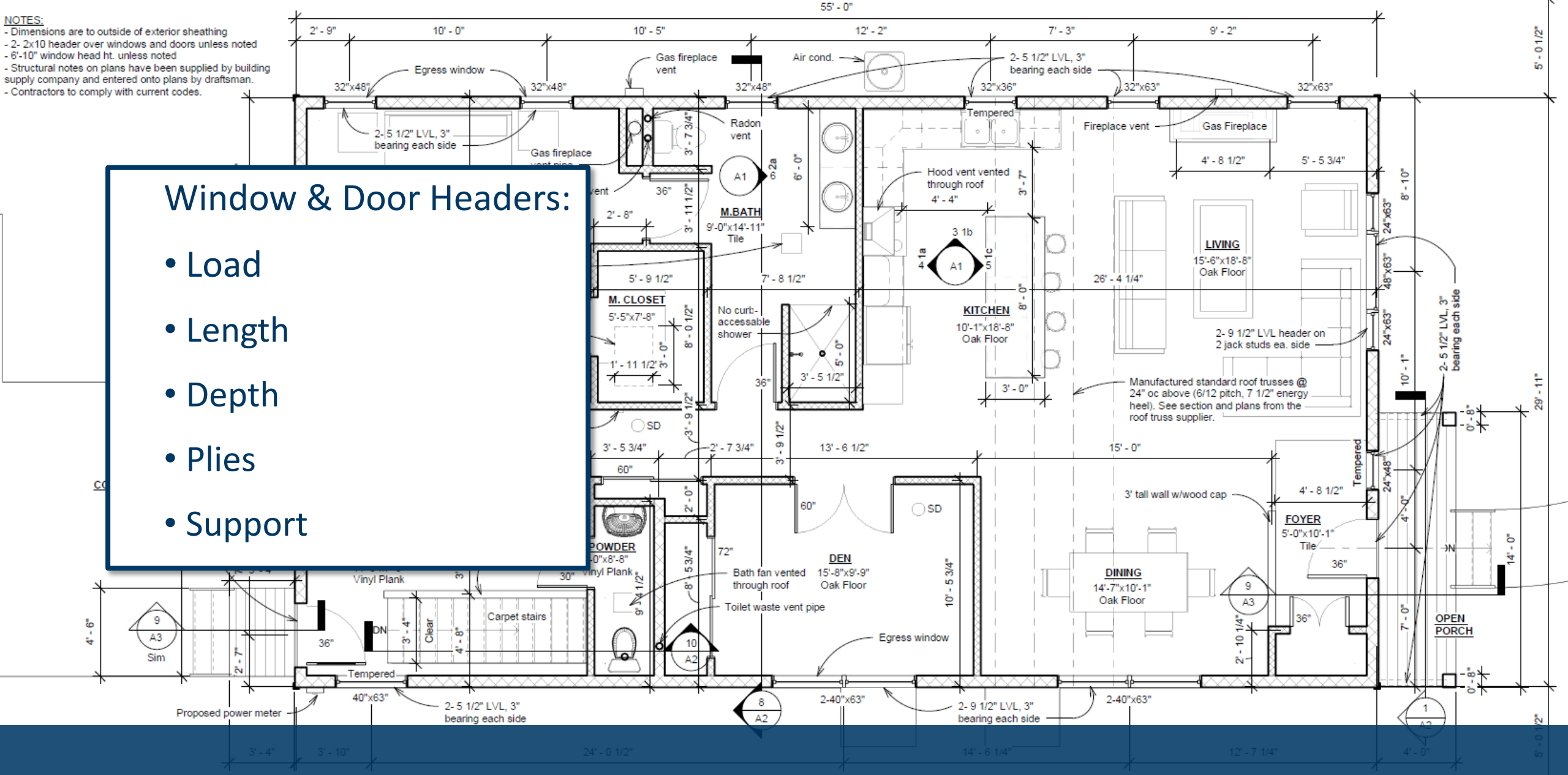
R602.10.7 Ends of braced wall lines with continuous sheathing. Each end of a *braced wall line* with continuous sheathing shall have one of the conditions shown in Figure R602.10.7.



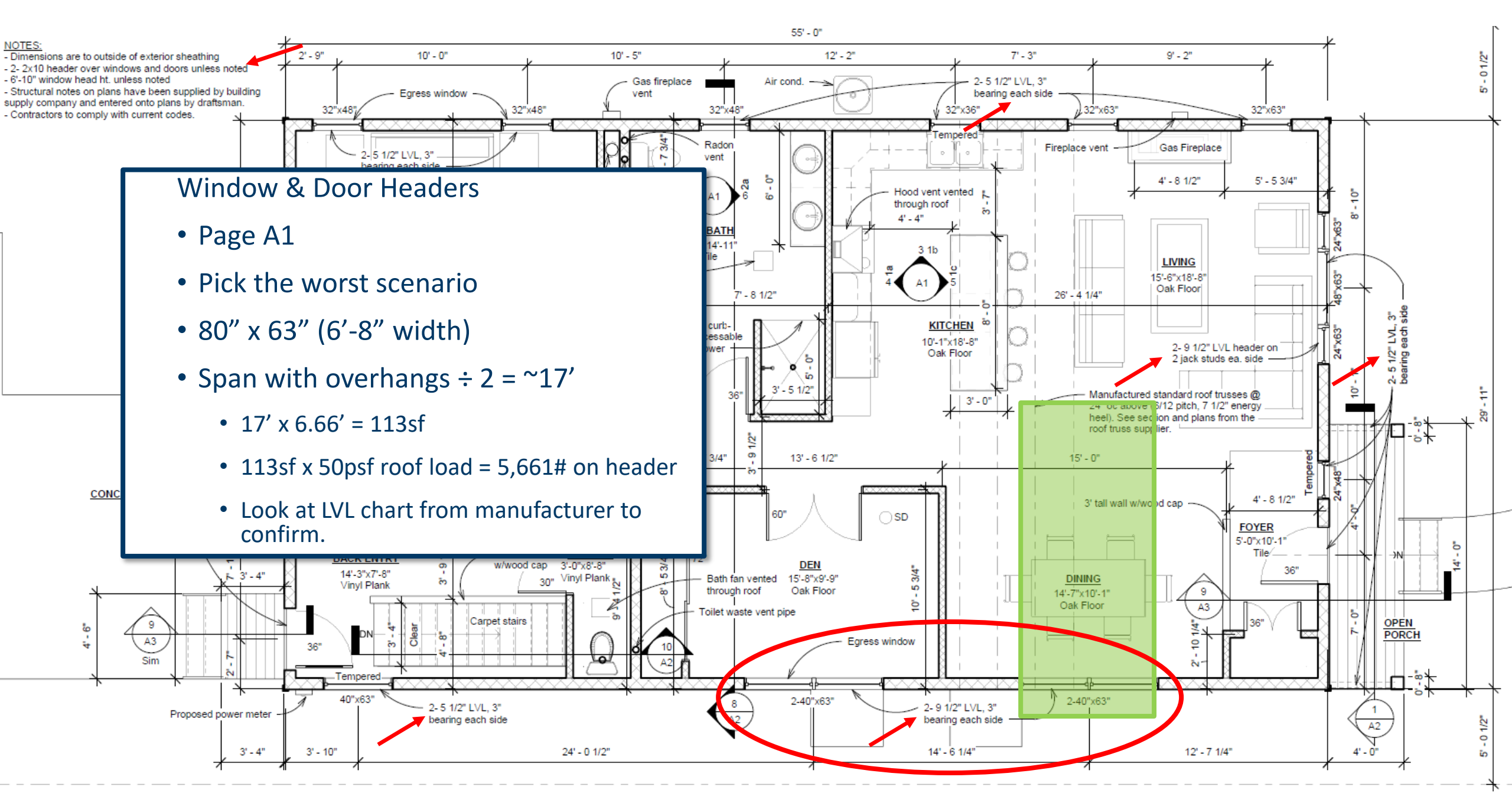




Headers, Beams, Girders – Chapter 6


NOTES:
- Dimensions are to outside of exterior sheathing
- 2- 2x10 header over windows and doors unless noted
- 6'-10" window head ht. unless noted
- Structural notes on plans have been supplied by building supply company and entered onto plans by draftsman.
- Contractors to comply with current codes.
Window & Door Headers:
• Load
• Length
• Depth
• Plies
• Support
55' - 0"
Egress window
Gas fireplace vent
Air cond.
2- 5 1/2" LVL, 3" bearing each side
Radon vent
M.BATH
9'-0"x14'-11"
Tile
Hood vent vented through roof
Tempered
Fireplace vent
Gas Fireplace
LIVING
15'-6"x18'-8"
Oak Floor
KITCHEN
10'-1"x16'-8"
Oak Floor
M. CLOSET
5'-5"x7'-8"
No curb-accessable shower
2- 9 1/2" LVL header on 2 jack studs ea. side
Manufactured standard roof trusses @ 24" oc above (6/12 pitch, 7 1/2" energy heel). See section and plans from the roof truss supplier.
POWDER
Vinyl Plank
Bath fan vented through roof
Toilet waste vent pipe
DEN
15'-8"x9'-9"
Oak Floor
Carpet stairs
Egress window
3' tall wall w/wood cap
FOYER
5'-0"x10'-1"
Tile
DINING
14'-7"x10'-1"
Oak Floor
OPEN PORCH
Tempered
Proposed power meter
2- 5 1/2" LVL, 3" bearing each side
2- 9 1/2" LVL, 3" bearing each side
Main Level
1/4" = 1'-0"

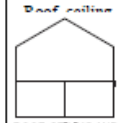
Headers


NOTES:
- Dimensions are to outside of exterior sheathing
- 2- 2x10 header over windows and doors unless noted
- 6'-10" window head ht. unless noted
- Structural notes on plans have been supplied by building supply company and entered onto plans by draftsman.
- Contractors to comply with current codes.
Window & Door Headers
• Page A1
• Pick the worst scenario
• 80” x 63” (6’-8” width)
• Span with overhangs ÷ 2 = ~17’
• 17’ x 6.66’ = 113sf
• 113sf x 50psf roof load = 5,661# on header
• Look at LVL chart from manufacturer to confirm.
55' - 0"
Egress window
Gas fireplace vent
Air cond.
2- 5 1/2" LVL, 3" bearing each side
Radon vent
Tempered
Fireplace vent
Gas Fireplace
Hood vent vented through roof
BATH
14'-11" Tile
LIVING
15'-6"x18'-8" Oak Floor
KITCHEN
10'-1"x18'-8" Oak Floor
2- 9 1/2" LVL header on 2 jack studs ea. side
Manufactured standard roof trusses @ 24" oc above 3/12 pitch, 7 1/2" energy heel). See section and plans from the roof truss supplier.
3' tall wall w/wood cap
FOYER
5'-0"x10'-1" Tile
DINING
14'-7"x10'-1" Oak Floor
DEN
15'-8"x9'-9" Oak Floor
Bath fan vented through roof
Toilet waste vent pipe
Carpet stairs
BACK ENTRY
14'-3"x7'-8" Vinyl Plank
3'-0"x8'-8" Vinyl Plank
OPEN PORCH
Proposed power meter
Egress window
2-40"x63"
2- 9 1/2" LVL, 3" bearing each side
2- 5 1/2" LVL, 3" bearing each side
Main Level
1/4" = 1'-0"

Window & Door Headers:

- Load
- Length
- Depth
- Plies
- Support

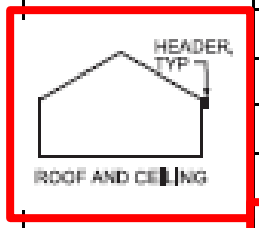
TABLE R602.7(1)
GIRDER SPANS[a] AND HEADER SPANS[a] FOR EXTERIOR BEARING WALLS
(Maximum spans for Douglas fir-larch, hem-fir, Southern pine and spruce-pine-fir[b] and required number of jack studs)

GIRDERS AND HEADERS SUPPORTING	SIZE	GROUND SNOW LOAD (psf)[a]																	
		30						50						70					
		Building width[c] (feet)																	
		12		24		36		12		24		36		12		24		36	
		Span	NJ[d]	Span	NJ[d]	Span	NJ[d]	Span	NJ[d]	Span	NJ[d]	Span	NJ[d]	Span	NJ[d]	Span	NJ[d]	Span	NJ[d]
	1-2 × 6	4-0	1	3-1	2	2-7	2	3-5	1	2-8	2	2-3	2	3-0	2	2-4	2	2-0	2
	1-2 × 8	5-1	2	3-11	2	3-3	2	4-4	2	3-4	2	2-10	2	3-10	2	3-0	2	2-6	3
	1-2 × 10	6-0	2	4-8	2	3-11	2	5-2	2	4-0	2	3-4	3	4-7	2	3-6	3	3-0	3
	1-2 × 12	7-1	2	5-5	2	4-7	3	6-1	2	4-8	3	3-11	3	5-5	2	4-2	3	3-6	3
	2-2 × 4	4-0	1	3-1	1	2-7	1	3-5	1	2-7	1	2-2	1	3-0	1	2-4	1	2-0	1
	2-2 × 6	6-0	1	4-7	1	3-10	1	5-1	1	3-11	1	3-3	2	4-6	1	3-6	2	2-11	2
	2-2 × 8	7-7	1	5-9	1	4-10	2	6-5	1	5-0	2	4-2	2	5-9	1	4-5	2	3-9	2
	2-2 × 10	9-0	1	6-10	2	5-9	2	7-8	2	5-11	2	4-11	2	6-9	2	5-3	2	4-5	2
	2-2 × 12	10-7	2	8-1	2	6-10	2	9-0	2	6-11	2	5-10	2	8-0	2	6-2	2	5-2	3
	3-2 × 8	9-5	1	7-3	1	6-1	1	8-1	1	6-3	1	5-3	2	7-2	1	5-6	2	4-8	2
	3-2 × 10	11-3	1	8-7	1	7-3	2	9-7	1	7-4	2	6-2	2	8-6	1	6-7	2	5-6	2
	3-2 × 12	13-2	1	10-1	2	8-6	2	11-3	2	8-8	2	7-4	2	10-0	2	7-9	2	6-6	2
	4-2 × 8	10-11	1	8-4	1	7-0	1	9-4	1	7-2	1	6-0	1	8-3	1	6-4	1	5-4	2
	4-2 × 10	12-11	1	9-11	1	8-4	1	11-1	1	8-6	1	7-2	2	9-10	1	7-7	2	6-4	2
	4-2 × 12	15-3	1	11-8	1	9-10	2	13-0	1	10-0	2	8-5	2	11-7	1	8-11	2	7-6	2
	1-2 × 6	3-3	1	2-7	2	2-2	2	3-0	2	2-4	2	2-0	2	2-9	2	2-2	2	1-10	2
	1-2 × 8	4-1	2	3-3	2	2-9	2	3-9	2	3-0	2	2-6	3	3-6	2	2-9	2	2-4	3
	1-2 × 10	4-11	2	3-10	2	3-3	3	4-6	2	3-6	3	3-0	3	4-1	2	3-3	3	2-9	3
	1-2 × 12	5-9	2	4-6	3	3-10	3	5-3	2	4-2	3	3-6	3	4-10	3	3-10	3	3-3	4
	2-2 × 4	3-3	1	2-6	1	2-2	1	3-0	1	2-4	1	2-0	1	2-8	1	2-2	1	1-10	1
	2-2 × 6	4-10	1	3-9	1	3-3	2	4-5	1	3-6	2	3-0	2	4-1	1	3-3	2	2-9	2
	2-2 × 8	6-1	1	4-10	2	4-1	2	5-7	2	4-5	2	3-9	2	5-2	2	4-1	2	3-6	2
	2-2 × 10	7-3	2	5-8	2	4-10	2	6-8	2	5-3	2	4-5	2	6-1	2	4-10	2	4-1	2
	2-2 × 12	8-6	2	6-8	2	5-8	2	7-10	2	6-2	2	5-3	3	7-2	2	5-8	2	4-10	3
	3-2 × 8	7-8	1	6-0	1	5-1	2	7-0	1	5-6	2	4-8	2	6-5	1	5-1	2	4-4	2
	3-2 × 10	9-1	1	7-2	2	6-1	2	8-4	1	6-7	2	5-7	2	7-8	2	6-1	2	5-2	2
	3-2 × 12	10-8	2	8-5	2	7-2	2	9-10	2	7-8	2	6-7	2	9-0	2	7-1	2	6-1	2
	4-2 × 8	8-10	1	6-11	1	5-11	1	8-1	1	6-4	1	5-5	2	7-5	1	5-11	1	5-0	2
	4-2 × 10	10-6	1	8-3	2	7-0	2	9-8	1	7-7	2	6-5	2	8-10	1	7-0	2	6-0	2
	4-2 × 12	12-4	1	9-8	2	8-3	2	11-4	2	8-11	2	7-7	2	10-4	2	8-3	2	7-0	2
	1-2 × 6	2-11	2	2-3	2	1-11	2	2-9	2	2-1	2	1-9	2	2-7	2	2-0	2	1-8	2
	1-2 × 8	3-9	2	2-10	2	2-5	3	3-6	2	2-8	2	2-3	3	3-3	2	2-6	3	2 -2	3
	1-2 × 10	4-5	2	3-5	3	2-10	3	4-2	2	3-2	3	2-8	3	3-11	2	3-0	3	2-6	3
	1-2 × 12	5-2	2	4-0	3	3-4	3	4-10	3	3-9	3	3-2	4	4-7	3	3-6	3	3-0	4
	2-2 × 4	2-11	1	2-3	1	1-10	1	2-9	1	2-1	1	1-9	1	2-7	1	2-0	1	1-8	1
	2-2 × 6	4-4	1	3-4	2	2-10	2	4-1	1	3-2	2	2-8	2	3-10	1	3-0	2	2-6	2
	2-2 × 8	5-6	2	4-3	2	3-7	2	5-2	2	4-0	2	3-4	2	4-10	2	3-9	2	3-2	2
	2-2 × 10	6-7	2	5-0	2	4-2	2	6-1	2	4-9	2	4-0	2	5-9	2	4-5	2	3-9	3
	2-2 × 12	7-9	2	5-11	2	4-11	3	7-2	2	5-7	2	4-8	3	6-9	2	5-3	3	4-5	3
	3-2 × 8	6-11	1	5-3	2	4-5	2	6-5	1	5-0	2	4-2	2	6-1	1	4-8	2	4-0	2
	3-2 × 10	8-3	2	6-3	2	5-1	2	7-8	2	5-11	2	5-0	2	7-3	2	5-7	2	4-8	2
	3-2 × 12	9-8	2	7-4	2	6-0	3	9-2	2	7-0	2	5-10	2	8-6	2	6-7	2	5-6	3
	4-2 × 8	8-0	1	6-0	1	4-10	2	7-6	1	5-9	2	4-10	2	7-0	1	5-5	2	4-7	2
	4-2 × 10	9-6	1	7-3	2	6-1	2	8-10	1	6-10	2	5-9	2	8-4	1	6-5	2	5-5	2
	4-2 × 12	11-2	2	8-6	2	7-2	2	10-5	2	8-0	2	6-9	2	9-10	2	7-7	2	6-5	2

(continued)

Headers – Dimensional Lumber

TABLE R602.7(1)
GIRDER SPANS[a] AND HEADER SPANS[a] FOR EXTERIOR BEARING WALLS
(Maximum spans for Douglas fir-larch, hem-fir, Southern pine and spruce-pine-fir[b] and required number of jack studs)

GIRDERS AND HEADERS SUPPORTING	SIZE	GROUND SNOW LOAD (psf)[e]																			
		30						50													
		Building width[c] (feet)																			
		12		24		36		12		24		36									
		Span[f]	NJ[d]	Span[f]	NJ[d]	Span[f]	NJ[d]	Span[f]	NJ[d]	Span[f]	NJ[d]	Span[f]	NJ[d]								
	1-2 × 6	4-0	1	3-1	2	2-7	2	3-5	1	2-8	2	2-3	2								
	1-2 × 8	5-1	2	3-11	2	3-3	2	4-4	2	3-4	2	2-10	2								
	1-2 × 10	6-0	2	4-8	2	3-11	2	5-2	2	4-0	2	3-4	3								
	1-2 × 12	7-1	2	5-5	2	4-7	3	6-1	2	4-8	3	3-11	3								
	2-2 × 4	4-0	1	3-1	1	2-7	1	3-5	1	2-7	1	2-2	1								
	2-2 × 6	6-0	1	4-7	1	3-10	1	5-1	1	3-11	1	3-3	2								
	2-2 × 8	7-7	1	5-9	1	4-10	2	6-5	1	5-0	2	4-2	2								
	2-2 × 10	9-0	1	6-10	2	5-9	2	7-8	2	5-11	2	4-11	2								
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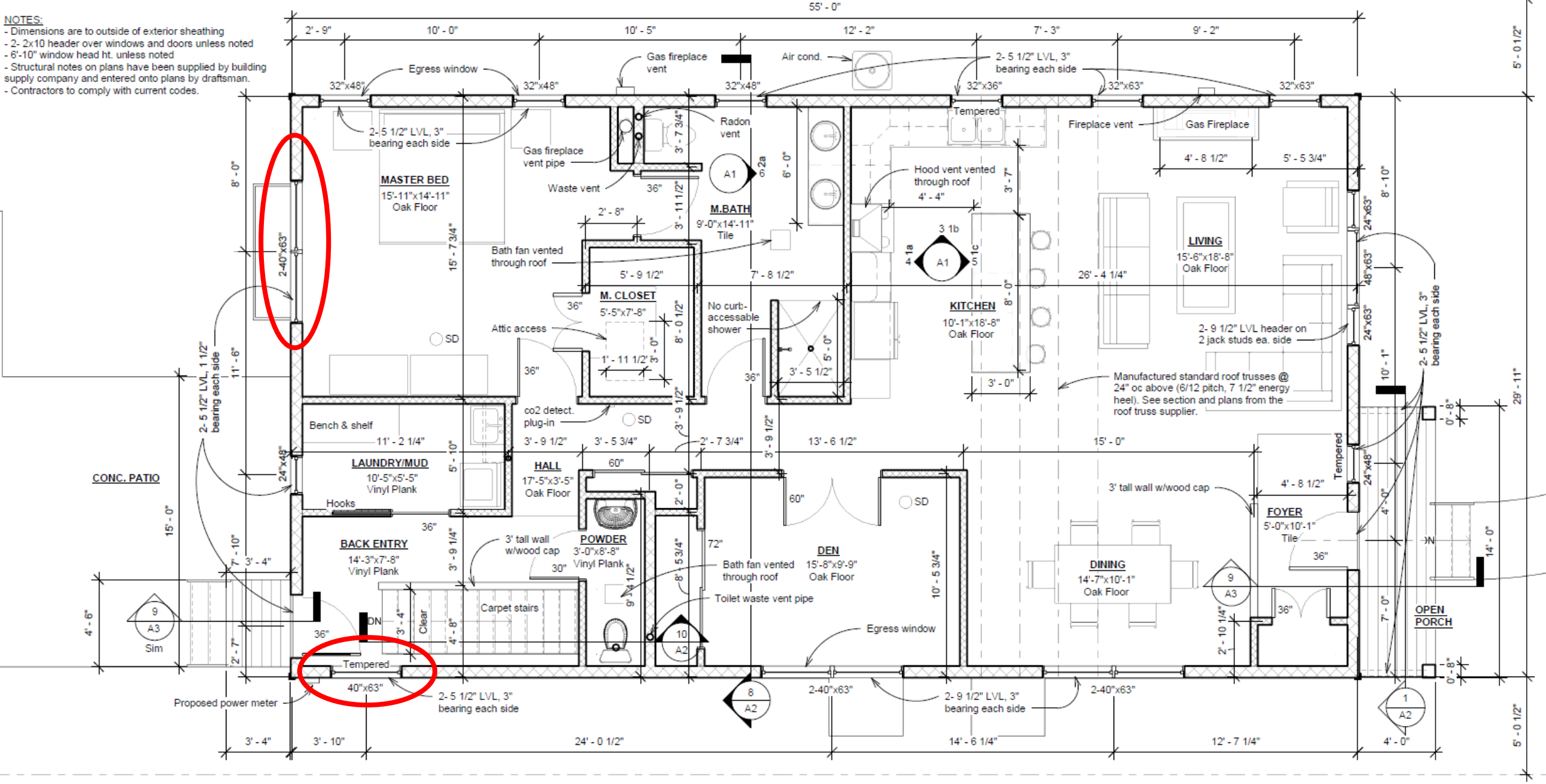
	3-2 × 8	9-5	1	7-3	1	6-1	1	8-1	1	6-3	1	5-3	2	7-2	1	5-6	2	4-8	2		
	3-2 × 10	11-3	1	8-7	1	7-3	2	9-7	1	7-4	2	6-2	2	8-6	1	6-7	2	5-6	2		
	3-2 × 12	13-2	1	10-1	2	8-6	2	11-3	2	8-8	2	7-4	2	10-0	2	7-9	2	6-6	2		
	4-2 × 8	10-11	1	8-4	1	7-0	1	9-4	1	7-2	1	6-0	1	8-3	1	6-4	1	5-4	2		
	4-2 × 10	12-11	1	9-11	1	8-4	1	11-1	1	8-6	1	7-2	2	9-10	1	7-7	2	6-4	2		
	4-2 × 12	15-3	1	11-8	1	9-10	2	13-0	1	10-0	2	8-5	2	11-7	1	8-11	2	7-6	2		

Window & Door Headers:

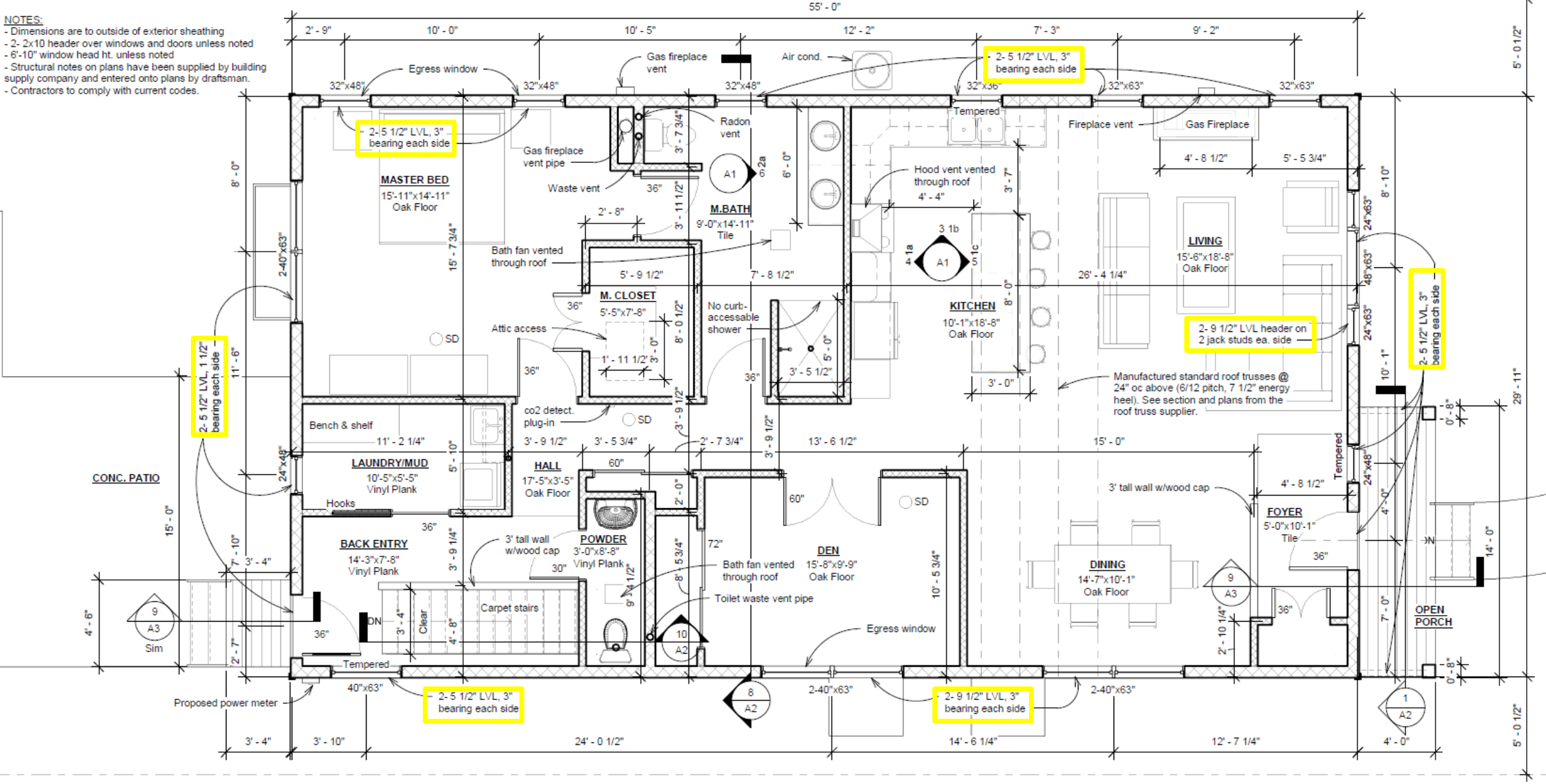
- 36’ is close to 32’ (Interpolation permitted)
- 3-2x10 or 3-2x12
- Min 2 jack studs required – *EACH SIDE*

Headers – Dimensional Lumber

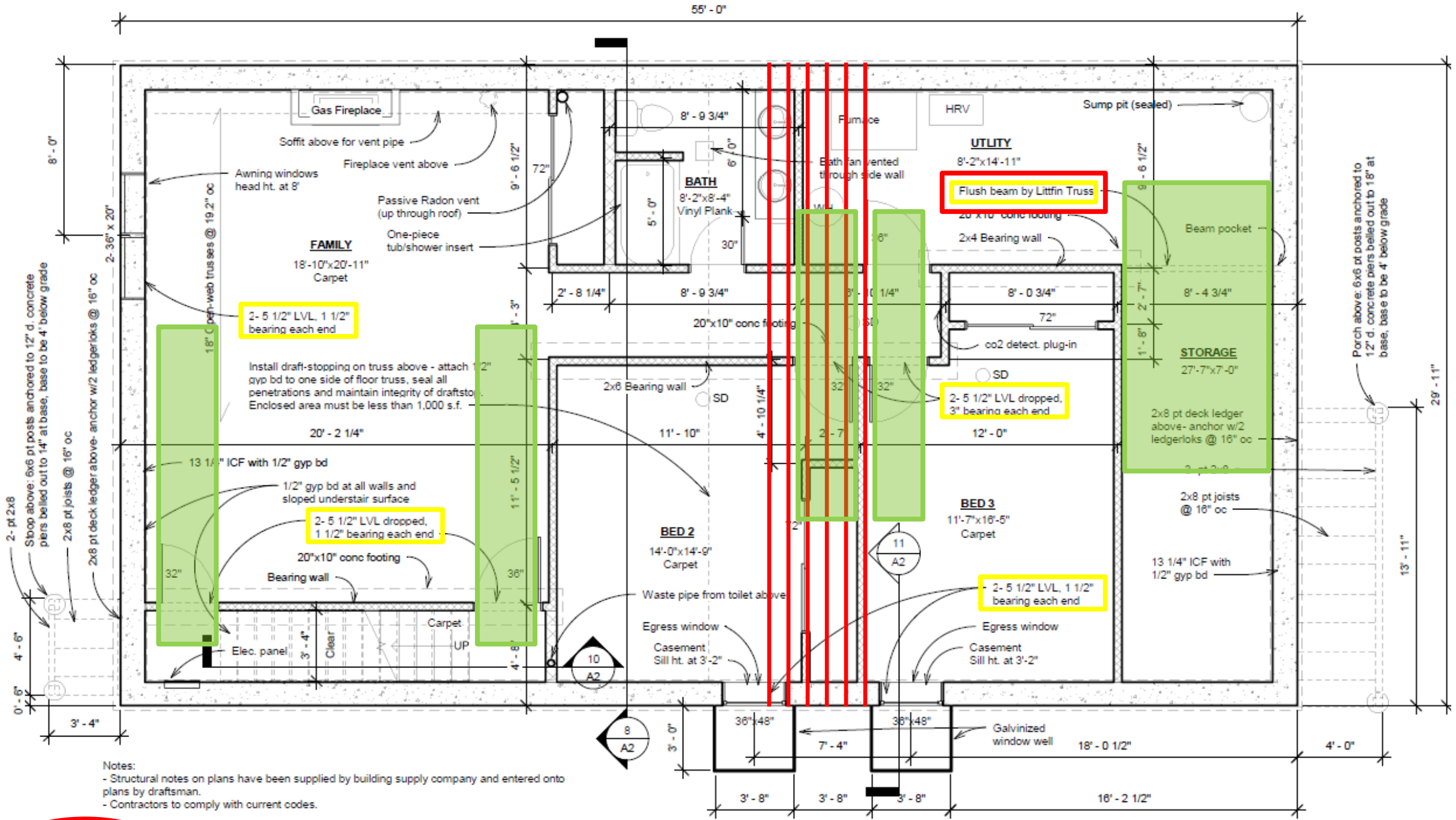
NOTES:
- Dimensions are to outside of exterior sheathing
- 2- 2x10 header over windows and doors unless noted
- 6'-10" window head ht. unless noted
- Structural notes on plans have been supplied by building supply company and entered onto plans by draftsman.
- Contractors to comply with current codes.



NOTES:
- Dimensions are to outside of exterior sheathing
- 2- 2x10 header over windows and doors unless noted
- 6'-10" window head ht. unless noted
- Structural notes on plans have been supplied by building supply company and entered onto plans by draftsman.
- Contractors to comply with current codes.



2 Main Level
1/4" = 1'-0"



Notes:
- Structural notes on plans have been supplied by building supply company and entered onto plans by draftsman.
- Contractors to comply with current codes.

1 Lower Level
1/4" = 1'-0"

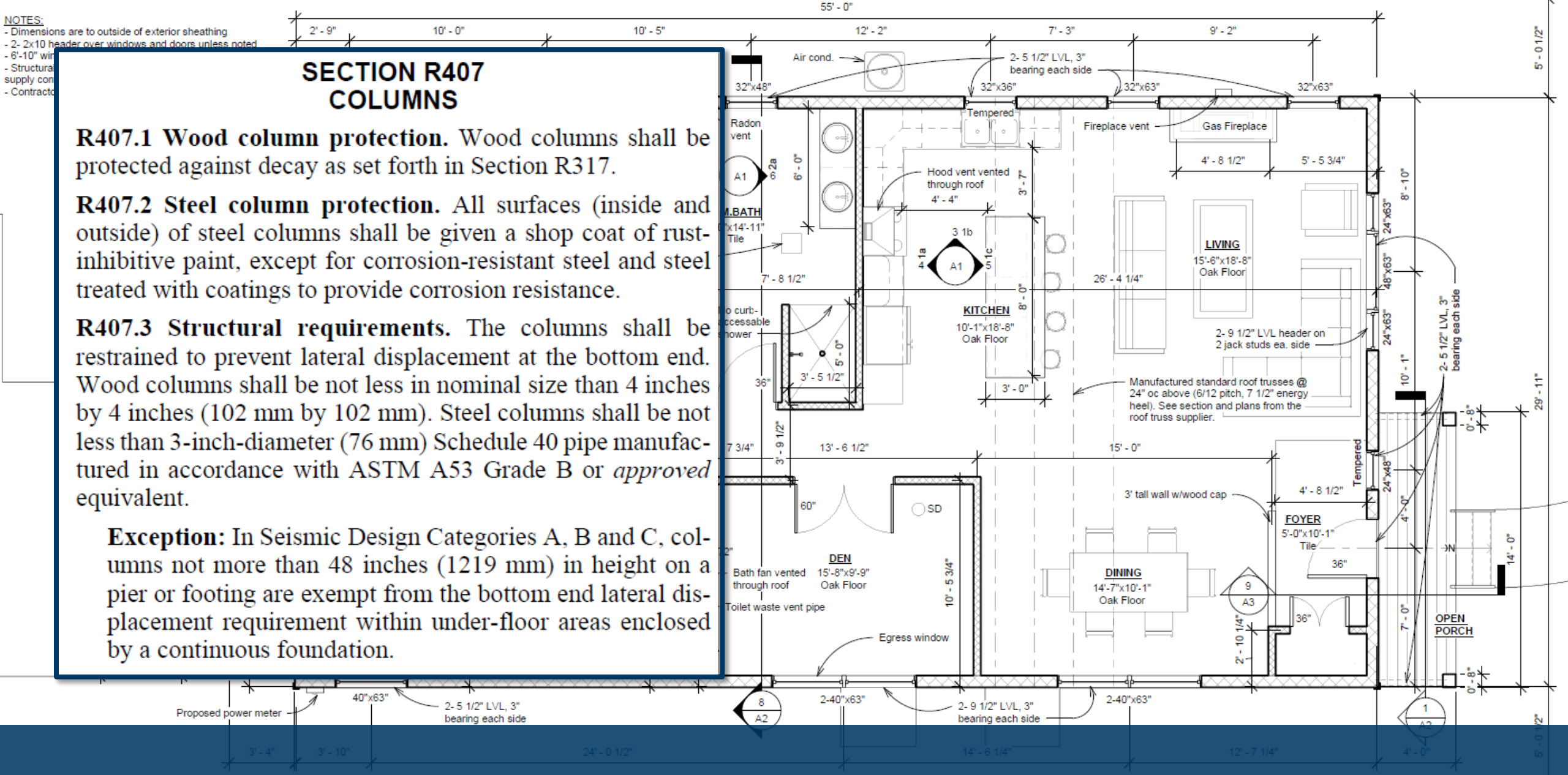
SECTION R407
COLUMNS

R407.1 Wood column protection. Wood columns shall be protected against decay as set forth in Section R317.

R407.2 Steel column protection. All surfaces (inside and outside) of steel columns shall be given a shop coat of rust-inhibitive paint, except for corrosion-resistant steel and steel treated with coatings to provide corrosion resistance.

R407.3 Structural requirements. The columns shall be restrained to prevent lateral displacement at the bottom end. Wood columns shall be not less in nominal size than 4 inches by 4 inches (102 mm by 102 mm). Steel columns shall be not less than 3-inch-diameter (76 mm) Schedule 40 pipe manufactured in accordance with ASTM A53 Grade B or *approved* equivalent.

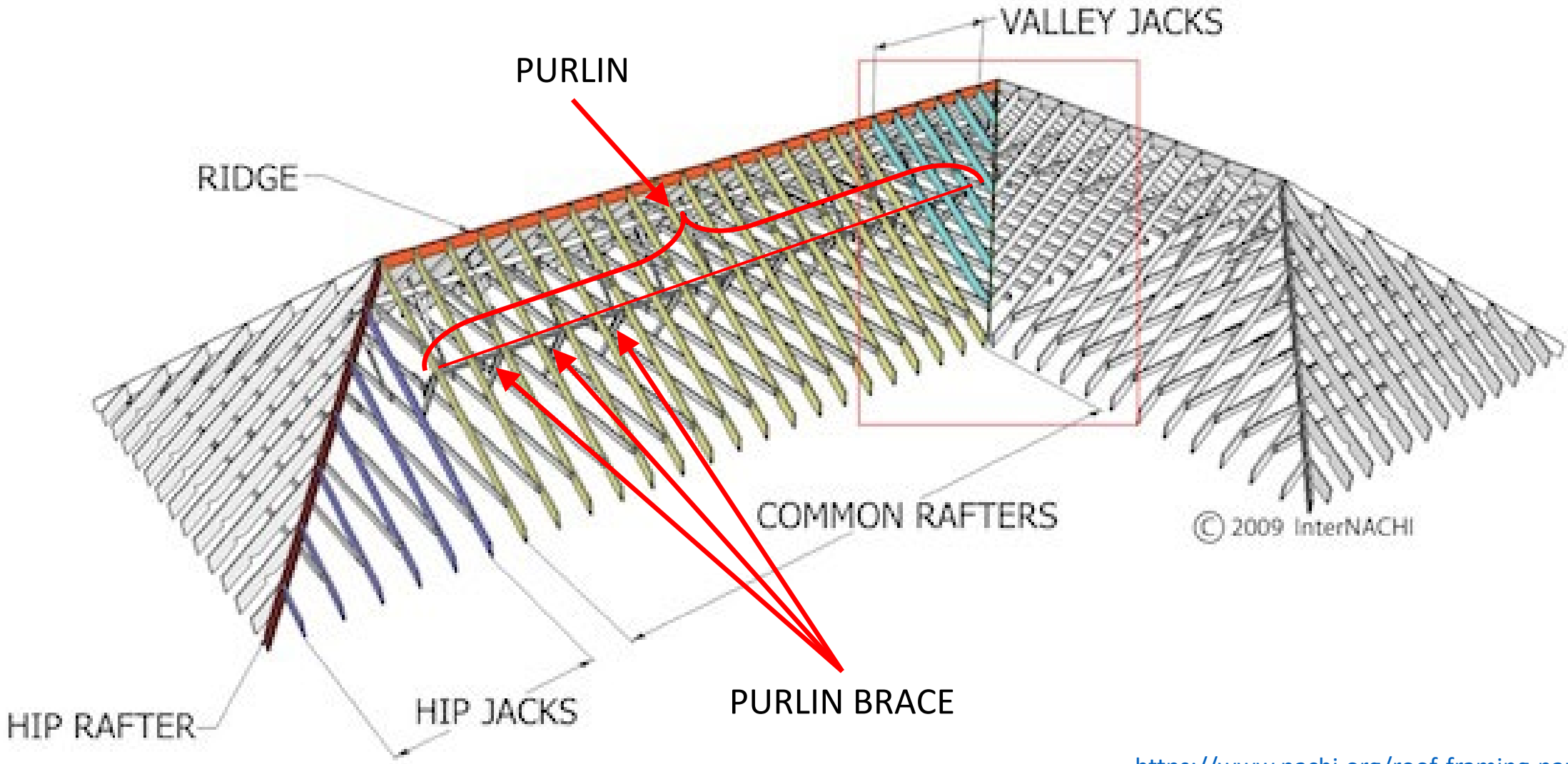
Exception: In Seismic Design Categories A, B and C, columns not more than 48 inches (1219 mm) in height on a pier or footing are exempt from the bottom end lateral displacement requirement within under-floor areas enclosed by a continuous foundation.



Columns – Chapter 4

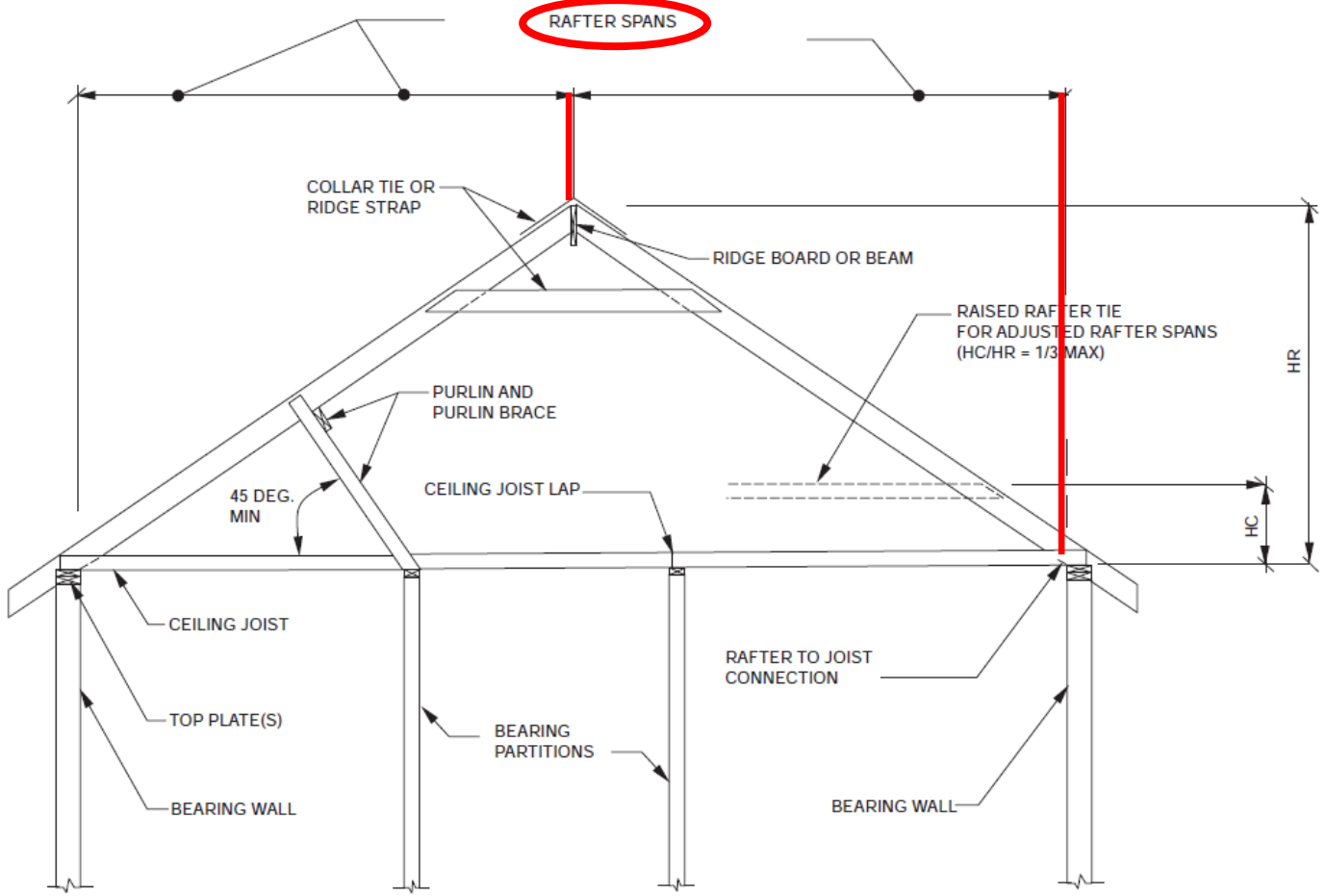
https://www.thinglink.com/scene/481917844028653570

Roof/Ceiling Construction – Chapter 8



https://www.nachi.org/roof-framing-part1-2.htm

Terminology



For SI: 1 inch = 25.4 mm, 1 foot = 305 mm, 1 degree = 0.018 rad.

H_C = Height of ceiling joists or rafter ties measured vertically above the top of rafter support walls.

H_R = Height of roof ridge measured vertically above the top of the rafter support walls.

FIGURE R802.4.5
BRACED RAFTER CONSTRUCTION

Terminology

R802.4 Rafters. Rafters shall be in accordance with this section.

R802.4.1 Rafter size. Rafters shall be sized based on the rafter spans in Tables R802.4.1(1) through R802.4.1(8). Rafter spans shall be measured along the horizontal projection of the rafter. For other grades and species and for other loading conditions, refer to the AWC STJR.

R802.4.2 Framing details. Rafters shall be framed not more than $1^1/_2$ inches (38 mm) offset from each other to a ridge board or directly opposite from each other with a collar tie, gusset plate or ridge strap in accordance with Table R602.3(1). Rafters shall be nailed to the top wall plates in accordance with Table R602.3(1) unless the roof assembly is required to comply with the uplift requirements of Section R802.11.

Span Tables – Need to Know:

- Snow load
- Dead load
- Rafter spacing
- Species
- Member size
- Span

TABLE R802.4.1(6)
RAFTER SPANS FOR COMMON LUMBER SPECIES
(Ground snow load = 50 psf, ceiling attached to rafters, L/Δ = 240)

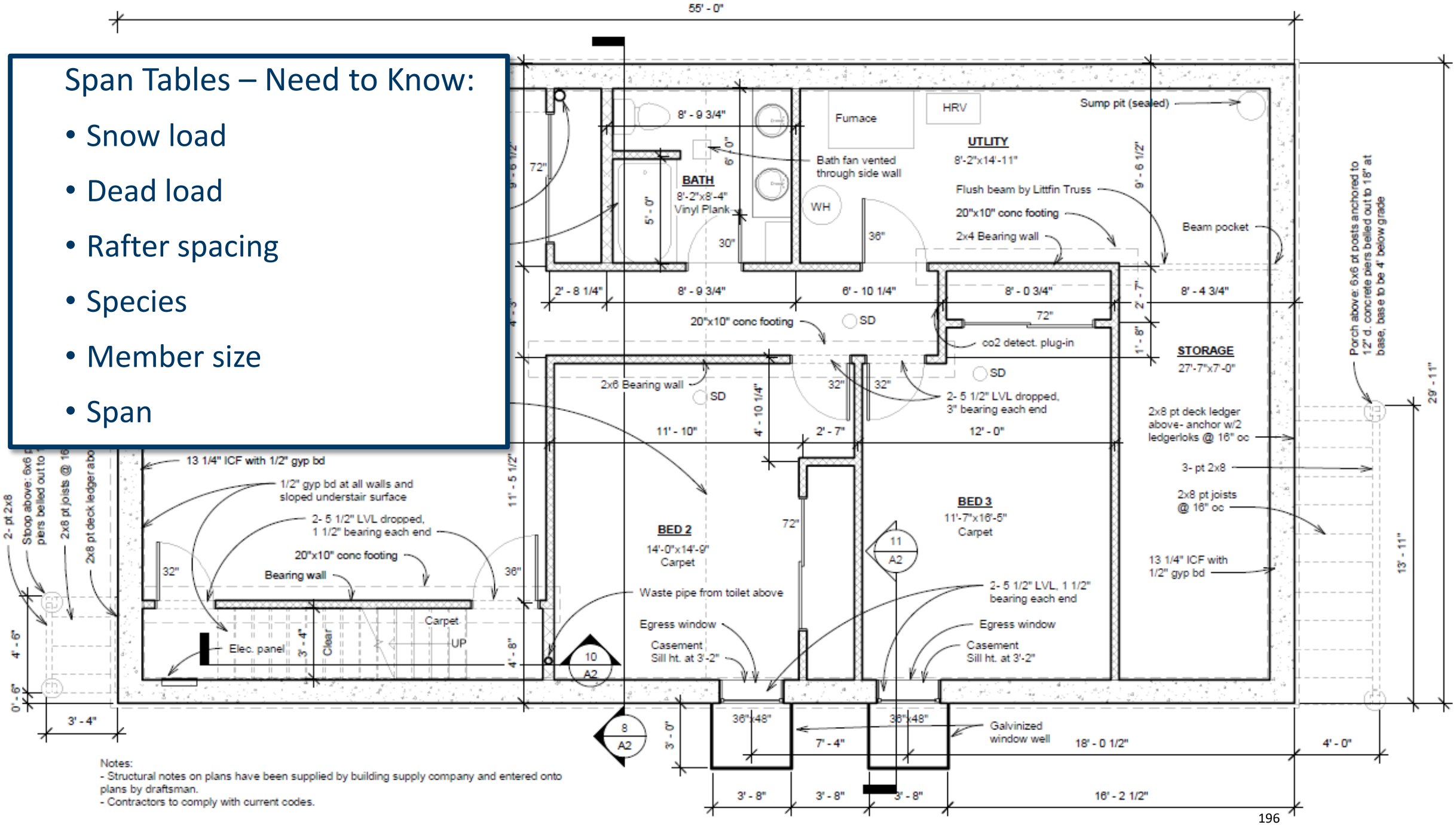
RAFTER SPACING (inches)	SPECIES AND GRADE		DEAD LOAD = 10 psf					DEAD LOAD = 20 psf				
			2 × 4	2 × 6	2 × 8	2 × 10	2 × 12	2 × 4	2 × 6	2 × 8	2 × 10	2 × 12
			Maximum rafter spans[a]									
			(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)	(feet-inches)
12	Douglas fir-larch	SS	7-8	12-1	15-11	20-3	24-8	7-8	12-1	15-11	20-3	24-5
	Douglas fir-larch	#1	7-5	11-7	15-3	18-7	21-7	7-5	11-2	14-1	17-3	20-0
	Douglas fir-larch	#2	7-3	11-5	14-5	17-8	20-5	7-3	10-7	13-4	16-4	18-11
	Douglas fir-larch	#3	6-0	8-9	11-0	13-6	15-7	5-6	8-1	10-3	12-6	14-6
	Hem-fir	SS	7-3	11-5	15-0	19-2	23-4	7-3	11-5	15-0	19-2	23-4
	Hem-fir	#1	7-1	11-2	14-8	18-4	21-3	7-1	11-0	13-11	17-0	19-9
	Hem-fir	#2	6-9	10-8	14-0	17-2	19-11	6-9	10-3	13-0	15-10	18-5
	Hem-fir	#3	5-10	8-6	10-9	13-2	15-3	5-5	7-10	10-0	12-2	14-1
	Southern pine	SS	7-6	11-10	15-7	19-11	24-3	7-6	11-10	15-7	19-11	24-3
	Southern pine	#1	7-3	11-5	15-0	18-2	21-7	7-3	11-4	14-5	16-10	20-0
	Southern pine	#2	6-11	10-6	13-4	15-10	18-8	6-6	9-9	12-4	14-8	17-3
	Southern pine	#3	5-5	8-0	10-1	12-3	14-6	5-0	7-5	9-4	11-4	13-5
	Spruce-pine-fir	SS	7-1	11-2	14-8	18-9	22-10	7-1	11-2	14-8	18-9	22-4
	Spruce-pine-fir	#1	6-11	10-11	14-3	17-5	20-2	6-11	10-5	13-2	16-1	18-8
	Spruce-pine-fir	#2	6-11	10-11	14-3	17-5	20-2	6-11	10-5	13-2	16-1	18-8
	Spruce-pine-fir	#3	5-10	8-6	10-9	13-2	15-3	5-5	7-10	10-0	12-2	14-1
16	Douglas fir-larch	SS	7-0	11-0	14-5	18-5	22-5	7-0	11-0	14-5	18-3	21-2
	Douglas fir-larch	#1	6-9	10-5	13-2	16-1	18-8	6-7	9-8	12-2	14-11	17-3
	Douglas fir-larch	#2	6-7	9-10	12-6	15-3	17-9	6-3	9-2	11-7	14-2	16-5
	Douglas fir-larch	#3	5-2	7-7	9-7	11-8	13-6	4-9	7-0	8-10	10-10	12-6
	Hem-fir	SS	6-7	10-4	13-8	17-5	21-2	6-7	10-4	13-8	17-5	20-5
	Hem-fir	#1	6-5	10-2	13-0	15-11	18-5	6-5	9-6	12-1	14-9	17-1
	Hem-fir	#2	6-2	9-7	12-2	14-10	17-3	6-1	8-11	11-3	13-9	15-11
	Hem-fir	#3	5-0	7-4	9-4	11-5	13-2	4-8	6-10	8-8	10-6	12-3
	Southern pine	SS	6-10	10-9	14-2	18-1	22-0	6-10	10-9	14-2	18-1	21-10
	Southern pine	#1	6-7	10-4	13-5	15-9	18-8	6-7	9-10	12-5	14-7	17-3
	Southern pine	#2	6-1	9-2	11-7	13-9	16-2	5-8	8-5	10-9	12-9	15-0
	Southern pine	#3	4-8	6-11	8-9	10-7	12-6	4-4	6-5	8-1	9-10	11-7
	Spruce-pine-fir	SS	6-5	10-2	13-4	17-0	20-9	6-5	10-2	13-4	16-8	19-4
	Spruce-pine-fir	#1	6-4	9-9	12-4	15-1	17-6	6-2	9-0	11-5	13-11	16-2
	Spruce-pine-fir	#2	6-4	9-9	12-4	15-1	17-6	6-2	9-0	11-5	13-11	16-2
	Spruce-pine-fir	#3	5-0	7-4	9-4	11-5	13-2	4-8	6-10	8-8	10-6	12-3
19.2	Douglas fir-larch	SS	6-7	10-4	13-7	17-4	20-11	6-7	10-4	13-7	16-8	19-4
	Douglas fir-larch	#1	6-4	9-6	12-0	14-8	17-1	6-0	8-10	11-2	13-7	15-9
	Douglas fir-larch	#2	6-2	9-0	11-5	13-11	16-2	5-8	8-4	10-7	12-11	15-0
	Douglas fir-larch	#3	4-8	6-11	8-9	10-8	12-4	4-4	6-4	8-1	9-10	11-5
	Hem-fir	SS	6-2	9-9	12-10	16-5	19-11	6-2	9-9	12-10	16-1	18-8
	Hem-fir	#1	5-11	9-5	11-11	14-6	16-10	5-11	8-8	11-0	13-5	15-7
	Hem-fir	#2	5-9	8-9	11-1	13-7	15-9	5-7	8-1	10-3	12-7	14-7
	Hem-fir	#3	4-7	6-9	8-6	10-5	12-1	4-3	6-3	7-11	9-7	11-2

(continued)

Rafter Span Tables

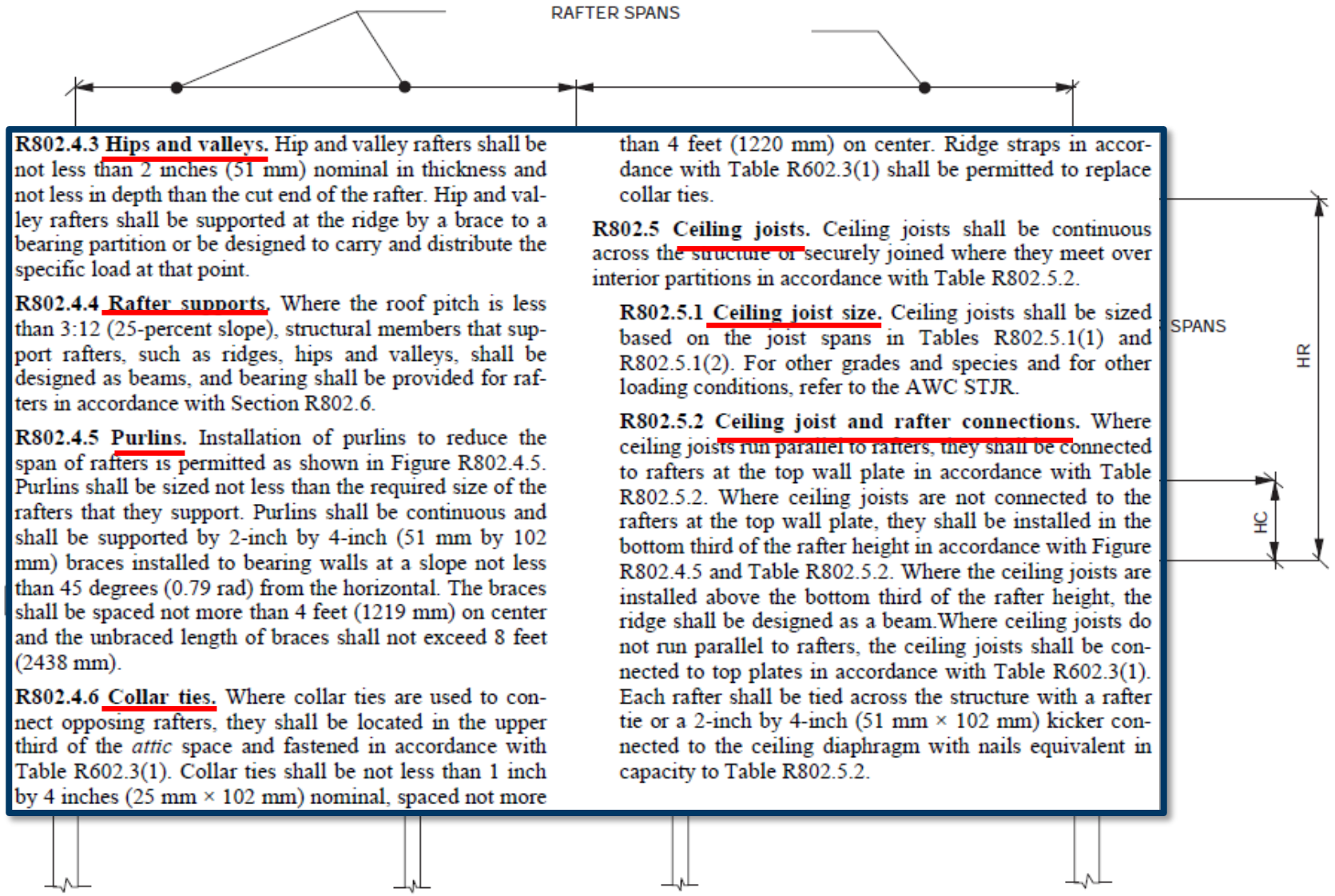
Span Tables – Need to Know:

- Snow load
- Dead load
- Rafter spacing
- Species
- Member size
- Span



Notes:
- Structural notes on plans have been supplied by building supply company and entered onto plans by draftsman.
- Contractors to comply with current codes.

1 Lower Level
1/4" = 1'-0"



R802.4.3 Hips and valleys. Hip and valley rafters shall be not less than 2 inches (51 mm) nominal in thickness and not less in depth than the cut end of the rafter. Hip and valley rafters shall be supported at the ridge by a brace to a bearing partition or be designed to carry and distribute the specific load at that point.

R802.4.4 Rafter supports. Where the roof pitch is less than 3:12 (25-percent slope), structural members that support rafters, such as ridges, hips and valleys, shall be designed as beams, and bearing shall be provided for rafters in accordance with Section R802.6.

R802.4.5 Purlins. Installation of purlins to reduce the span of rafters is permitted as shown in Figure R802.4.5. Purlins shall be sized not less than the required size of the rafters that they support. Purlins shall be continuous and shall be supported by 2-inch by 4-inch (51 mm by 102 mm) braces installed to bearing walls at a slope not less than 45 degrees (0.79 rad) from the horizontal. The braces shall be spaced not more than 4 feet (1219 mm) on center and the unbraced length of braces shall not exceed 8 feet (2438 mm).

R802.4.6 Collar ties. Where collar ties are used to connect opposing rafters, they shall be located in the upper third of the *attic* space and fastened in accordance with Table R602.3(1). Collar ties shall be not less than 1 inch by 4 inches (25 mm × 102 mm) nominal, spaced not more than 4 feet (1220 mm) on center. Ridge straps in accordance with Table R602.3(1) shall be permitted to replace collar ties.

R802.5 Ceiling joists. Ceiling joists shall be continuous across the structure or securely joined where they meet over interior partitions in accordance with Table R802.5.2.

R802.5.1 Ceiling joist size. Ceiling joists shall be sized based on the joist spans in Tables R802.5.1(1) and R802.5.1(2). For other grades and species and for other loading conditions, refer to the AWC STJR.

R802.5.2 Ceiling joist and rafter connections. Where ceiling joists run parallel to rafters, they shall be connected to rafters at the top wall plate in accordance with Table R802.5.2. Where ceiling joists are not connected to the rafters at the top wall plate, they shall be installed in the bottom third of the rafter height in accordance with Figure R802.4.5 and Table R802.5.2. Where the ceiling joists are installed above the bottom third of the rafter height, the ridge shall be designed as a beam.Where ceiling joists do not run parallel to rafters, the ceiling joists shall be connected to top plates in accordance with Table R602.3(1). Each rafter shall be tied across the structure with a rafter tie or a 2-inch by 4-inch (51 mm × 102 mm) kicker connected to the ceiling diaphragm with nails equivalent in capacity to Table R802.5.2.

For SI: 1 inch = 25.4 mm, 1 foot = 305 mm, 1 degree = 0.018 rad.

H_C = Height of ceiling joists or rafter ties measured vertically above the top of rafter support walls.

H_R = Height of roof ridge measured vertically above the top of the rafter support walls.

FIGURE R802.4.5
BRACED RAFTER CONSTRUCTION

Hand Framed Roof/Ceiling

TABLE R802.5.1(1)
CEILING JOIST SPANS FOR COMMON LUMBER SPECIES
(Uninhabitable attics without storage, live load = 10 psf, L/Δ = 240)

TABLE R802.5.1(2)
CEILING JOIST SPANS FOR COMMON LUMBER SPECIES
(Uninhabitable attics with limited storage, live load = 20 psf, L/Δ = 240)

TABLE R802.5.1(1)
CEILING JOIST SPANS FOR COMMON LUMBER SPECIES
(Uninhabitable attics without storage, live load = 10 psf, L/Δ = 240)

CEILING JOIST SPACING (inches)	SPECIES AND GRADE		DEAD LOAD = 5 psf			
			2 × 4	2 × 6	2 × 8	2 × 10
			Maximum ceiling joist spans			
			(feet - inches)	(feet - inches)	(feet - inches)	(feet - inches)
12	Douglas fir-larch	SS	13-2	20-8	Note a	Note a
	Douglas fir-larch	#1	12-8	19-11	Note a	Note a
	Douglas fir-larch	#2	12-5	19-6	25-8	Note a
	Douglas fir-larch	#3	11-1	16-3	20-7	25-2
	Hem-fir	SS	12-5	19-6	25-8	Note a
	Hem-fir	#1	12-2	19-1	25-2	Note a
	Hem-fir	#2	11-7	18-2	24-0	Note a
	Hem-fir	#3	10-10	15-10	20-1	24-6
	Southern pine	SS	12-11	20-3	Note a	Note a
	Southern pine	#1	12-5	19-6	25-8	Note a
	Southern pine	#2	11-10	18-8	24-7	Note a
	Southern pine	#3	10-1	14-11	18-9	22-9
	Spruce-pine-fir	SS	12-2	19-1	25-2	Note a
	Spruce-pine-fir	#1	11-10	18-8	24-7	Note a
	Spruce-pine-fir	#2	11-10	18-8	24-7	Note a
	Spruce-pine-fir	#3	10-10	15-10	20-1	24-6
16	Douglas fir-larch	SS	11-11	18-9	24-8	Note a
	Douglas fir-larch	#1	11-6	18-1	23-10	Note a
	Douglas fir-larch	#2	11-3	17-8	23-4	Note a
	Douglas fir-larch	#3	9-7	14-1	17-10	21-9
	Hem-fir	SS	11-3	17-8	23-4	Note a
	Hem-fir	#1	11-0	17-4	22-10	Note a
	Hem-fir	#2	10-6	16-6	21-9	Note a
	Hem-fir	#3	9-5	13-9	17-5	21-3
	Southern pine	SS	11-9	18-5	24-3	Note a
	Southern pine	#1	11-3	17-8	23-10	Note a
	Southern pine	#2	10-9	16-11	21-7	25-7
	Southern pine	#3	8-9	12-11	16-3	19-9
	Spruce-pine-fir	SS	11-0	17-4	22-10	Note a
	Spruce-pine-fir	#1	10-9	16-11	22-4	Note a
	Spruce-pine-fir	#2	10-9	16-11	22-4	Note a
	Spruce-pine-fir	#3	9-5	13-9	17-5	21-3

Ceiling Joist Span Tables

http://betterlivingcomponents.com/roof-trusses-2/

Roof Truss – Chapter 8

R802.10 Wood trusses.

R802.10.1 Truss design drawings. Truss design drawings, prepared in conformance to Section R802.10.1, shall be provided to the *building official* and *approved* prior to installation. Truss design drawings shall be provided with the shipment of trusses delivered to the job site. Truss design drawings shall include, at a minimum, the following information:

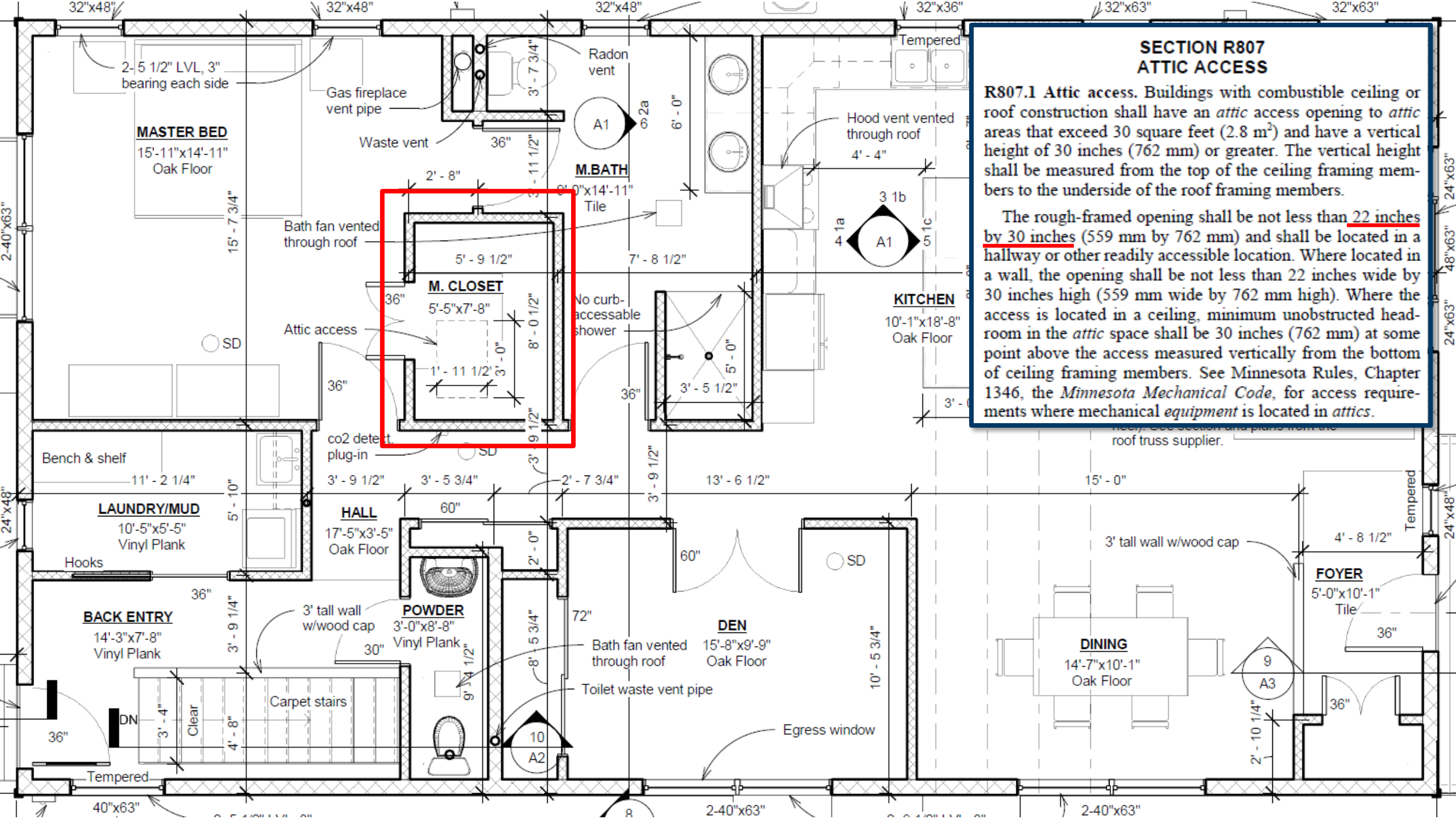
1. Slope or depth, span and spacing.
2. Location of all joints.
3. Required bearing widths.
4. Design loads as applicable.
   - 4.1. Top chord live load (as determined from Section R301.6).
   - 4.2. Top chord dead load.
   - 4.3. Bottom chord live load.
   - 4.4. Bottom chord dead load.
   - 4.5. Concentrated loads and their points of application.
   - 4.6. Controlling wind and earthquake loads.
5. Adjustments to lumber and joint connector design values for conditions of use.
6. Each reaction force and direction.
7. Joint connector type and description such as size, thickness or gage and the dimensioned location of each joint connector except where symmetrically located relative to the joint interface.
8. Lumber size, species and *grade for each member.*
9. Connection requirements for:
   - 9.1. Truss to girder-truss.
   - 9.2. Truss ply to ply.
   - 9.3. Field splices.
10. Calculated deflection ratio or maximum description for live and total load.
11. Maximum axial compression forces in the truss members to enable the building designer to design the size, connections and anchorage of the permanent continuous lateral bracing. Forces shall be shown on the truss design drawing or on supplemental documents.
12. Required permanent truss member bracing location.

R802.10.2 Design. Wood trusses shall be designed in accordance with accepted engineering practice. The design and manufacture of metal-plate-connected wood trusses shall comply with ANSI/TPI 1. The truss design drawings shall be prepared by a registered professional where required by the statutes of the *jurisdiction* in which the project is to be constructed in accordance with Section R106.1.

R802.10.2.1 Applicability limits. The provisions of this section shall control the design of truss roof framing where snow controls for buildings that are not greater than 60 feet (18 288 mm) in length perpendicular to the joist, rafter or truss span, not greater than 36 feet (10 973 mm) in width parallel to the joist, rafter or truss span, not more than three stories above grade plane in height, and have roof slopes not smaller than 3:12 (25-percent slope) or greater than 12:12 (100-percent slope). Truss roof framing constructed in accordance with the provisions of this section shall be limited to sites subjected to a maximum design wind speed of 140 miles per hour (63 m/s), Exposure B or C, and a maximum ground snow load of 70 psf (3352 Pa). For consistent loading of all truss types, roof snow load is to be computed as: $0.7\ p_g$.

R802.10.3 Bracing. Trusses shall be braced to prevent rotation and provide lateral stability in accordance with the requirements specified in the *construction documents* for the building and on the individual truss design drawings. In the absence of specific bracing requirements, trusses shall be braced in accordance with accepted industry practice such as the SBCA *Building Component Safety Information (BCSI) Guide to Good Practice for Handling, Installing & Bracing of Metal Plate Connected Wood Trusses.*

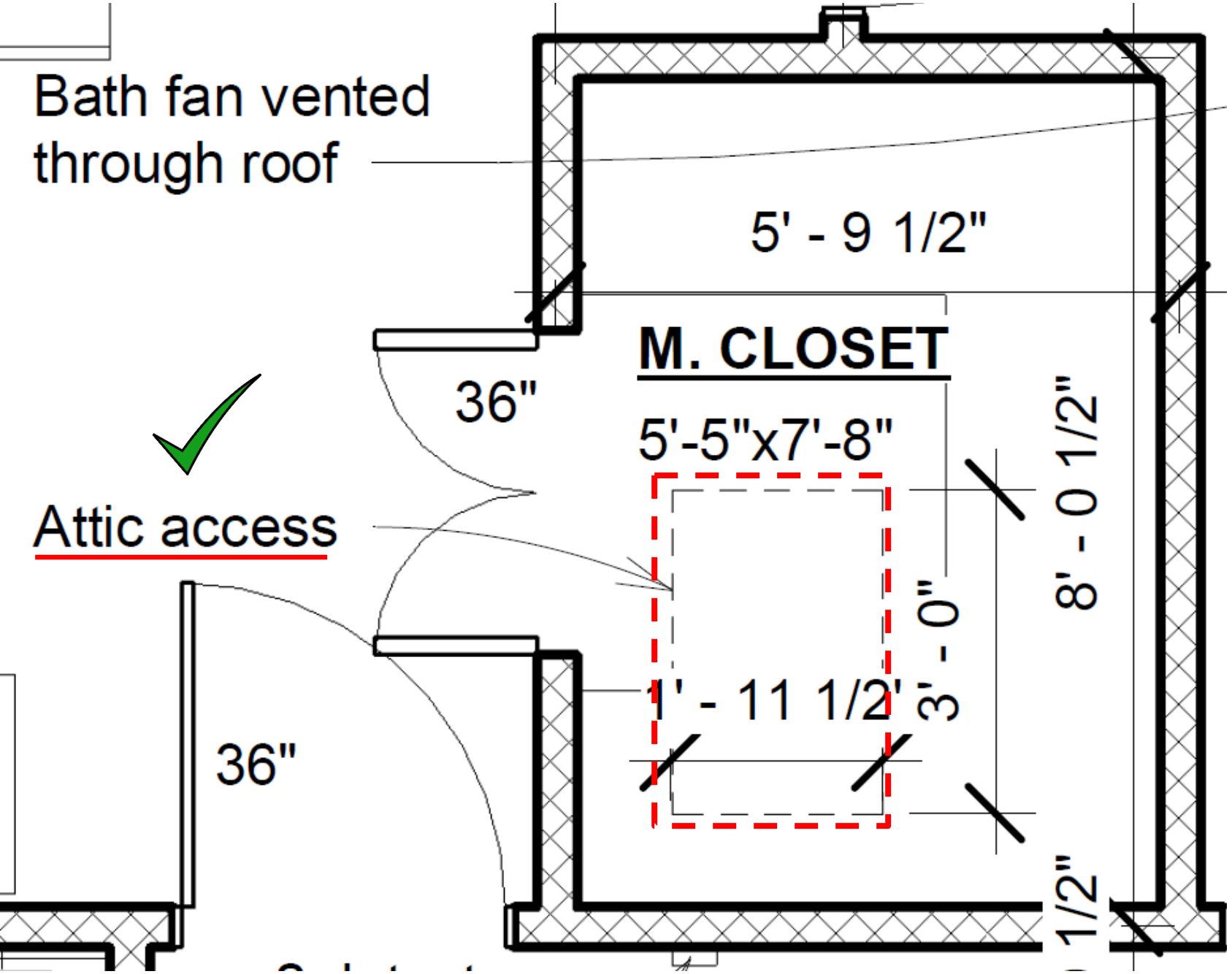
R802.10.4 Alterations to trusses. Truss members shall not be cut, notched, drilled, spliced or otherwise altered in any way without the approval of a registered *design professional.* Alterations resulting in the addition of load such as HVAC equipment water heater that exceeds the design load for the truss shall not be permitted without verification that the truss is capable of supporting such additional loading.



SECTION R807
ATTIC ACCESS

R807.1 Attic access. Buildings with combustible ceiling or roof construction shall have an *attic* access opening to *attic* areas that exceed 30 square feet (2.8 m^2) and have a vertical height of 30 inches (762 mm) or greater. The vertical height shall be measured from the top of the ceiling framing members to the underside of the roof framing members.

The rough-framed opening shall be not less than 22 inches by 30 inches (559 mm by 762 mm) and shall be located in a hallway or other readily accessible location. Where located in a wall, the opening shall be not less than 22 inches wide by 30 inches high (559 mm wide by 762 mm high). Where the access is located in a ceiling, minimum unobstructed headroom in the *attic* space shall be 30 inches (762 mm) at some point above the access measured vertically from the bottom of ceiling framing members. See Minnesota Rules, Chapter 1346, the *Minnesota Mechanical Code*, for access requirements where mechanical *equipment* is located in *attics*.



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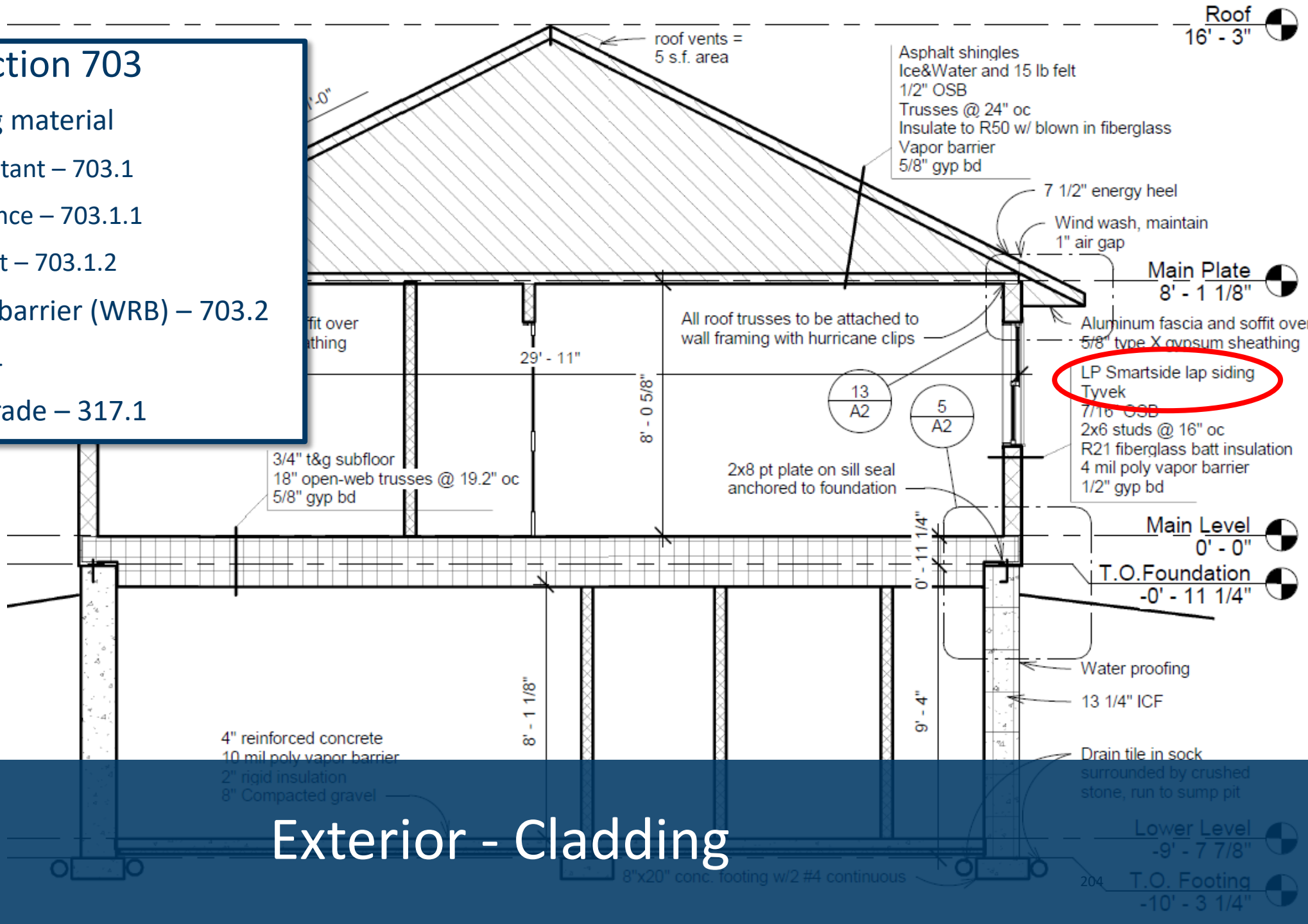
Exterior – Chapters 7 & 9

Exterior – Section 703

- Approved siding material
  - Weather resistant – 703.1
  - Water resistance – 703.1.1
  - Wind resistant – 703.1.2
- Water-resistive barrier (WRB) – 703.2
- Flashing – 703.4
- Separation to grade – 317.1



Exterior - Cladding

clear airspaces. Other openings with the equivalent vent area shall be permitted.

1. Vinyl polypropylene or horizontal aluminum siding applied over a weather-resistive barrier as specified in Table R703.3(1).
2. Brick veneer with a clear airspace as specified in Table R703.8.4.
3. Other approved vented claddings.

SECTION R703
EXTERIOR COVERING

R703.1 General. Exterior walls shall provide the building with a weather-resistant exterior wall envelope. The exterior wall envelope shall include flashing as described in Section R703.4.

Exception: Log walls designed and constructed in accordance with the provisions of ICC 400.

R703.1.1 Water resistance. The exterior wall envelope shall be designed and constructed in a manner that prevents the accumulation of water within the wall assembly by providing a water-resistant barrier behind the exterior cladding as required by Section R703.2 and a means of draining to the exterior water that penetrates the exterior cladding.

Exceptions:

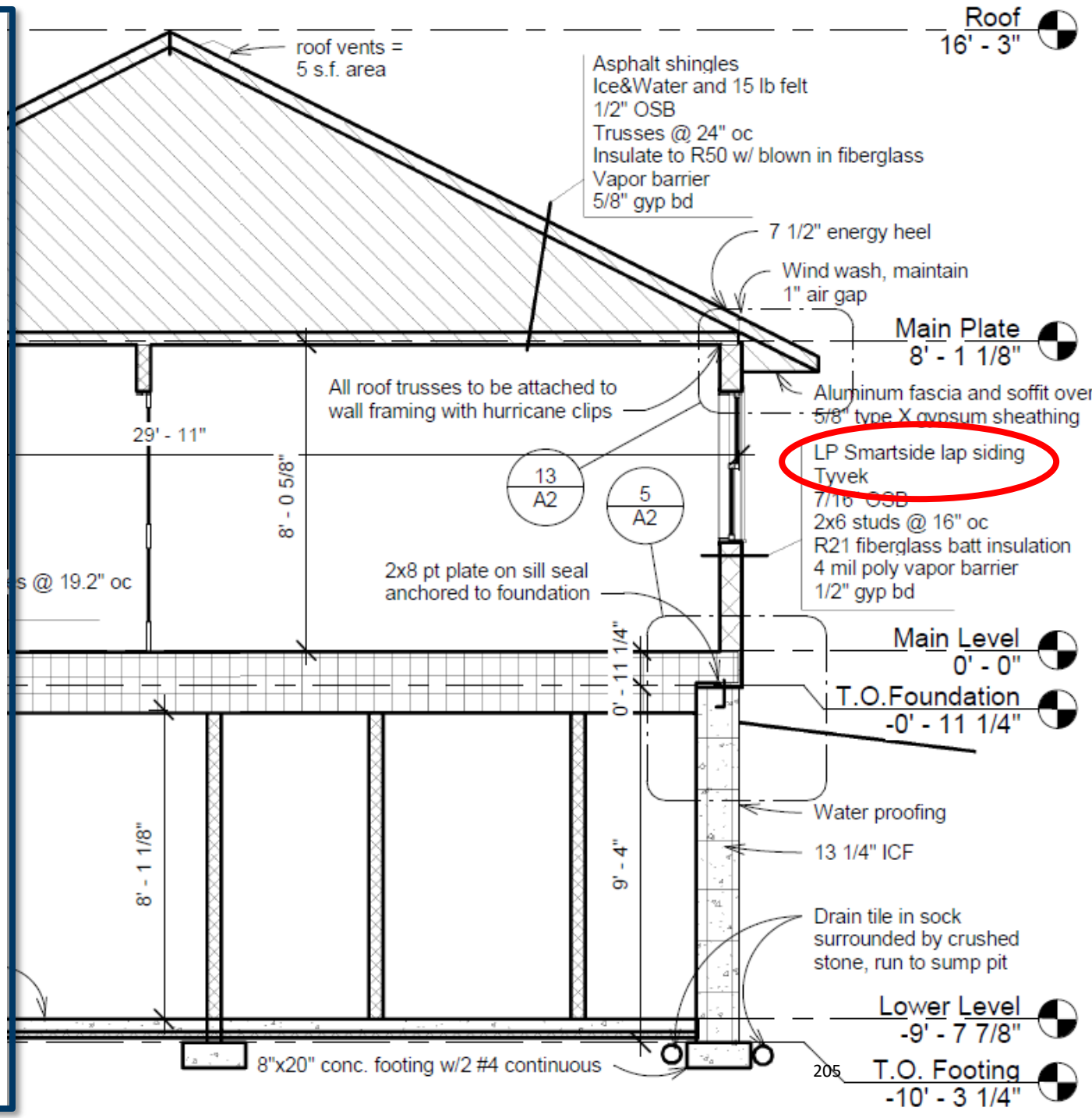
1. A weather-resistant exterior wall envelope shall not be required over concrete or masonry walls designed in accordance with Chapter 6 and flashed in accordance with Section R703.4 or R703.8.
2. Compliance with the requirements for a means of drainage, and the requirements of Sections R703.2 and R703.4, shall not be required for an exterior wall envelope that has been demonstrated to resist wind-driven rain through testing of the exterior wall envelope, including joints, penetrations and intersections with dissimilar materials, in accordance with ASTM E331 under the following conditions:
   - 2.1. Exterior wall envelope test assemblies shall include at least one opening, one control joint, one wall/eave interface and one wall sill. All tested openings and penetrations shall be representative of the intended end-use configuration.
   - 2.2. Exterior wall envelope test assemblies shall be at least 4 feet by 8 feet (1219 mm by 2438 mm) in size.
   - 2.3. Exterior wall assemblies shall be tested at a minimum differential pressure of 6.24 pounds per square foot (299 Pa).
   - 2.4. Exterior wall envelope assemblies shall be subjected to the minimum test exposure for a minimum of 2 hours.

The exterior wall envelope design shall be considered to resist wind-driven rain where the results of testing indicate that water did not penetrate control joints in the exterior wall envelope, joints at the perimeter of openings penetration or intersections of terminations with dissimilar materials.

R703.1.2 Wind resistance. Wall coverings, backing materials and their attachments shall be capable of resisting wind loads in accordance with Tables R301.2(2) and R301.2(3). Wind-pressure resistance of the siding, soffit and backing materials shall be determined by ASTM E330 or other applicable standard test methods. Where wind-pressure resistance is determined by design analysis, data from approved design standards and analysis conforming to generally accepted engineering practice shall be used to evaluate the siding, soffit and backing material and its fastening. All applicable failure modes including bending rupture of siding, fastener withdrawal and fastener head pull-through shall be considered in the testing or design analysis. Where the wall covering, soffit and backing material resist wind load as an assembly, use of the design capacity of the assembly shall be permitted.

R703.2 Water-resistive barrier. One layer of No. 15 asphalt felt, free from holes and breaks, complying with ASTM D226 for Type 1 felt or other approved water-resistive barrier shall be applied over studs or sheathing of all exterior walls. No.15 asphalt felt shall be applied horizontally, with the upper layer lapped over the lower layer not less than 2 inches (51 mm). Where joints occur, felt shall be lapped not less than 6 inches (152 mm). Other *approved* materials shall be installed in accordance with the *water-resistive barrier* manufacturer's installation instructions. The No. 15 asphalt felt or other approved water-resistive barrier material shall overlap the flashings required in Section R703.4 not less than 2 inches (51 mm). The No. 15 asphalt felt or other approved *water-resistive barrier* material shall be continuous up to the underside of the rafter or truss top chord and terminated at penetrations and building appendages in a manner to meet the requirements of the exterior wall envelope as described in Section R703.1.

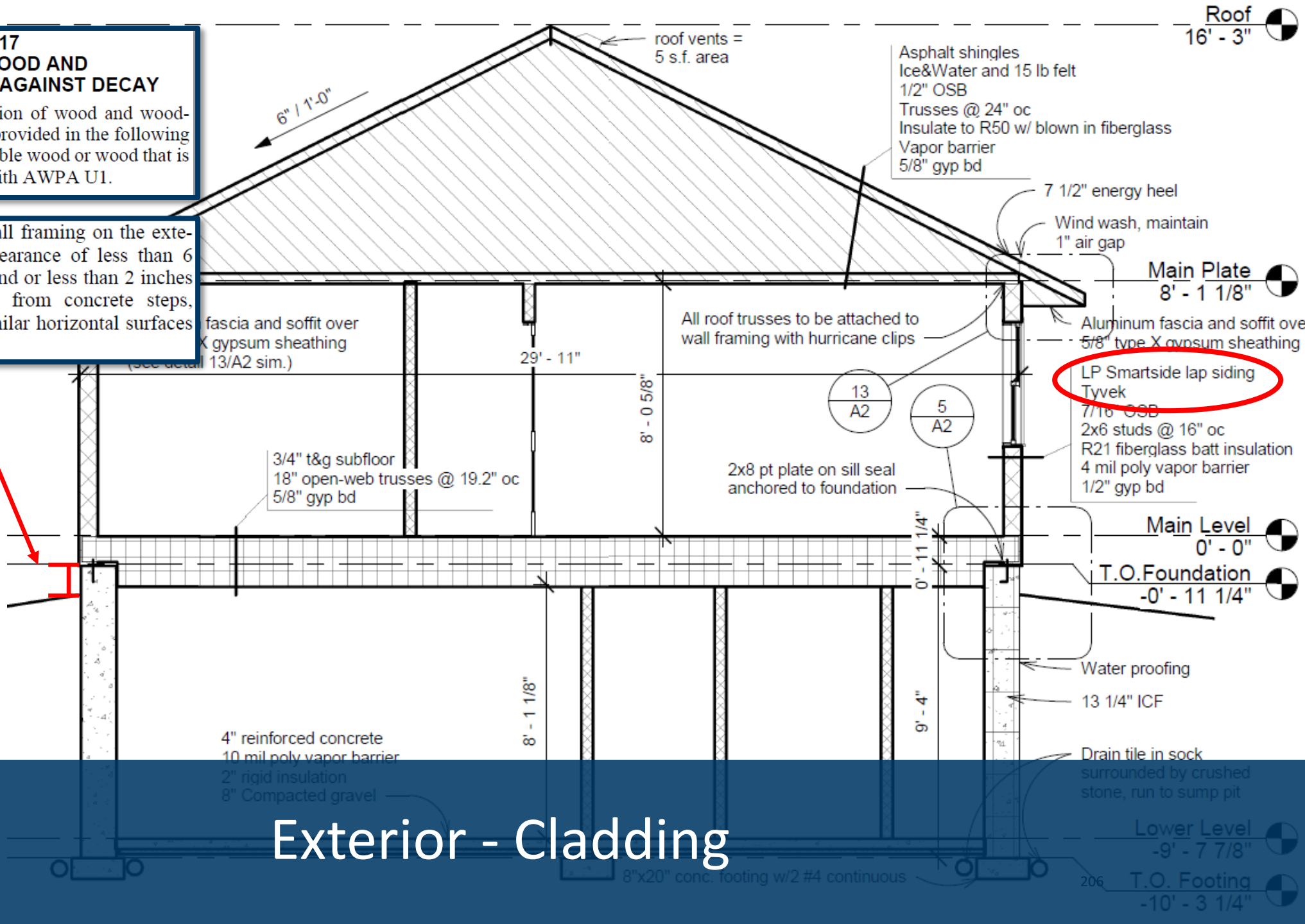
R703.3 Wall covering nominal thickness and attachments. The nominal thickness and attachment of exterior wall coverings shall be in accordance with Table R703.3(1), the wall covering material requirements of this section, and the wall covering manufacturer's installation instructions. Cladding attachment over foam sheathing shall comply with the additional requirements and limitations of Sections R703.15 through R703.17. Nominal material thicknesses in Table R703.3(1) are based on a maximum stud spacing of 16 inches (406 mm) on center. Where specified by the siding manufacturer's instructions and supported by a test report or other documentation, attachment to studs with greater spacing is permitted. Fasteners for exterior wall coverings attached to wood framing shall be in accordance with Section R703.3.3 and Table R703.3(1). Exterior wall coverings shall be attached to cold-formed steel light frame construction in accordance with the cladding manufacturer's installation instructions, the requirements of Table R703.3(1) using screw fasteners substituted for the nails specified in accordance with Table R703.3(2), or an approved design.



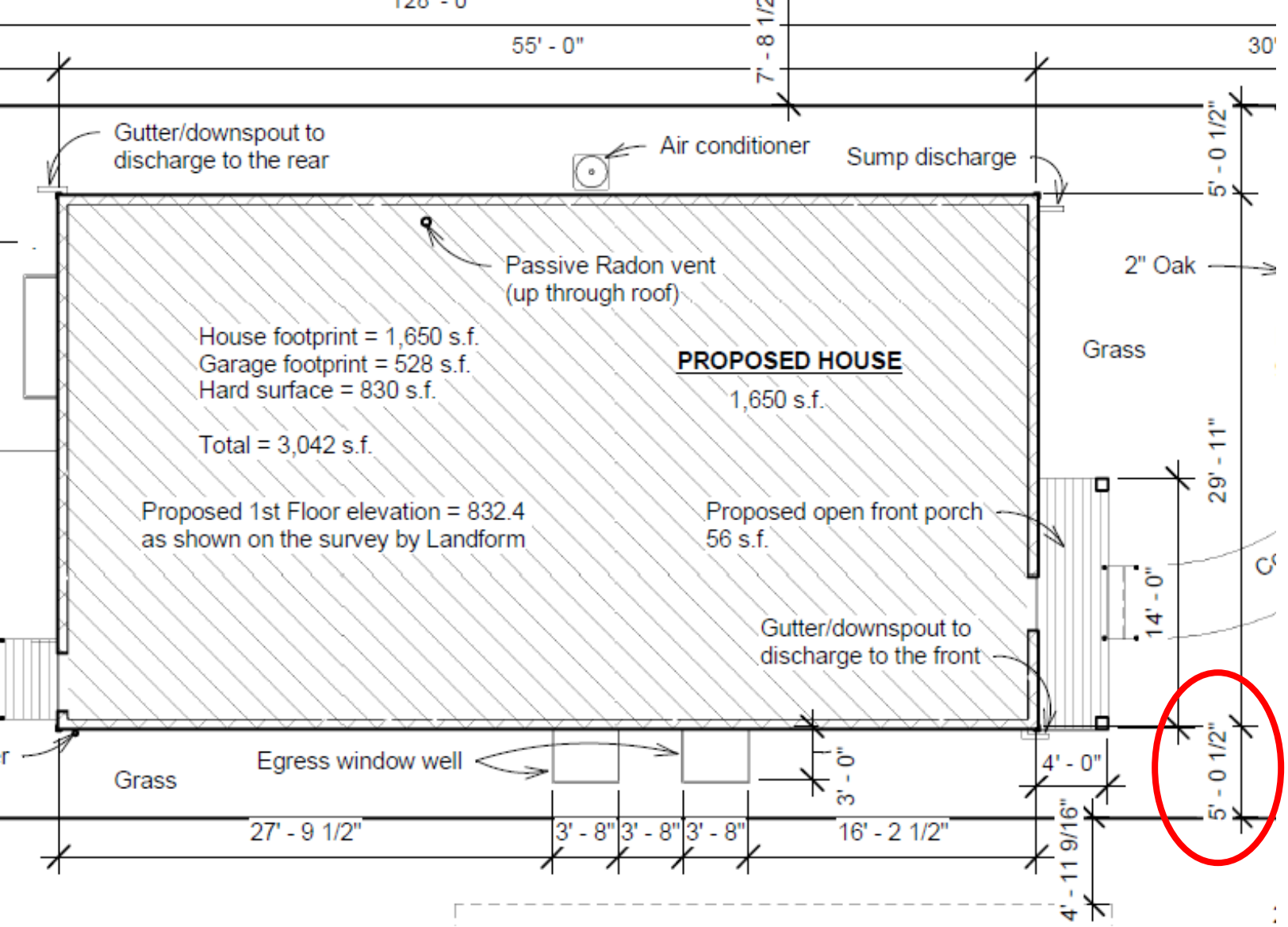
SECTION R317
PROTECTION OF WOOD AND WOOD-BASED PRODUCTS AGAINST DECAY

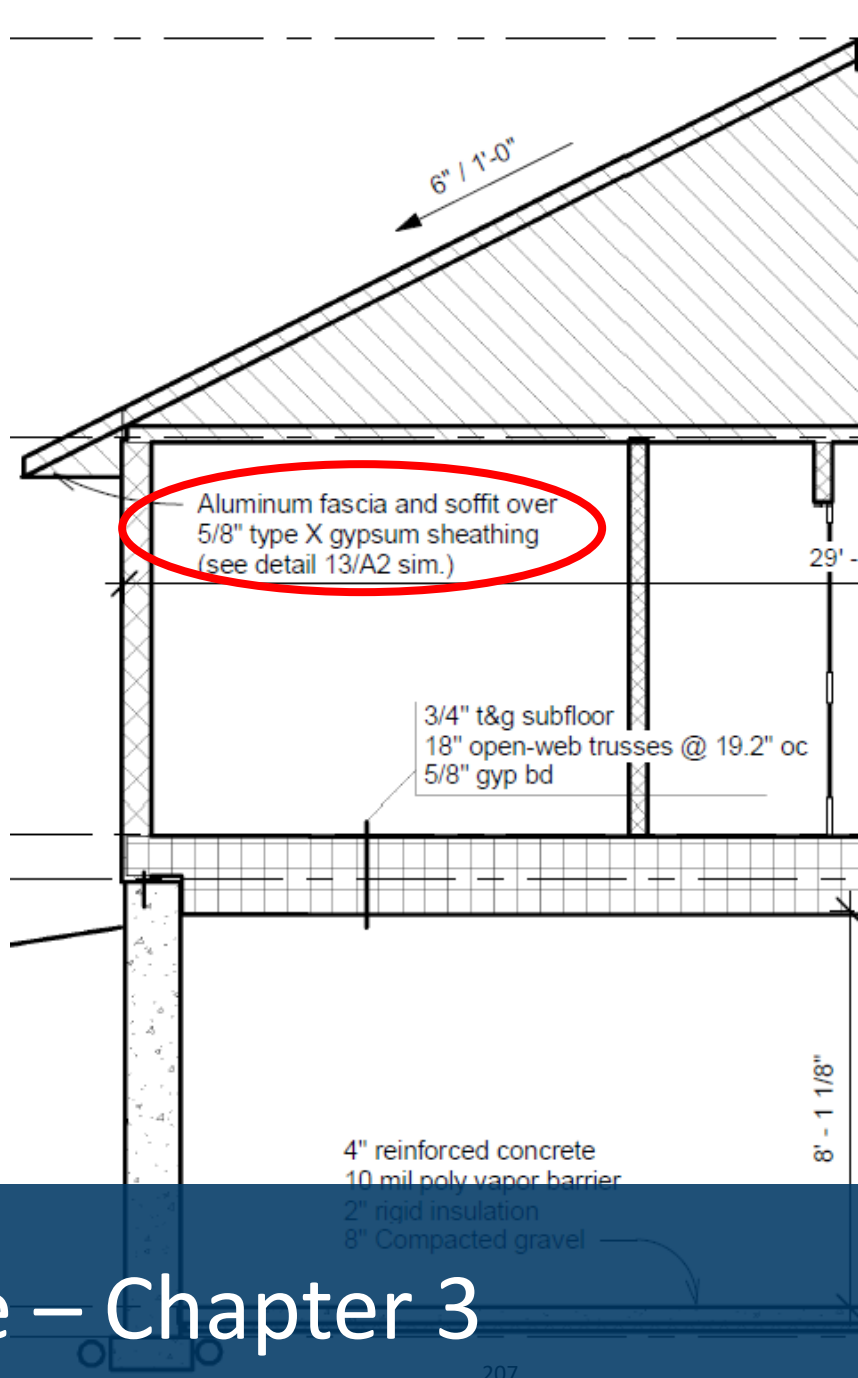
R317.1 Location required. Protection of wood and wood-based products from decay shall be provided in the following locations by the use of naturally durable wood or wood that is preservative-treated in accordance with AWPA U1.

5. Wood siding, sheathing and wall framing on the exterior of a building having a clearance of less than 6 inches (152 mm) from the ground or less than 2 inches (51 mm) measured vertically from concrete steps, porch slabs, patio slabs and similar horizontal surfaces exposed to the weather.



Exterior - Cladding



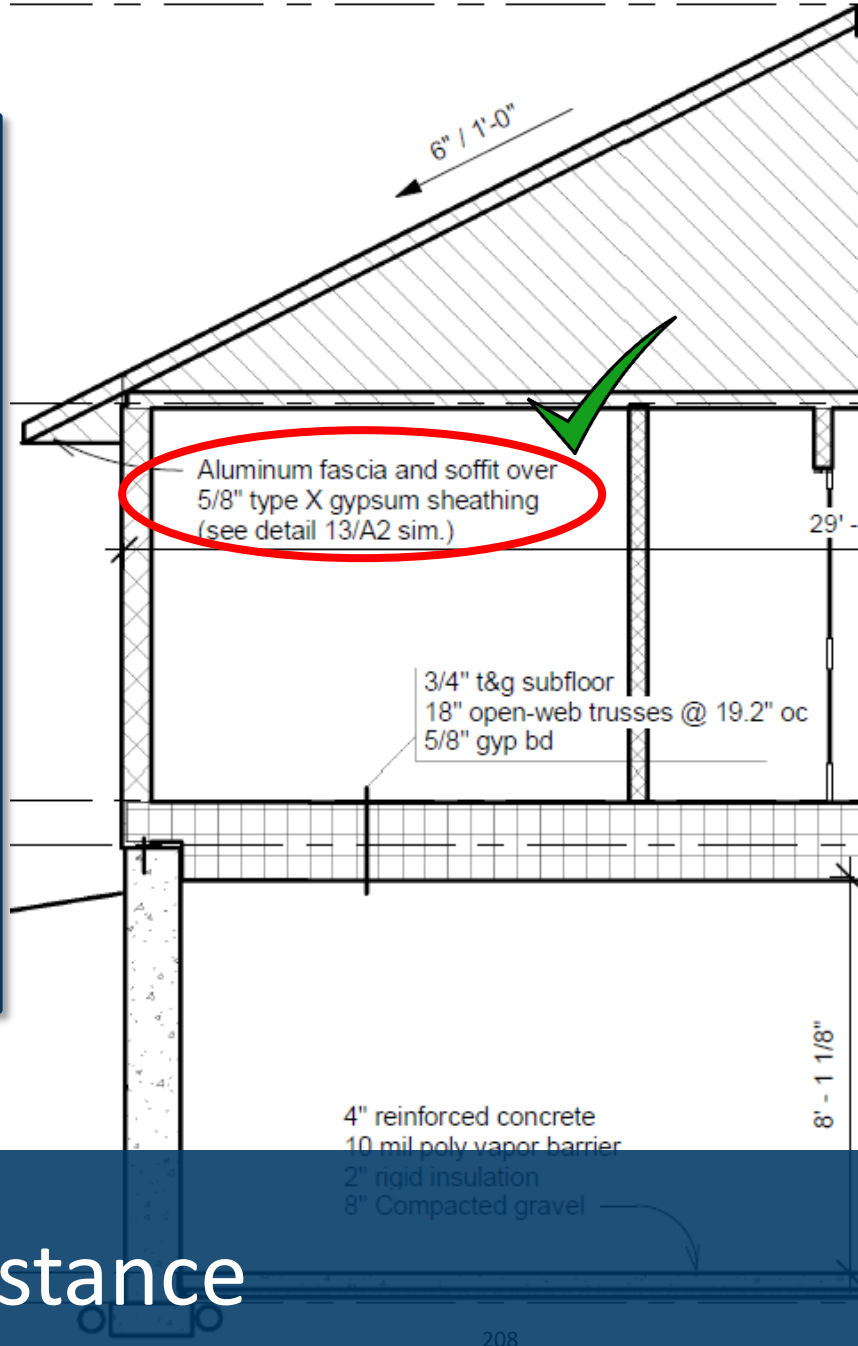


Exterior – Fire Separation Distance – Chapter 3

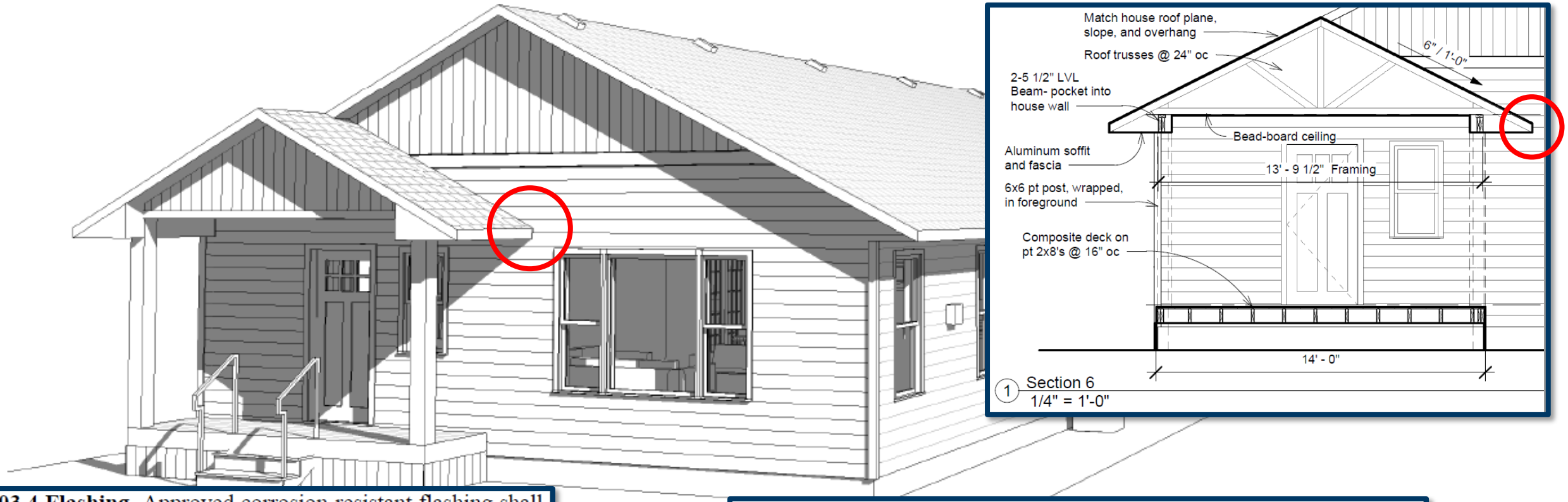
TABLE R302.1(1)
EXTERIOR WALLS

EXTERIOR WALL ELEMENT		MINIMUM FIRE-RESISTANCE RATING	MINIMUM FIRE SEPARATION DISTANCE
Walls	Fire-resistance rated	1 hour—tested in accordance with ASTM E119, UL 263, or Section 703.3 of the *International Building Code* with exposure from both sides	0 feet
	Not fire-resistance rated	0 hours	≥ 5 feet
Projections	Not allowed	NA	< 2 feet
	Fire-resistance rated	1 hour on the underside, or heavy timber, or fire-retardant-treated wood[a, b, c]	≥ 2 feet to < 5 feet
	Not fire-resistance rated	0 hours	≥ 5 feet
Openings in walls	Not allowed	NA	< 3 feet
	25% maximum of wall area	0 hours	3 feet
	Unlimited	0 hours	5 feet
Penetrations	All	Comply with Section R302.4	< 3 feet
		None required	3 feet

For SI: 1 foot = 304.8 mm.
NA = Not Applicable.
a. The fire-resistance rating shall be permitted to be reduced to 0 hours on the underside of the eave overhang if fireblocking is provided from the wall top plate to the underside of the roof sheathing.
b. The fire-resistance rating shall be permitted to be reduced to 0 hours on the underside of the rake overhang where gable vent openings are not installed.
c. One hour on the underside equates to one layer of $^{5}/_{8}$-inch type X gypsum sheathing. Openings are not allowed.



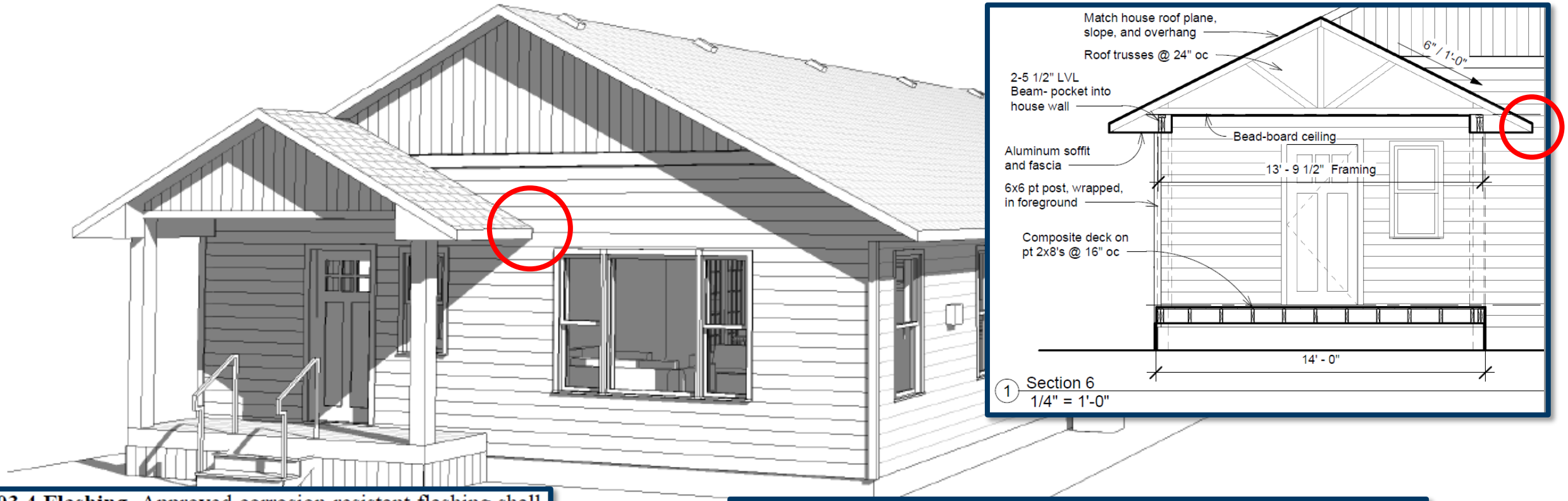
Exterior – Fire Separation Distance



R703.4 Flashing. Approved corrosion-resistant flashing shall be applied shingle-fashion in such a manner as to prevent entry of water into the wall cavity or penetration of water to the building structural framing components. Self-adhered membranes used as flashing shall comply with AAMA 711. Fluid-applied membranes used as flashing in exterior walls shall comply with AAMA 714. The flashing shall extend to the surface of the exterior wall finish. Approved corrosion-resistant flashings shall be installed at the following locations:

9. Where the lower portion of a sloped roof stops within the plane of an intersecting wall cladding in such a manner as to divert water away from the assembly in compliance with Section R903.2.1.

Exterior – Flashing



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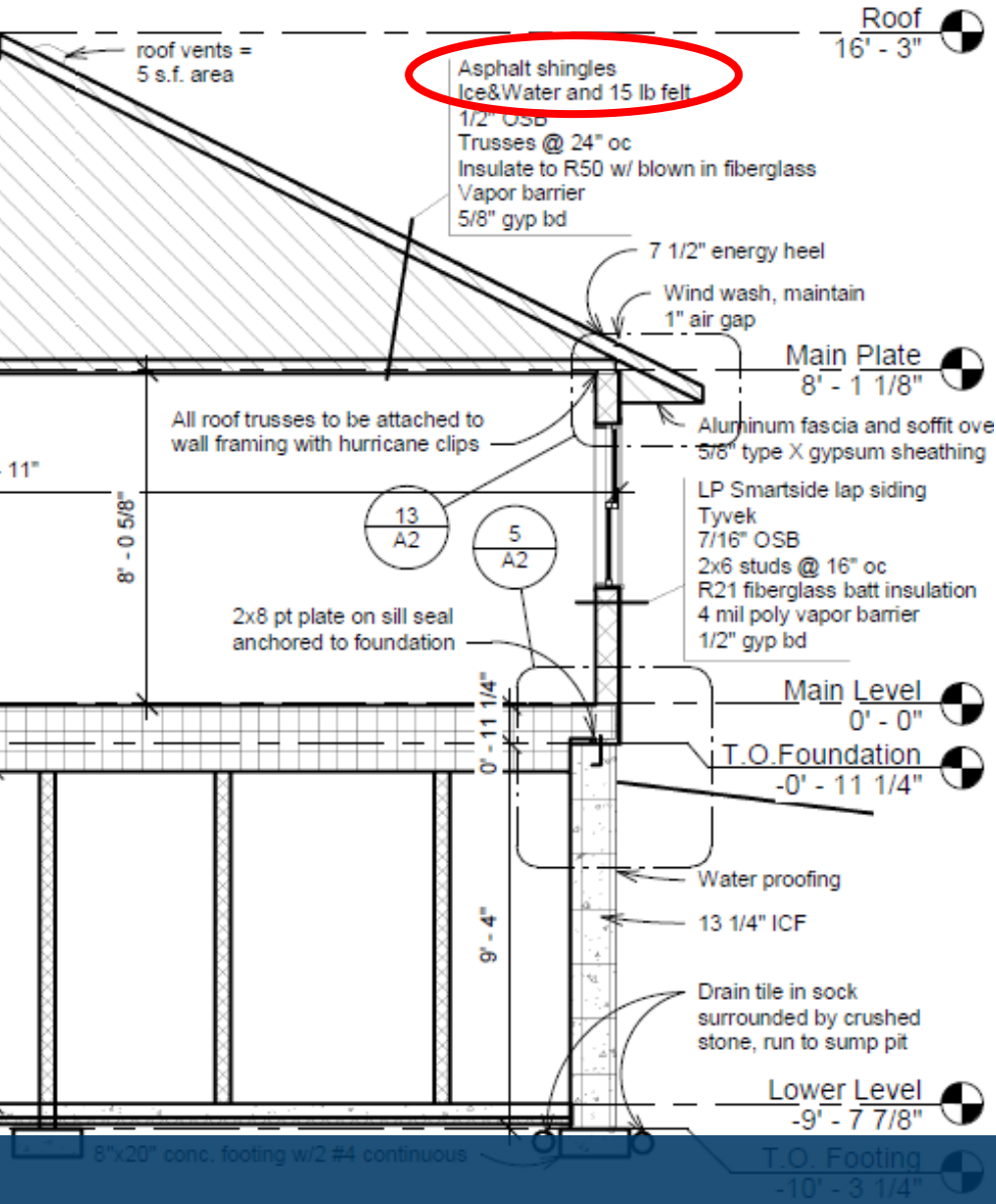
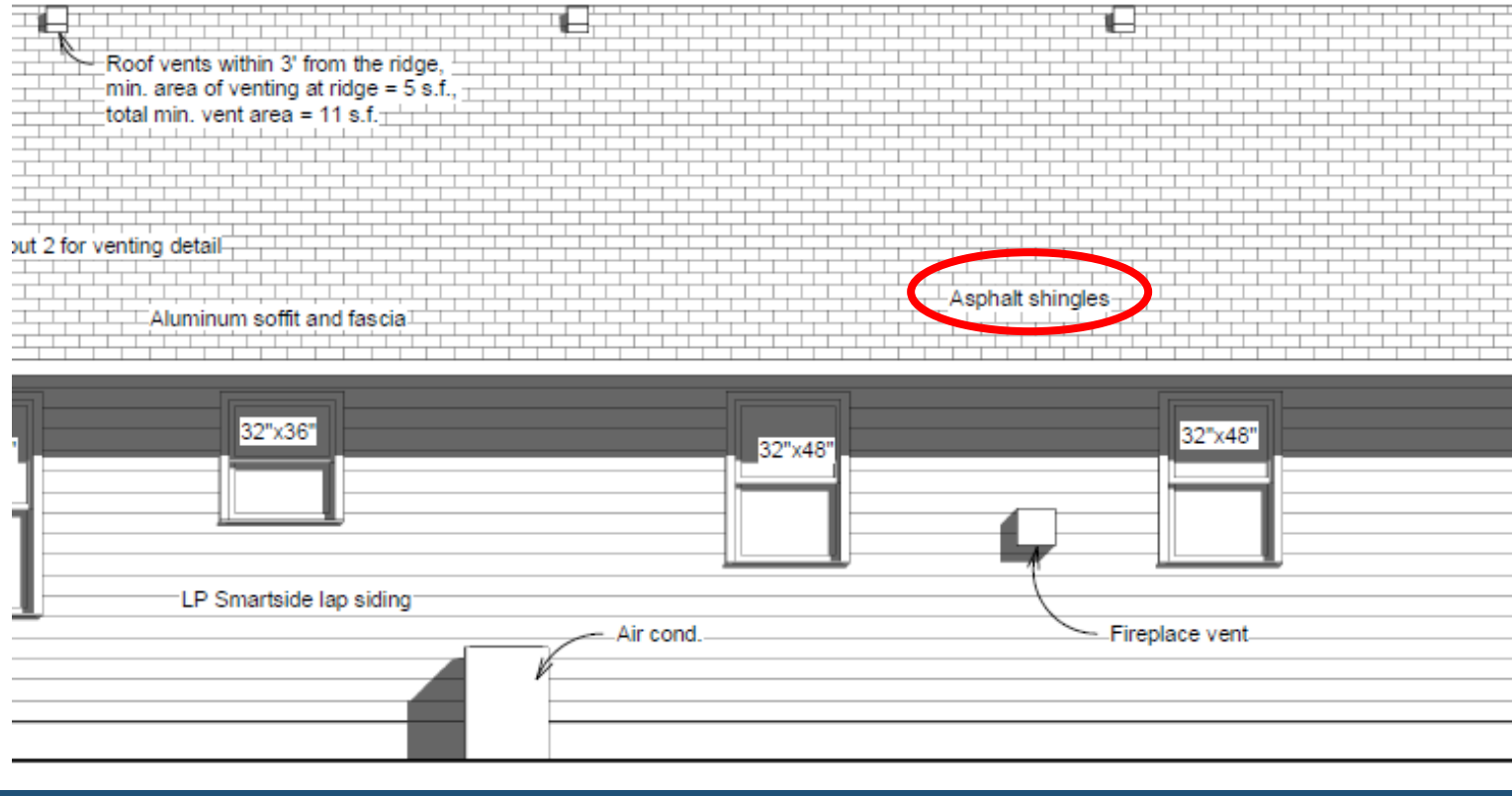
Exterior – Flashing





Exterior – Roof Covering – Chapter 9

R905.2 Asphalt shingles. The installation of asphalt shingles shall comply with the provisions of this section.

R905.2.1 Sheathing requirements. Asphalt shingles shall be fastened to solidly sheathed decks or 1-inch thick nominal wood boards.

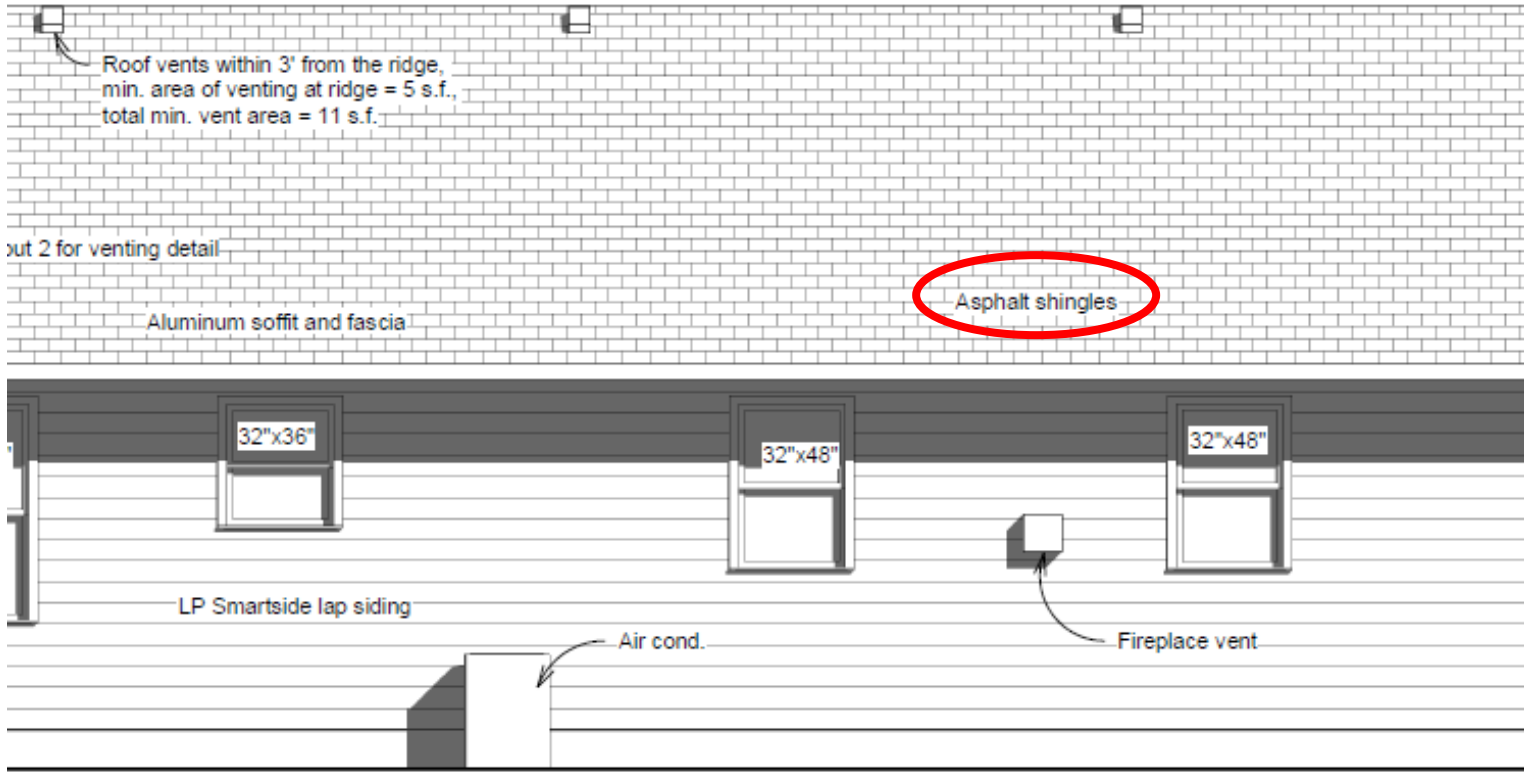
R905.2.2 Slope. Asphalt shingles shall be used only on roof slopes of two units vertical in 12 units horizontal (17-percent slope) or greater. For roof slopes from two units vertical in 12 units horizontal (17-percent slope) up to four units vertical in 12 units horizontal (33-percent slope), double *underlayment* application is required in accordance with Section R905.1.1.

R905.2.3 Underlayment. *Underlayment* shall comply with Section R905.1.1.

R905.2.4 Asphalt shingles. Asphalt shingles shall comply with ASTM D3462.

R905.2.4.1 Wind resistance of asphalt shingles. Asphalt shingles shall be tested in accordance with ASTM D7158. Asphalt shingles shall meet the classification requirements of Table R905.2.4.1 for the appropriate ultimate design wind speed. Asphalt shingle packaging shall bear a label to indicate compliance with ASTM D7158 and the required classification in Table R905.2.4.1.

Exception: Asphalt shingles not included in the scope of ASTM D7158 shall be tested and labeled in accordance with ASTM D3161. Asphalt shingle packaging shall bear a label to indicate compliance with ASTM D3161 and the required classification in Table R905.2.4.1.



Exterior – Roof Covering

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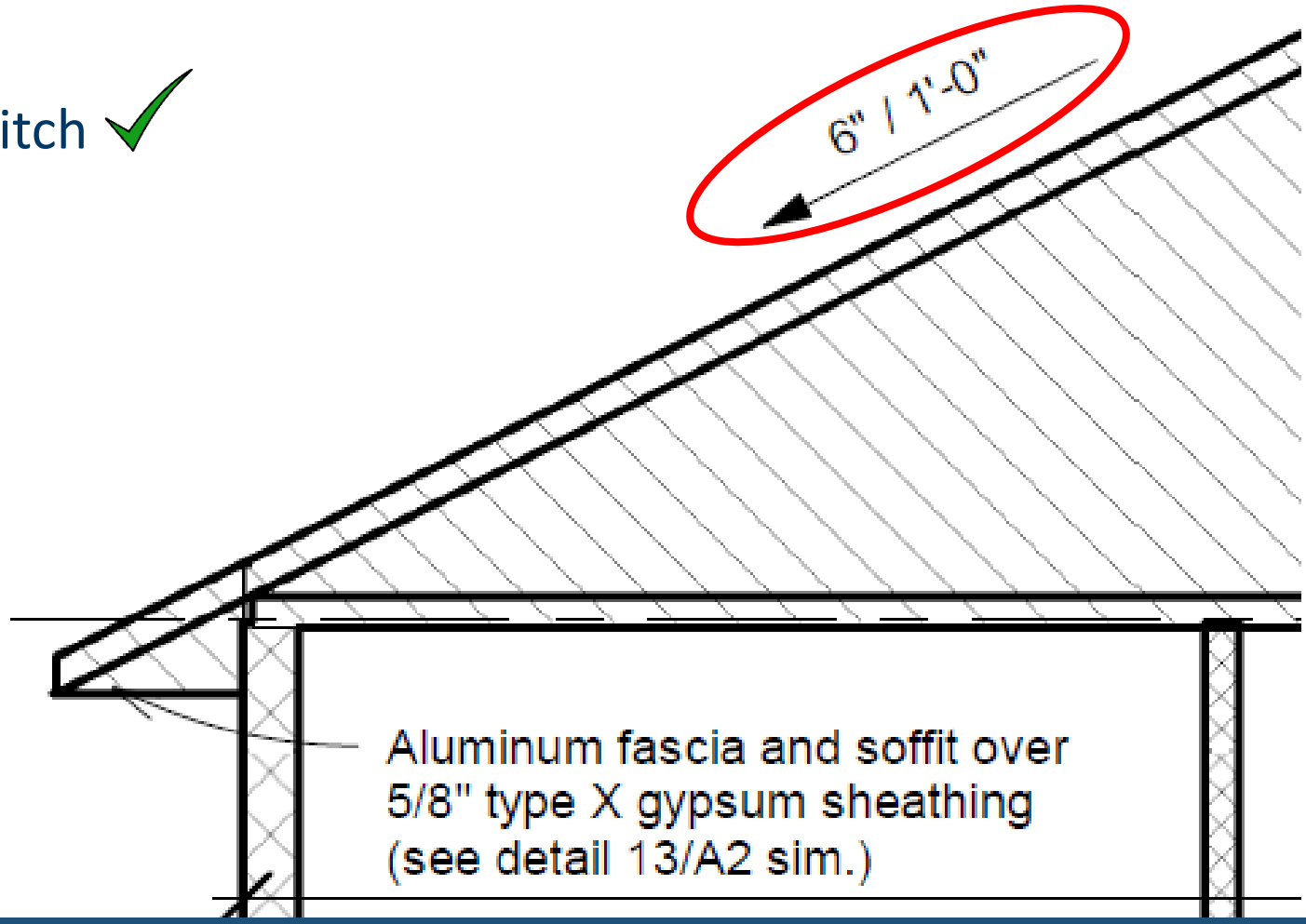
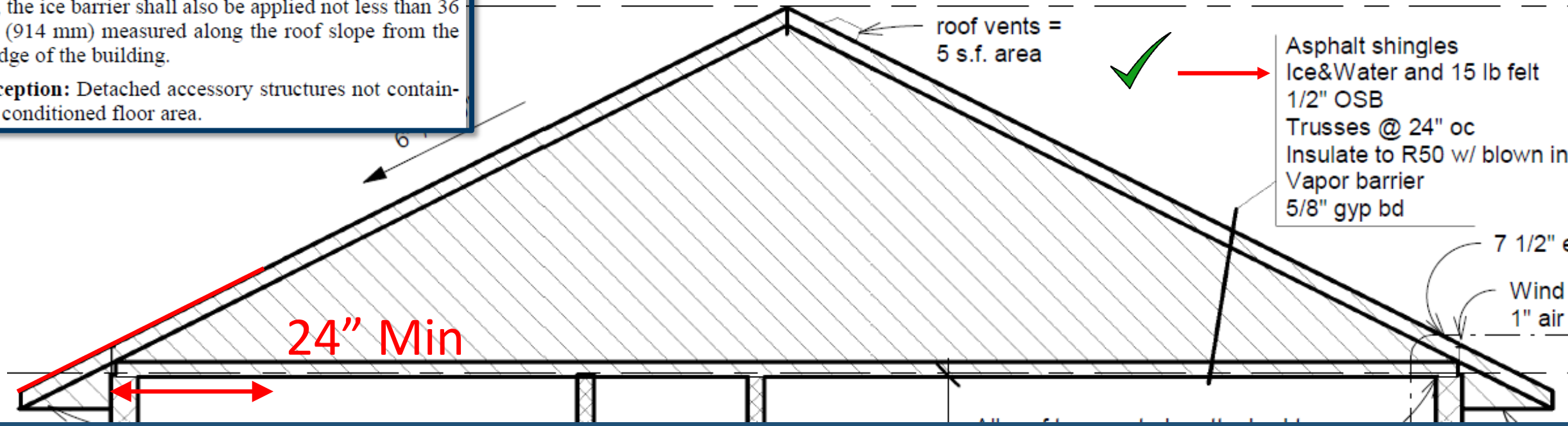
6:12 Pitch ✓



Exterior – Roof Covering

R905.1.2 Ice barriers. In areas where there has been a history of ice forming along the eaves causing a backup of water as designated in Table R301.2(1), an ice barrier shall be installed for asphalt shingles, metal roof shingles, mineral-surfaced roll roofing, slate and slate-type shingles, wood shingles and wood shakes. The ice barrier shall consist of not fewer than two layers of *underlayment* cemented together, or a self-adhering polymer-modified bitumen sheet shall be used in place of normal *underlayment* and extend from the lowest edges of all roof surfaces to a point not less than 24 inches (610 mm) inside the exterior wall line of the building. On roofs with slope equal to or greater than eight units vertical in 12 units horizontal (67-percent slope), the ice barrier shall also be applied not less than 36 inches (914 mm) measured along the roof slope from the eave edge of the building.

Exception: Detached accessory structures not containing conditioned floor area.



Exterior – Roof Covering

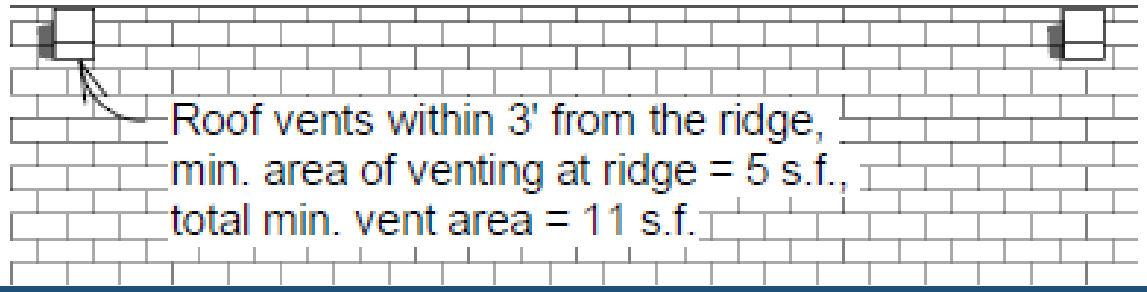
SECTION R806
ROOF VENTILATION

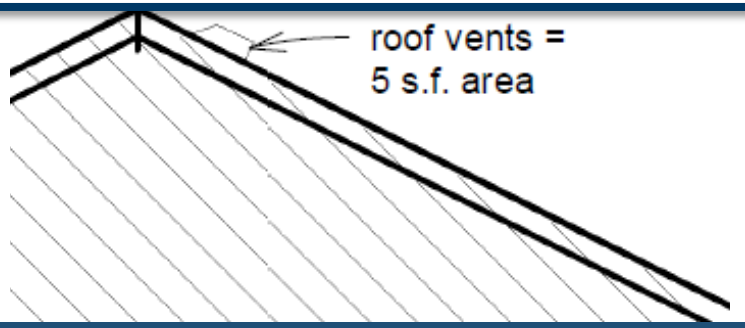
R806.1 Ventilation required. Enclosed attics and enclosed rafter spaces formed where ceilings are applied directly to the underside of roof rafters shall have cross ventilation for each separate space by ventilating openings protected against the entrance of rain or snow. Ventilation openings shall have a least dimension of $^1/_{16}$ inch (1.6 mm) minimum and $^1/_4$ inch (6.4 mm) maximum. Ventilation openings having a least dimension larger than $^1/_4$ inch (6.4 mm) shall be provided with corrosion-resistant wire cloth screening, hardware cloth, perforated vinyl or similar material with openings having a least dimension of $^1/_{16}$ inch (1.6 mm) minimum and $^1/_4$ inch (6.4 mm) maximum. Openings in roof framing members shall conform to the requirements of Section R802.7. Required ventilation openings shall open directly to the outside air and shall be protected to prevent the entry of birds, rodents, snakes and other similar creatures.

R806.2 Minimum vent area. The minimum net free ventilating area shall be $^1/_{150}$ of the area of the vented space.

Exception: The minimum net free ventilation area shall be $^1/_{300}$ of the vented space provided both of the following conditions are met:

1. In Climate Zones 6, 7 and 8, a Class I or II vapor retarder is installed on the warm-in-winter side of the ceiling.
2. Not less than 40 percent and not more than 50 percent of the required ventilating area is provided by ventilators located in the upper portion of the attic or rafter space. Upper ventilators shall be located not more than 3 feet (914 mm) below the ridge or highest point of the space, measured vertically. The balance of the required ventilation provided shall be located in the bottom one-third of the *attic* space. Where the location of wall or roof framing members conflicts with the installation of upper ventilators, installation more than 3 feet (914 mm) below the ridge or highest point of the space shall be permitted.





Exterior – Roof Covering

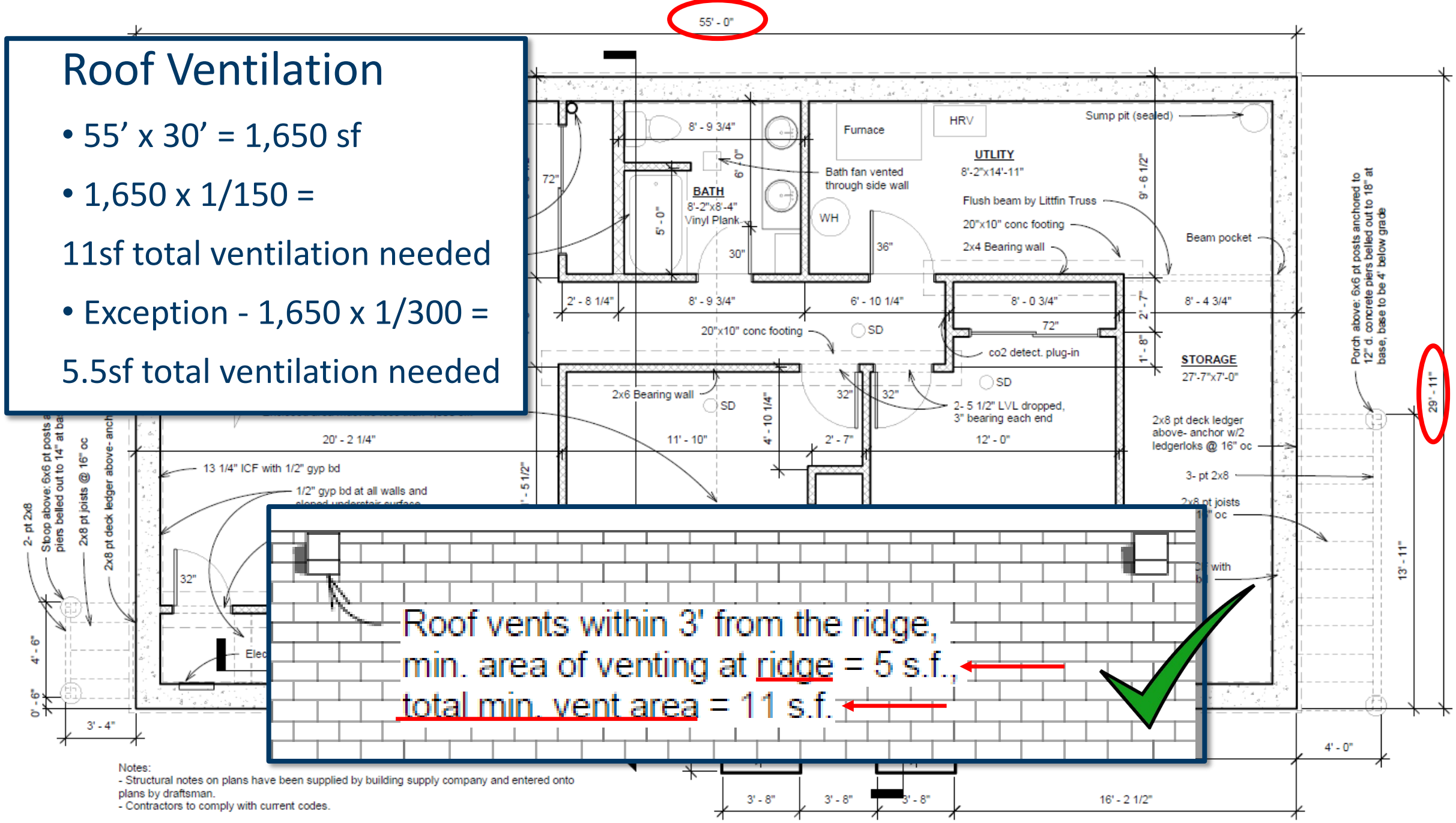
Roof Ventilation

- 55’ x 30’ = 1,650 sf
- 1,650 x 1/150 =

11sf total ventilation needed

- Exception - 1,650 x 1/300 =

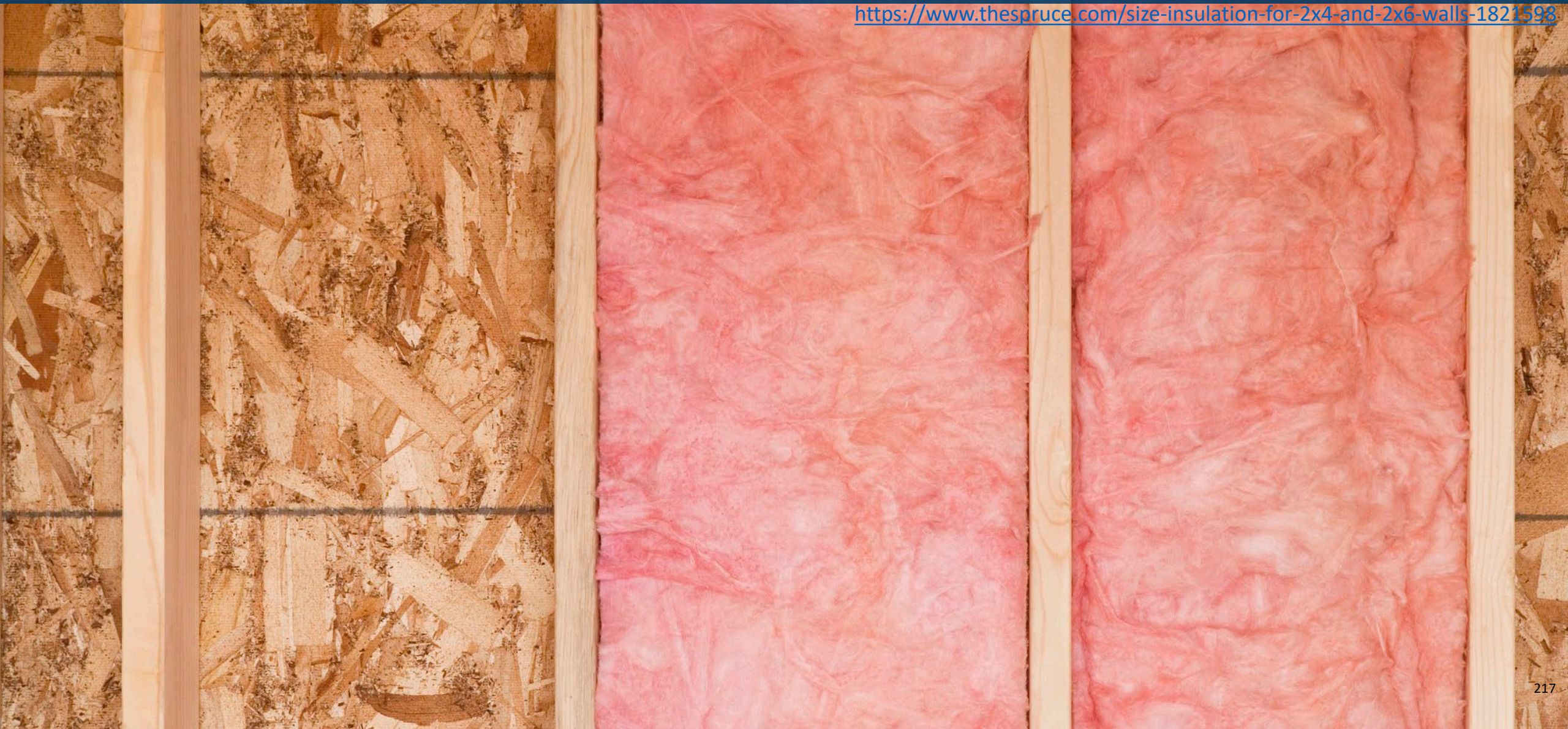
5.5sf total ventilation needed



Notes:
- Structural notes on plans have been supplied by building supply company and entered onto plans by draftsman.
- Contractors to comply with current codes.

1 Lower Level
1/4" = 1'-0"

Insulation – MNRE Chapter 4



https://www.thespruce.com/size-insulation-for-2x4-and-2x6-walls-1821598

Insulation – RE402

TABLE R402.1.1
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT[a]

CLIMATE ZONE	FENESTRATION *U*-FACTOR[b]	SKYLIGHT[b] *U*-FACTOR	GLAZED FENESTRATION SHGC[b,e]	CEILING[j] *R*-VALUE	WOOD FRAME WALL *R*-VALUE[f]	MASS WALL *R*-VALUE[i,g,h]	FLOOR *R*-VALUE	BASEMENT[c, i] WALL *R*-VALUE	SLAB[d] *R*-VALUE & DEPTH	CRAWL SPACE[c, i] WALL *R*-VALUE
6	0.32	0.55	NR	49	20, 13+5	15/20	30[e]	15	10, 3.5 ft	15
7	0.32	0.55	NR	49	21	19/21	38[e]	15	10, 5 ft	15

For SI: 1 foot = 304.8 mm.

a. R-values are minimums. U-factors and SHGC are maximums. When insulation is installed in a cavity that is less than the label or design thickness of the insulation, the installed R-value of the insulation shall not be less than the R-value specified in the table.

b. The fenestration U-factor column excludes skylights. The SHGC column applies to all glazed fenestration.

c. See Section R402.2.8.

d. Insulation R-values for heated slabs shall be installed to the depth indicated or to the top of the footing, whichever is less.

e. Or insulation sufficient to fill the framing cavity, R-19 minimum.

f. First value is cavity insulation, second is continuous insulation or insulated siding, so "13+5" means R-13 cavity insulation plus R-5 continuous insulation or insulated siding. If structural sheathing covers 40 percent or less of the exterior, continuous insulation R-value shall be permitted to be reduced by no more than R-3 in the locations where structural sheathing is used to maintain a consistent total sheathing thickness.

g. The second R-value applies when more than half the insulation is on the interior of the mass wall.

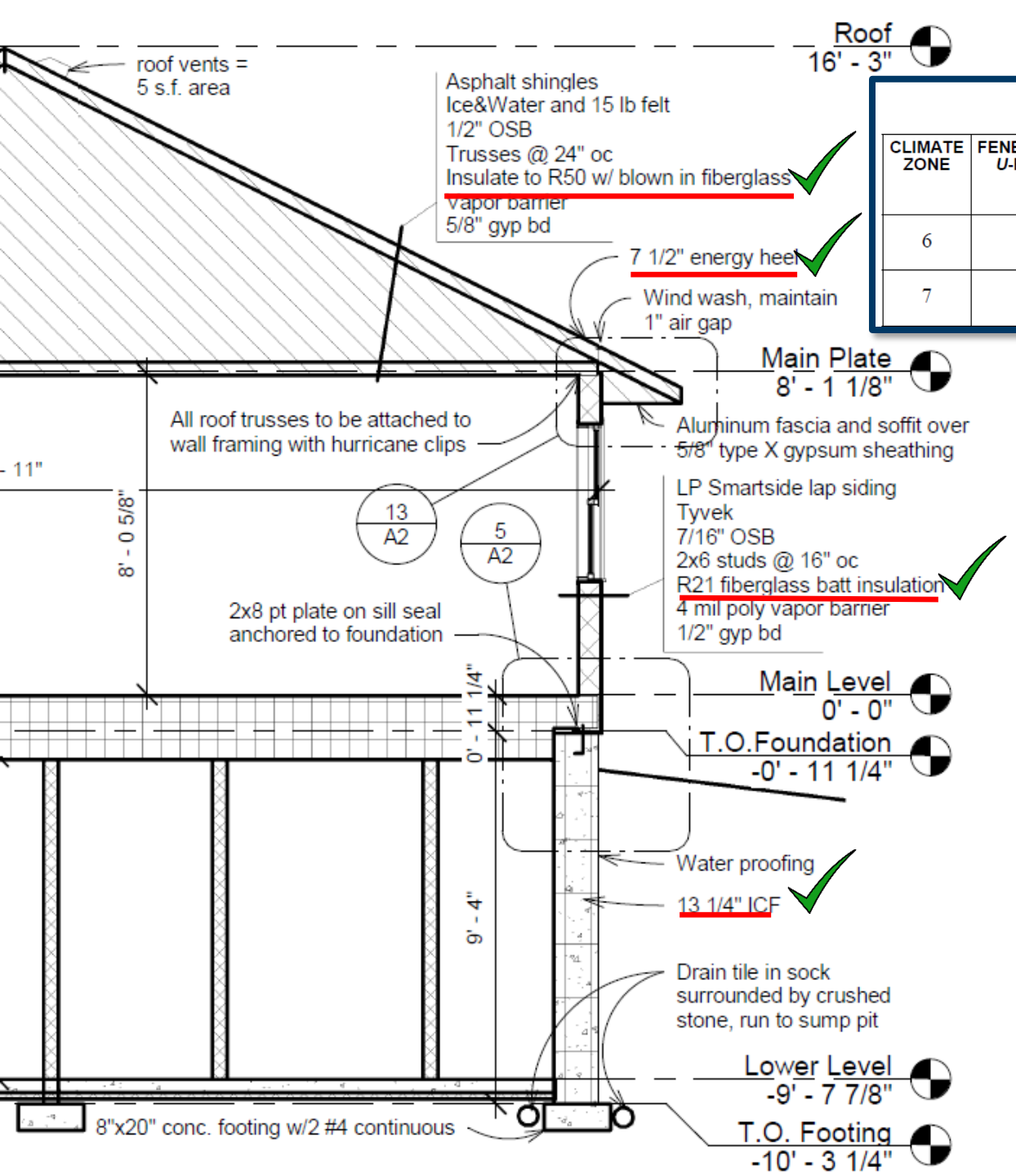
h. When using log-type construction for thermal mass walls the following applies:

(1) a minimum of a 7-inch diameter log shall be used; and

(2) the U-value of fenestration products shall be 0.29 overall on average or better.

i. See Section 402.2.8. A minimum R-19 cavity insulation is required in wood foundation walls.

j. Roof/ceiling assemblies shall have a minimum 6-inch energy heel.



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6	0.32	0.55	NR	49	20, 13+5	15/20	30[e]	15	10, 3.5 ft	15
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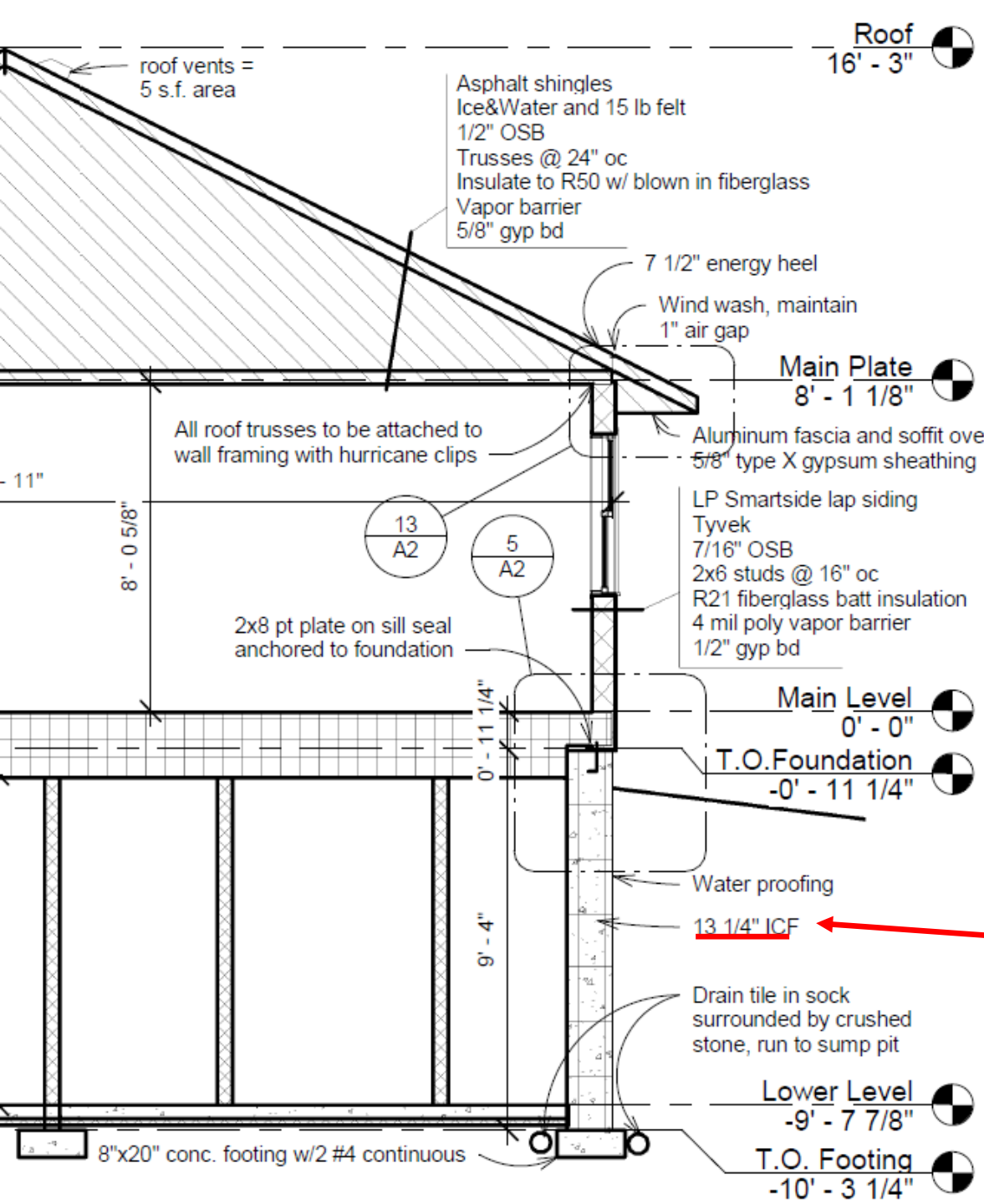


SECTION R316
FOAM PLASTIC

R316.1 General. The provisions of this section shall govern the materials, design, application, construction and installation of foam plastic materials.

R316.2 Labeling and identification. Packages and containers of foam plastic insulation and foam plastic insulation components delivered to the job site shall bear the *label* of an *approved agency* showing the manufacturer's name, the product listing, product identification and information sufficient to determine that the end use will comply with the requirements.

R316.3 Surface burning characteristics. Unless otherwise allowed in Section R316.5, foam plastic, or foam plastic cores used as a component in manufactured assemblies, used in building construction shall have a flame spread index of not more than 75 and shall have a smoke-developed index of not more than 450 when tested in the maximum thickness and density intended for use in accordance with ASTM E84 or UL 723. Loose-fill-type foam plastic insulation shall be tested as board stock for the flame spread index and smoke-developed index.

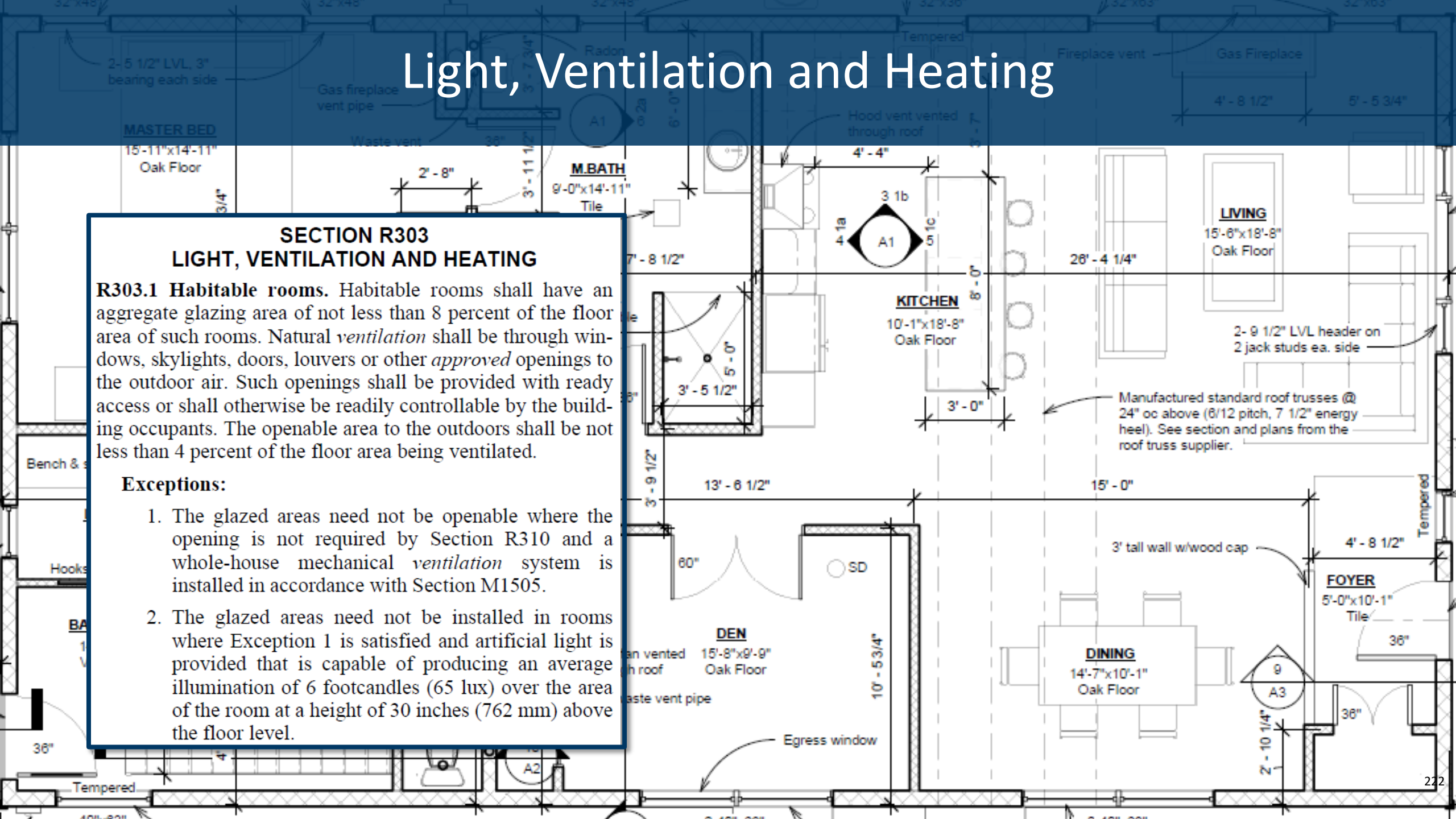
Exception: Foam plastic insulation more than 4 inches (102 mm) thick shall have a flame spread index of not more than 75 and a smoke-developed index of not more than 450 where tested at a thickness of not more than 4 inches (102 mm), provided that the end use is *approved* in accordance with Section R316.6 using the thickness and density intended for use.

R316.4 Thermal barrier. Unless otherwise allowed in Section R316.5, foam plastic shall be separated from the interior of a building by an *approved* thermal barrier of not less than $^{1}/_{2}$-inch (12.7 mm) gypsum wallboard, $^{23}/_{32}$-inch (18.2 mm) wood structural panel or a material that is tested in accordance with and meets the acceptance criteria of both the Temperature Transmission Fire Test and the Integrity Fire Test of NFPA 275.

Light, Ventilation and Heating – Chapter 3

https://knoxinspect.com/2018/10/furnace-vs-boiler-they-are-not-the-same/thompson-heating-and-cooling-duct-work-residential-ductwork/

Light, Ventilation and Heating

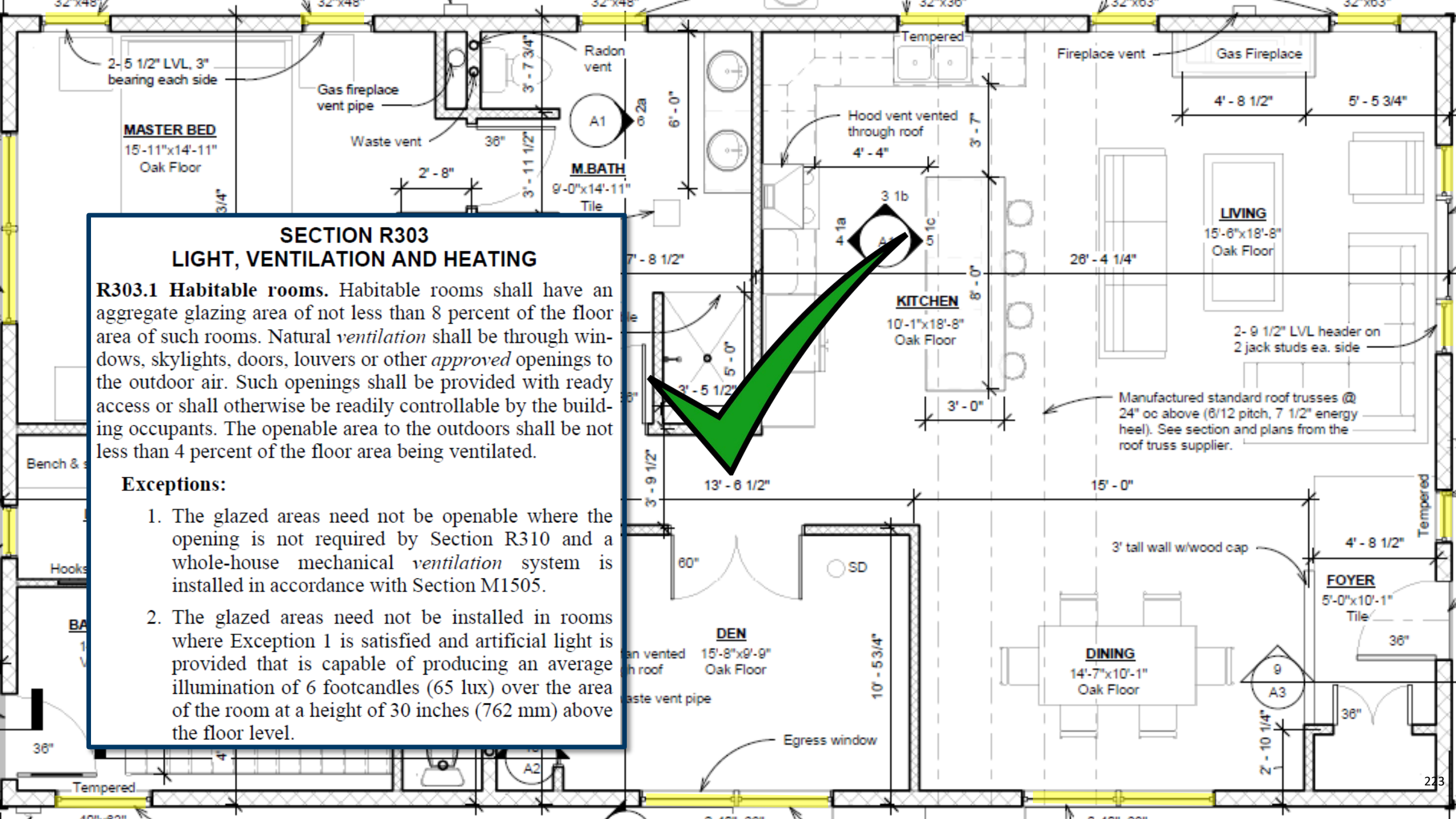


SECTION R303
LIGHT, VENTILATION AND HEATING

R303.1 Habitable rooms. Habitable rooms shall have an aggregate glazing area of not less than 8 percent of the floor area of such rooms. Natural *ventilation* shall be through windows, skylights, doors, louvers or other *approved* openings to the outdoor air. Such openings shall be provided with ready access or shall otherwise be readily controllable by the building occupants. The openable area to the outdoors shall be not less than 4 percent of the floor area being ventilated.

Exceptions:

1. The glazed areas need not be openable where the opening is not required by Section R310 and a whole-house mechanical *ventilation* system is installed in accordance with Section M1505.
2. The glazed areas need not be installed in rooms where Exception 1 is satisfied and artificial light is provided that is capable of producing an average illumination of 6 footcandles (65 lux) over the area of the room at a height of 30 inches (762 mm) above the floor level.



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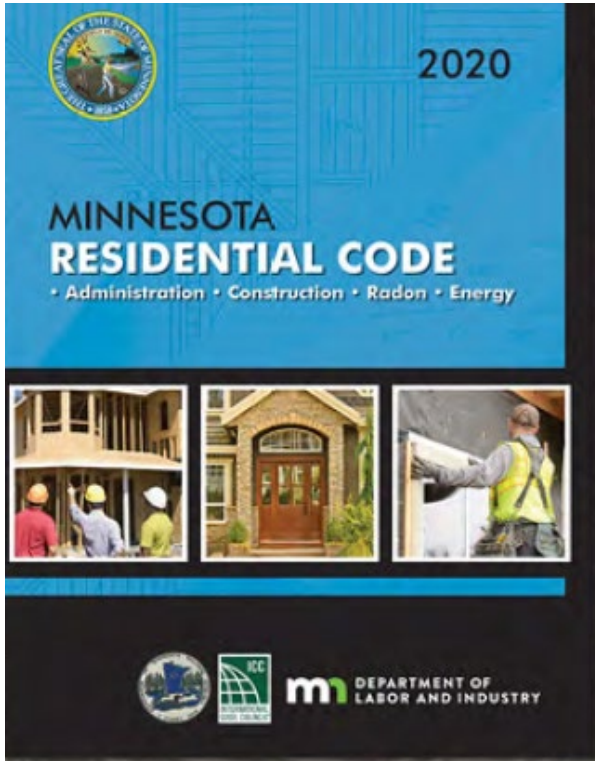
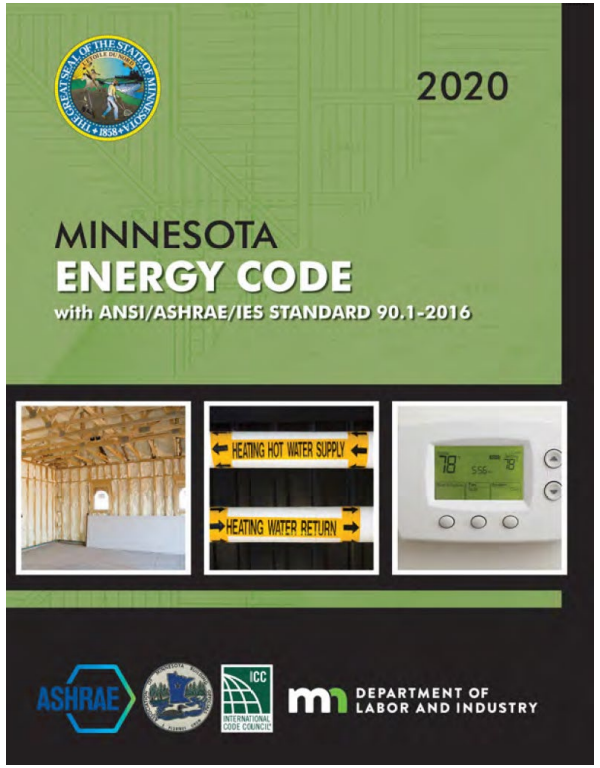
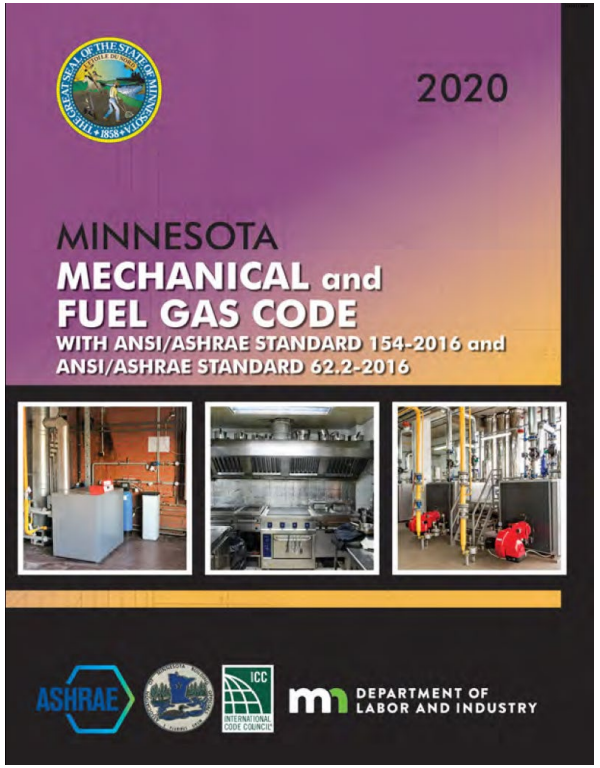
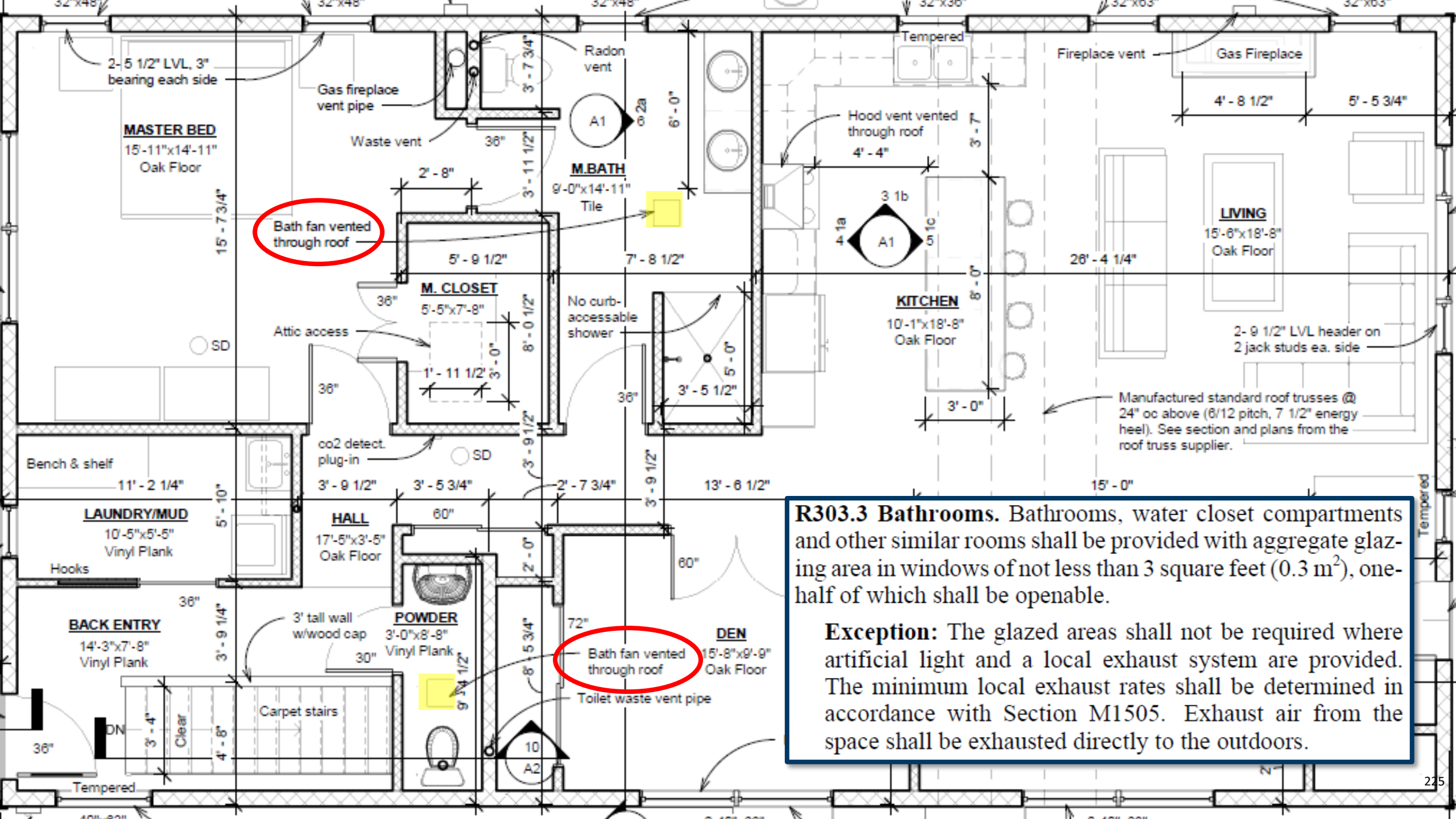
R303.4 Mechanical ventilation. Mechanical ventilation of a dwelling unit shall comply with either Minnesota Rules, Chapter 1322 or 1346.





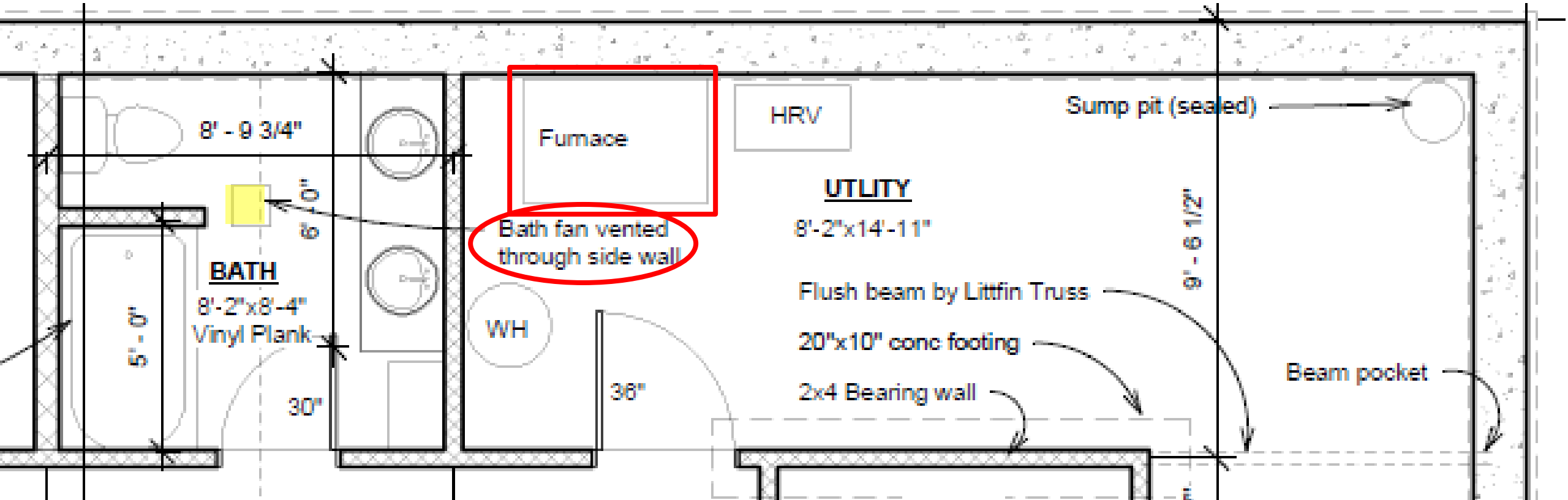




R303.3 Bathrooms. Bathrooms, water closet compartments and other similar rooms shall be provided with aggregate glazing area in windows of not less than 3 square feet (0.3 m^2), one-half of which shall be openable.

Exception: The glazed areas shall not be required where artificial light and a local exhaust system are provided. The minimum local exhaust rates shall be determined in accordance with Section M1505. Exhaust air from the space shall be exhausted directly to the outdoors.

R303.10 Required heating. Where the winter design temperature in Table R301.2(1) is below 60°F (16°C), every *dwelling unit* shall be provided with heating facilities capable of maintaining a room temperature of not less than 68°F (20°C) at a point 3 feet (914 mm) above the floor and 2 feet (610 mm) from exterior walls in habitable rooms at the design temperature. The installation of one or more portable space heaters shall not be used to achieve compliance with this section.



Minimum Room Areas

SECTION R304
MINIMUM ROOM AREAS

R304.1 Minimum area. Habitable rooms shall have a floor area of not less than 70 square feet (6.5 m^2).

Exception: Kitchens.

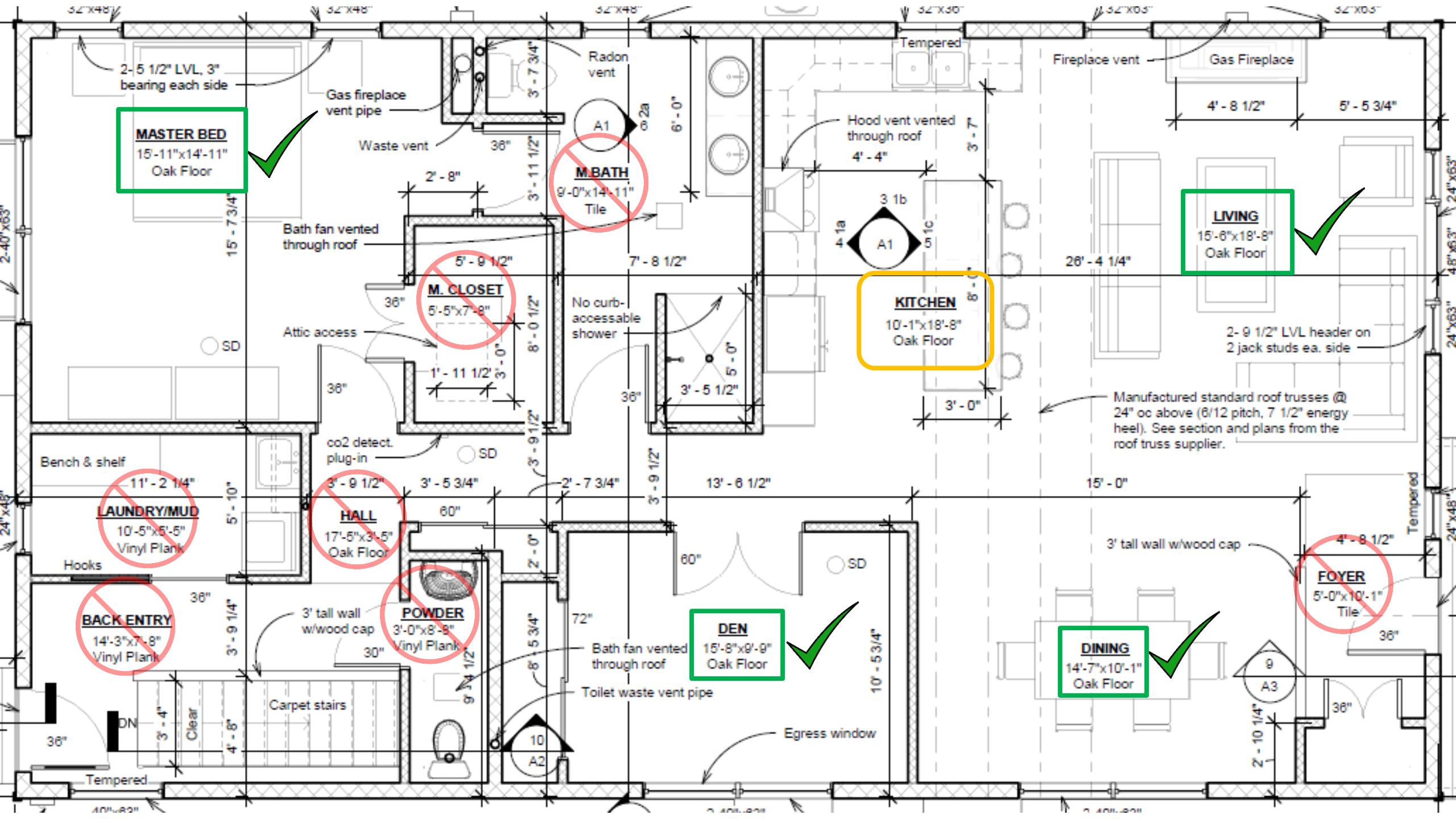
R304.2 Minimum dimensions. Habitable rooms shall be not less than 7 feet (2134 mm) in any horizontal dimension.

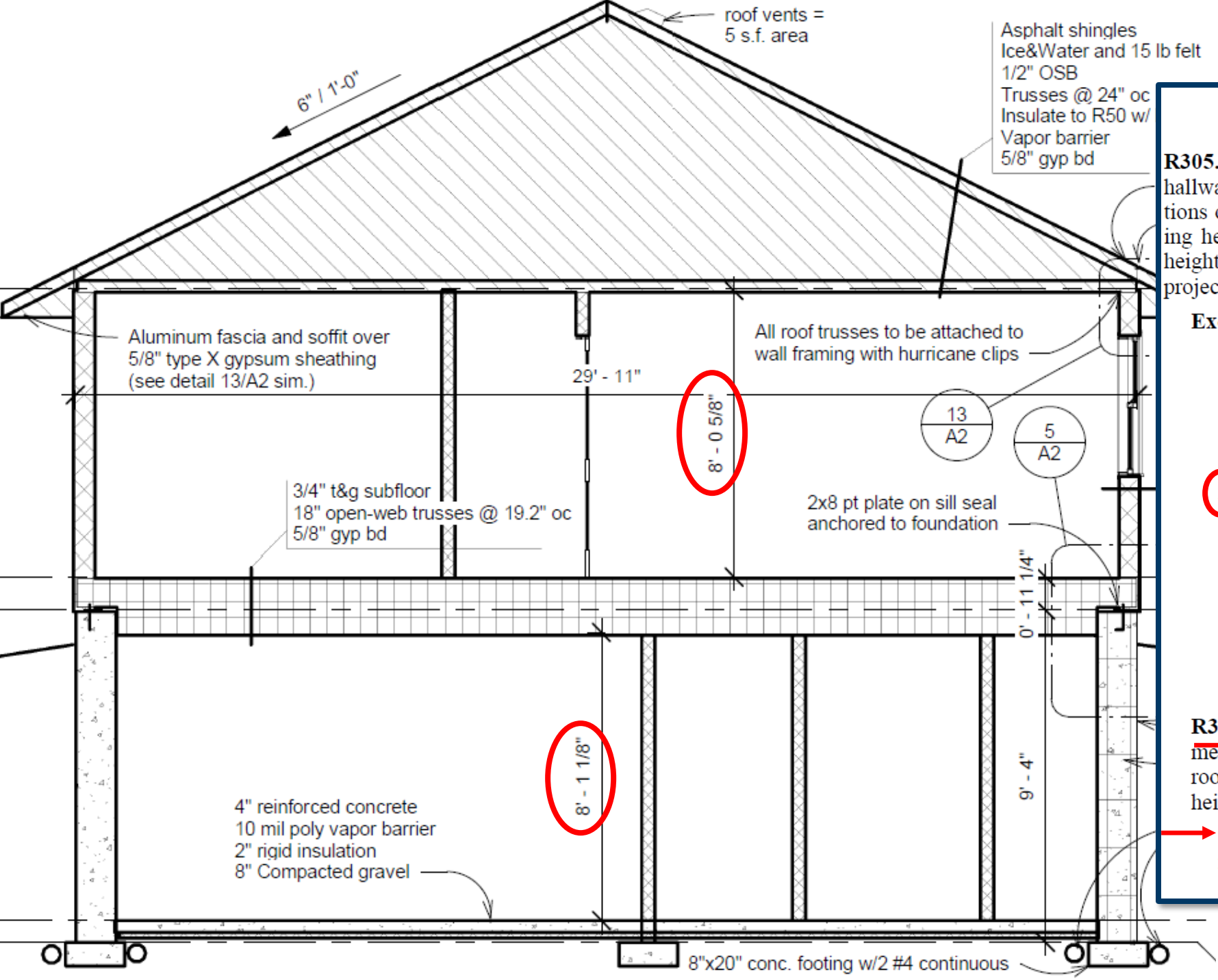
Exception: Kitchens.

R304.3 Height effect on room area. Portions of a room with a sloping ceiling measuring less than 5 feet (1524 mm) or a furred ceiling measuring less than 7 feet (2134 mm) from the finished floor to the finished ceiling shall not be considered as contributing to the minimum required habitable area for that room.

[RB] HABITABLE SPACE. A space in a building for living, sleeping, eating or cooking. Bathrooms, toilet rooms, closets, halls, storage or utility spaces and similar areas are not considered *habitable spaces*.

https://www.grainger.com/product/STANLEY-25-ft-Steel-SAE-Tape-Measure-6A498


2- 5 1/2" LVL, 3" bearing each side
MASTER BED
15'-11"x14'-11"
Oak Floor
Gas fireplace vent pipe
Waste vent
Radon vent
M.BATH
9'-0"x14'-11"
Tile
Bath fan vented through roof
M. CLOSET
5'-5"x7'-8"
Attic access
SD
No curb-accessable shower
co2 detect. plug-in
Bench & shelf
LAUNDRY/MUD
10'-5"x5'-5"
Vinyl Plank
Hooks
HALL
17'-5"x3'-5"
Oak Floor
BACK ENTRY
14'-3"x7'-8"
Vinyl Plank
3' tall wall w/wood cap
POWDER
3'-0"x8'-9"
Vinyl Plank
Carpet stairs
Clear
DN
Tempered
Bath fan vented through roof
Toilet waste vent pipe
DEN
15'-8"x9'-9"
Oak Floor
Egress window
Tempered
Hood vent vented through roof
KITCHEN
10'-1"x18'-8"
Oak Floor
Fireplace vent
Gas Fireplace
LIVING
15'-6"x18'-8"
Oak Floor
2- 9 1/2" LVL header on 2 jack studs ea. side
Manufactured standard roof trusses @ 24" oc above (6/12 pitch, 7 1/2" energy heel). See section and plans from the roof truss supplier.
3' tall wall w/wood cap
FOYER
5'-0"x10'-1"
Tile
DINING
14'-7"x10'-1"
Oak Floor
Tempered



SECTION R305
CEILING HEIGHT

R305.1 Minimum height, new buildings. *Habitable space*, hallways, bathrooms, toilet rooms, laundry rooms, and portions of basements containing these spaces shall have a ceiling height of not less than 7 feet (2134 mm). The required height shall be measured from the finish floor to the lowest projection from the ceiling.

Exceptions:

1. For rooms with sloped ceilings, at least 50 percent of the required floor area of the room shall have a ceiling height of at least 7 feet (2134 mm) and no portion of the required floor area may have a ceiling height of less than 5 feet (1524 mm).
2. Bathrooms shall have a minimum ceiling height of 6 feet 8 inches (2032 mm) at the center of the front clearance area for water closets, bidets, or sinks. The ceiling height above fixtures shall be such that the fixture is capable of being used for its intended purpose. A shower or tub equipped with a showerhead shall have a minimum ceiling height of 6 feet 8 inches (2032 mm) above a minimum area 30 inches (762 mm) by 30 inches (762 mm) at the showerhead.

R305.1.1 Basements, new buildings. Portions of basements that do not contain habitable space, hallways, bathrooms, toilet rooms, and laundry rooms shall have a ceiling height of not less than 6 feet 8 inches (2032 mm).

Exception: Beams, girders, ducts, or other obstructions may project to within 6 feet 4 inches (1931 mm) of the finished floor.

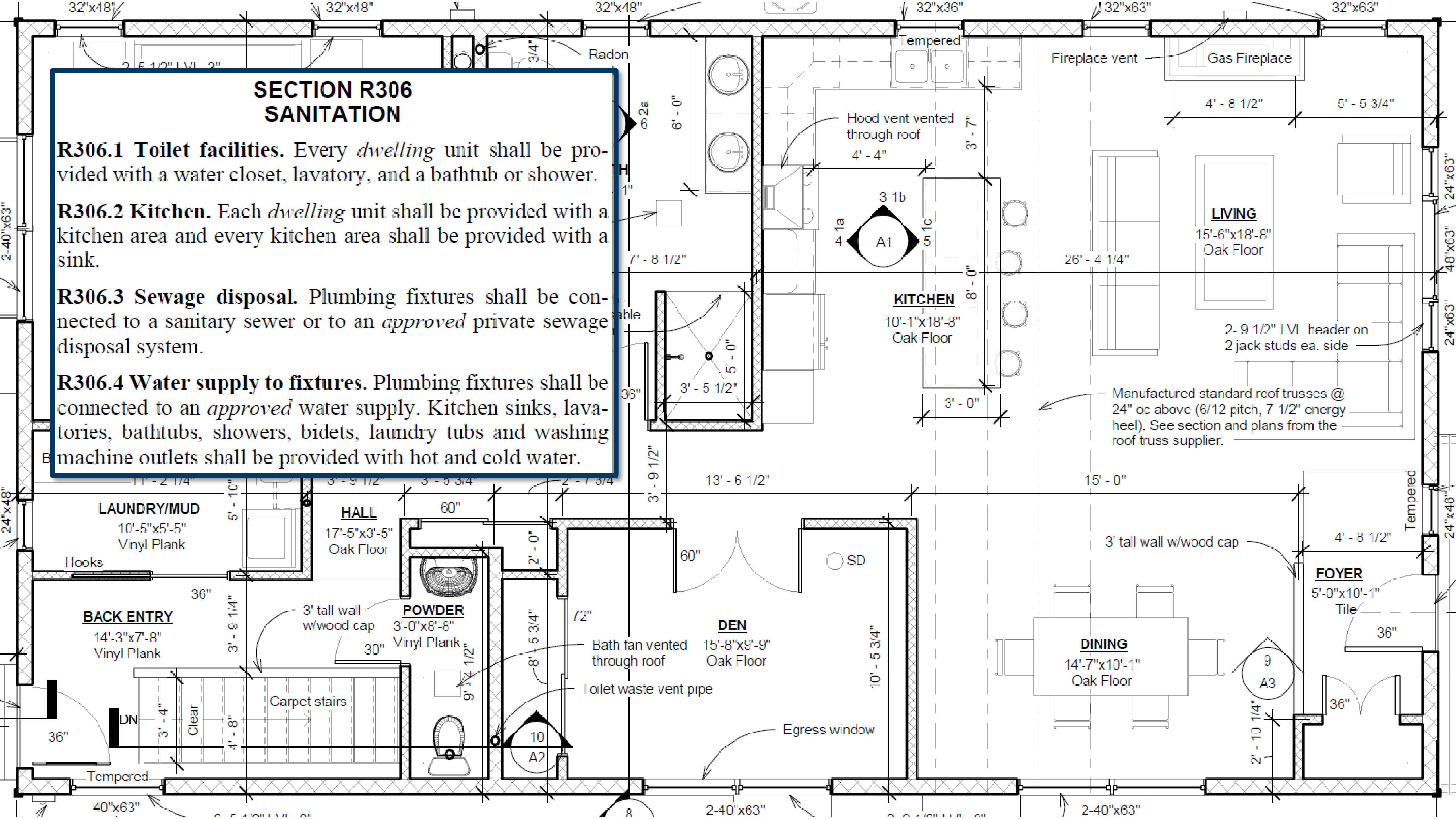
SECTION R306
SANITATION

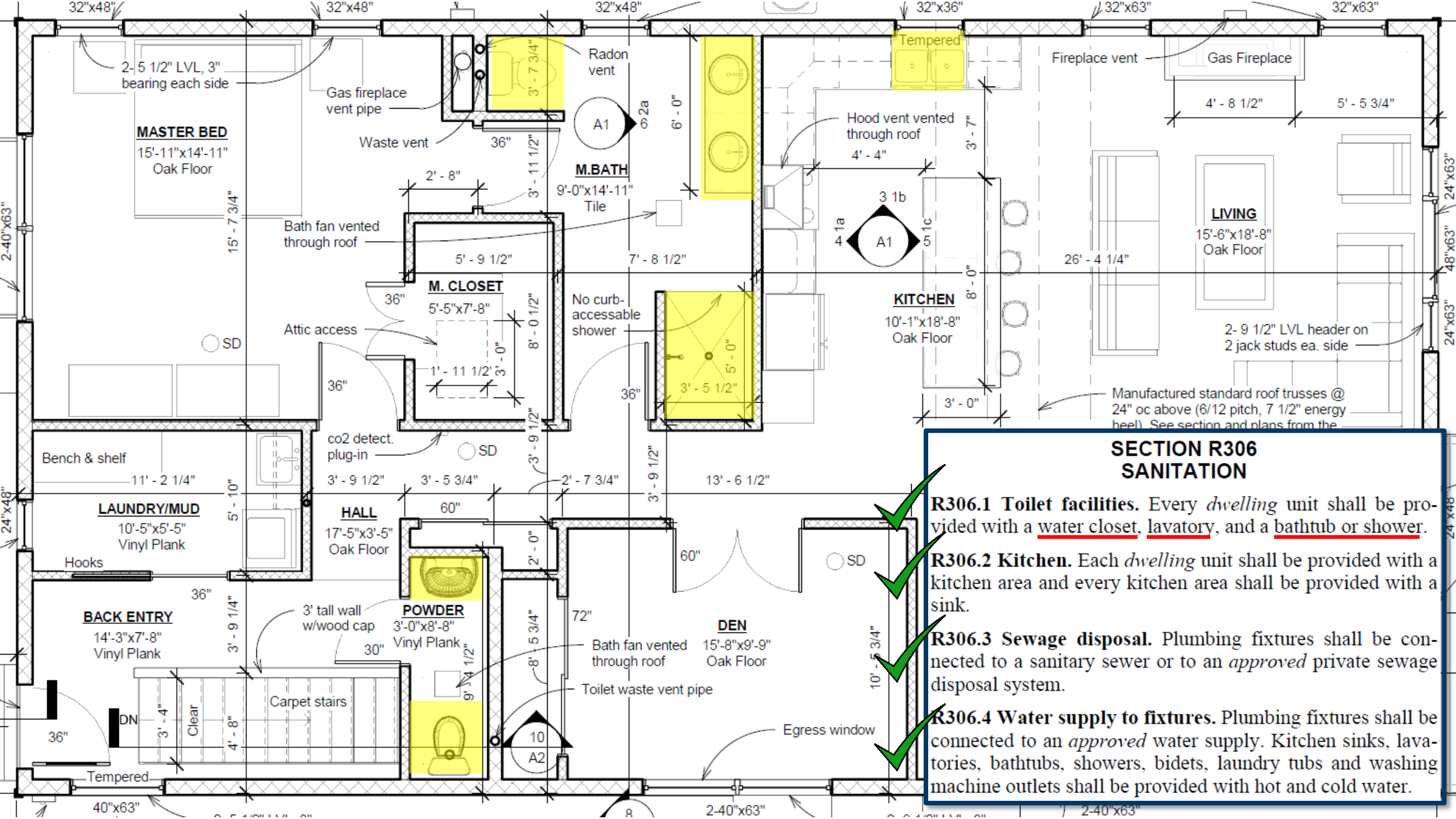
R306.1 Toilet facilities. Every *dwelling* unit shall be provided with a water closet, lavatory, and a bathtub or shower.

R306.2 Kitchen. Each *dwelling* unit shall be provided with a kitchen area and every kitchen area shall be provided with a sink.

R306.3 Sewage disposal. Plumbing fixtures shall be connected to a sanitary sewer or to an *approved* private sewage disposal system.

R306.4 Water supply to fixtures. Plumbing fixtures shall be connected to an *approved* water supply. Kitchen sinks, lavatories, bathtubs, showers, bidets, laundry tubs and washing machine outlets shall be provided with hot and cold water.





SECTION R306
SANITATION

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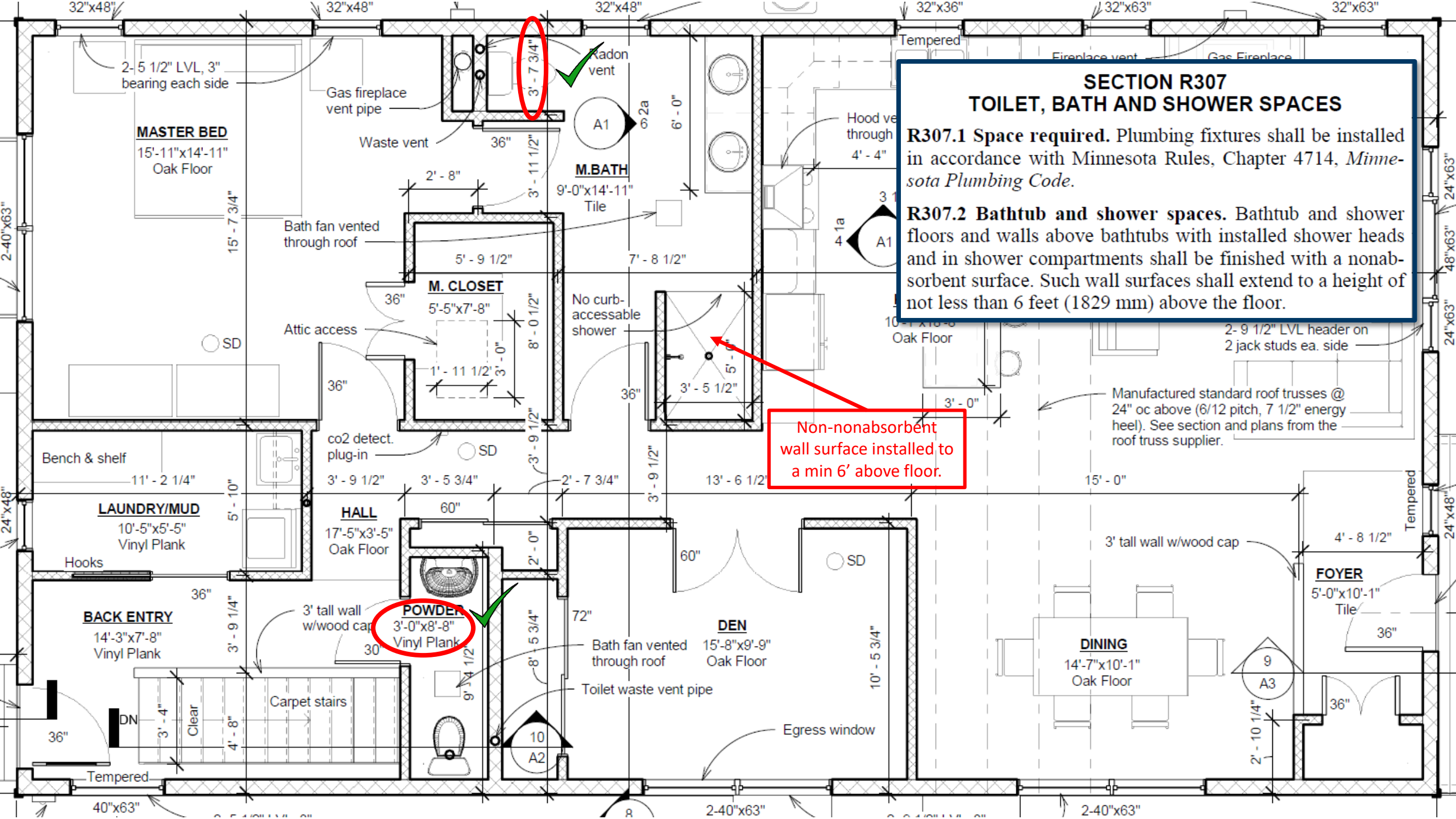

SECTION R307
TOILET, BATH AND SHOWER SPACES
R307.1 Space required. Plumbing fixtures shall be installed in accordance with Minnesota Rules, Chapter 4714, Minnesota Plumbing Code.
R307.2 Bathtub and shower spaces. Bathtub and shower floors and walls above bathtubs with installed shower heads and in shower compartments shall be finished with a nonabsorbent surface. Such wall surfaces shall extend to a height of not less than 6 feet (1829 mm) above the floor.
Non-nonabsorbent wall surface installed to a min 6' above floor.
MASTER BED
15'-11"x14'-11"
Oak Floor
M.BATH
9'-0"x14'-11"
Tile
M. CLOSET
5'-5"x7'-8"
LAUNDRY/MUD
10'-5"x5'-5"
Vinyl Plank
HALL
17'-5"x3'-5"
Oak Floor
POWDER
3'-0"x8'-8"
Vinyl Plank
BACK ENTRY
14'-3"x7'-8"
Vinyl Plank
DEN
15'-8"x9'-9"
Oak Floor
DINING
14'-7"x10'-1"
Oak Floor
FOYER
5'-0"x10'-1"
Tile
2- 5 1/2" LVL, 3" bearing each side
Gas fireplace vent pipe
Waste vent
Radon vent
Bath fan vented through roof
Attic access
No curb-accessable shower
Bench & shelf
Hooks
co2 detect. plug-in
3' tall wall w/wood cap
Carpet stairs
Toilet waste vent pipe
Egress window
Hood vent through
Fireplace vent
Gas Fireplace
2- 9 1/2" LVL header on 2 jack studs ea. side
Manufactured standard roof trusses @ 24" oc above (6/12 pitch, 7 1/2" energy heel). See section and plans from the roof truss supplier.
3' tall wall w/wood cap
Tempered
Clear
DN
SD

https://www.decoist.com/bathroom-side-tables-stools/?chrome=1

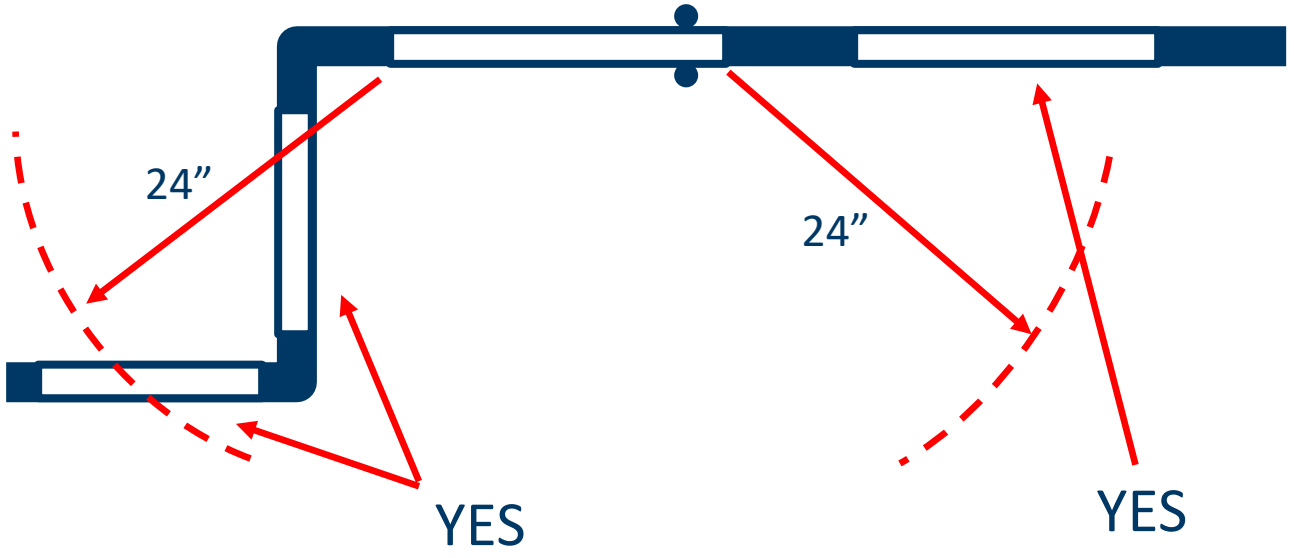
Glazing

R308.4.2 Glazing adjacent to doors. Glazing in an individual fixed or operable panel adjacent to a door shall be considered to be a hazardous location where the bottom exposed edge of the glazing is less than 60 inches (1524 mm) above the floor or walking surface and it meets either of the following conditions:

1. Where the glazing is within 24 inches (610 mm) of either side of the door in the plane of the door in a closed position.
2. Where the glazing is on a wall less than 180 degrees (3.14 rad) from the plane of the door in a closed position and within 24 inches (610 mm) of the hinge side of an in-swinging door.

Exceptions:

1. Decorative glazing.
2. Where there is an intervening wall or other permanent barrier between the door and the glazing.
3. Where access through the door is to a closet or storage area 3 feet (914 mm) or less in depth. Glazing in this application shall comply with Section R308.4.3.
4. Glazing that is adjacent to the fixed panel of patio doors.



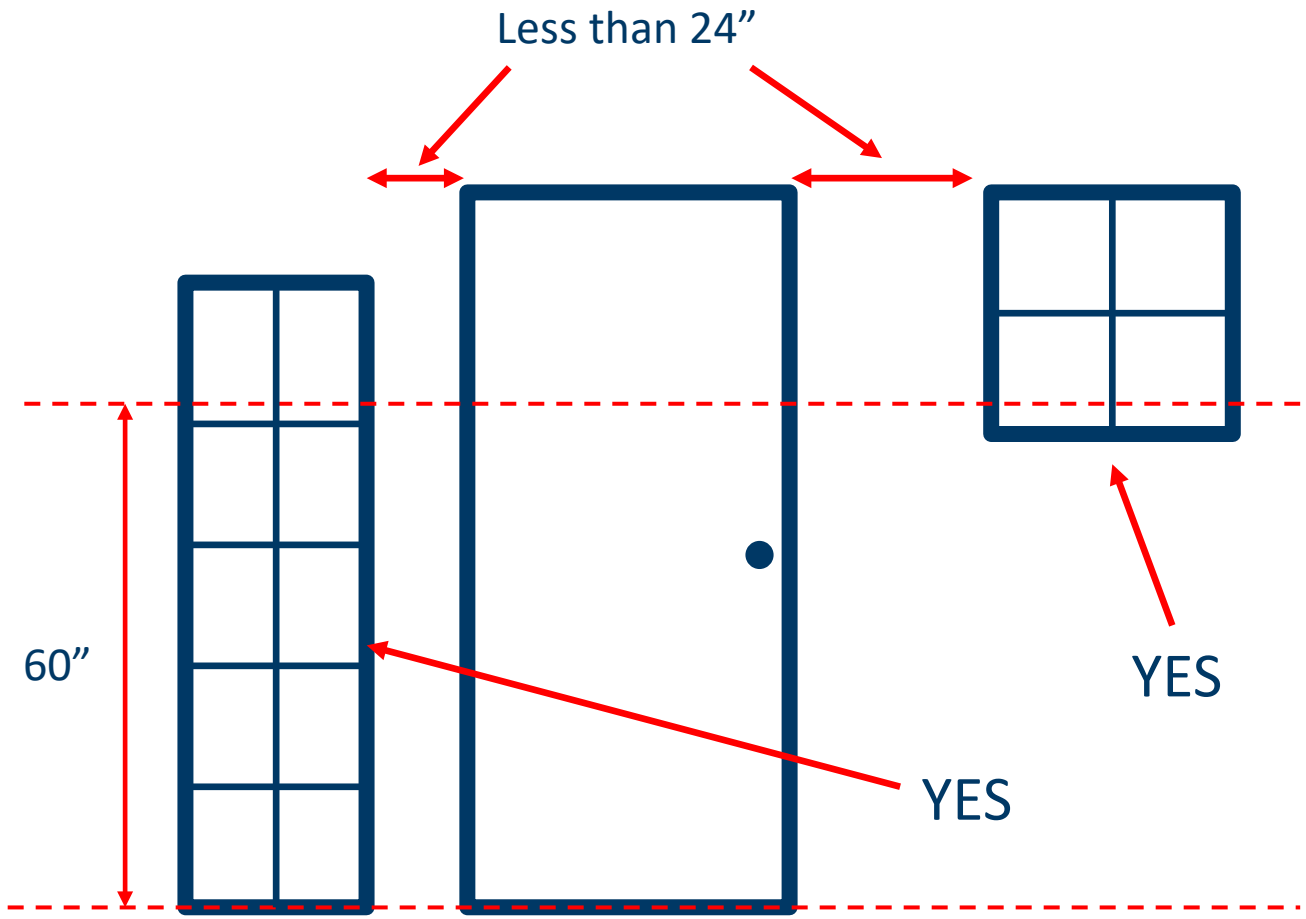
Safety glazing required?

R308.4.2 Glazing adjacent to doors. Glazing in an individual fixed or operable panel adjacent to a door shall be considered to be a hazardous location where the bottom exposed edge of the glazing is less than 60 inches (1524 mm) above the floor or walking surface and it meets either of the following conditions:

1. Where the glazing is within 24 inches (610 mm) of either side of the door in the plane of the door in a closed position.
2. Where the glazing is on a wall less than 180 degrees (3.14 rad) from the plane of the door in a closed position and within 24 inches (610 mm) of the hinge side of an in-swinging door.

Exceptions:

1. Decorative glazing.
2. Where there is an intervening wall or other permanent barrier between the door and the glazing.
3. Where access through the door is to a closet or storage area 3 feet (914 mm) or less in depth. Glazing in this application shall comply with Section R308.4.3.
4. Glazing that is adjacent to the fixed panel of patio doors.



Safety glazing required?

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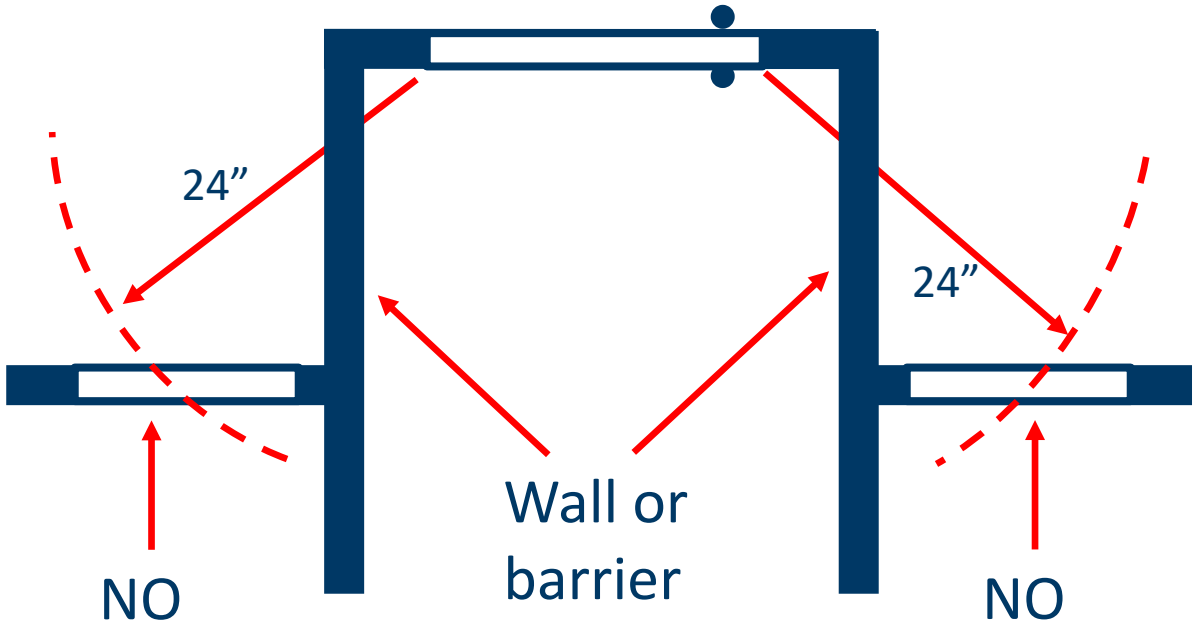
1. Where the glazing is within 24 inches (610 mm) of either side of the door in the plane of the door in a closed position.
2. Where the glazing is on a wall less than 180 degrees (3.14 rad) from the plane of the door in a closed position and within 24 inches (610 mm) of the hinge side of an in-swinging door.

Exceptions:

1. Decorative glazing.
2. Where there is an intervening wall or other permanent barrier between the door and the glazing.
3. Where access through the door is to a closet or storage area 3 feet (914 mm) or less in depth. Glazing in this application shall comply with Section R308.4.3.
4. Glazing that is adjacent to the fixed panel of patio doors.



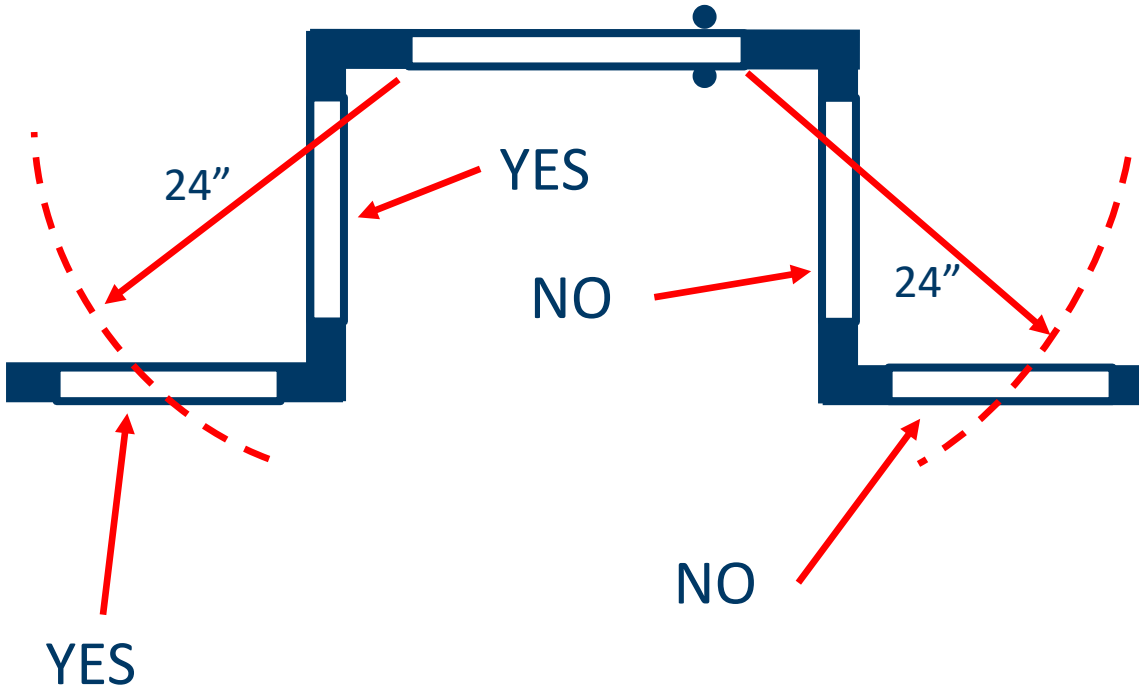
Safety glazing required?

R308.4.2 Glazing adjacent to doors. Glazing in an individual fixed or operable panel adjacent to a door shall be considered to be a hazardous location where the bottom exposed edge of the glazing is less than 60 inches (1524 mm) above the floor or walking surface and it meets either of the following conditions:

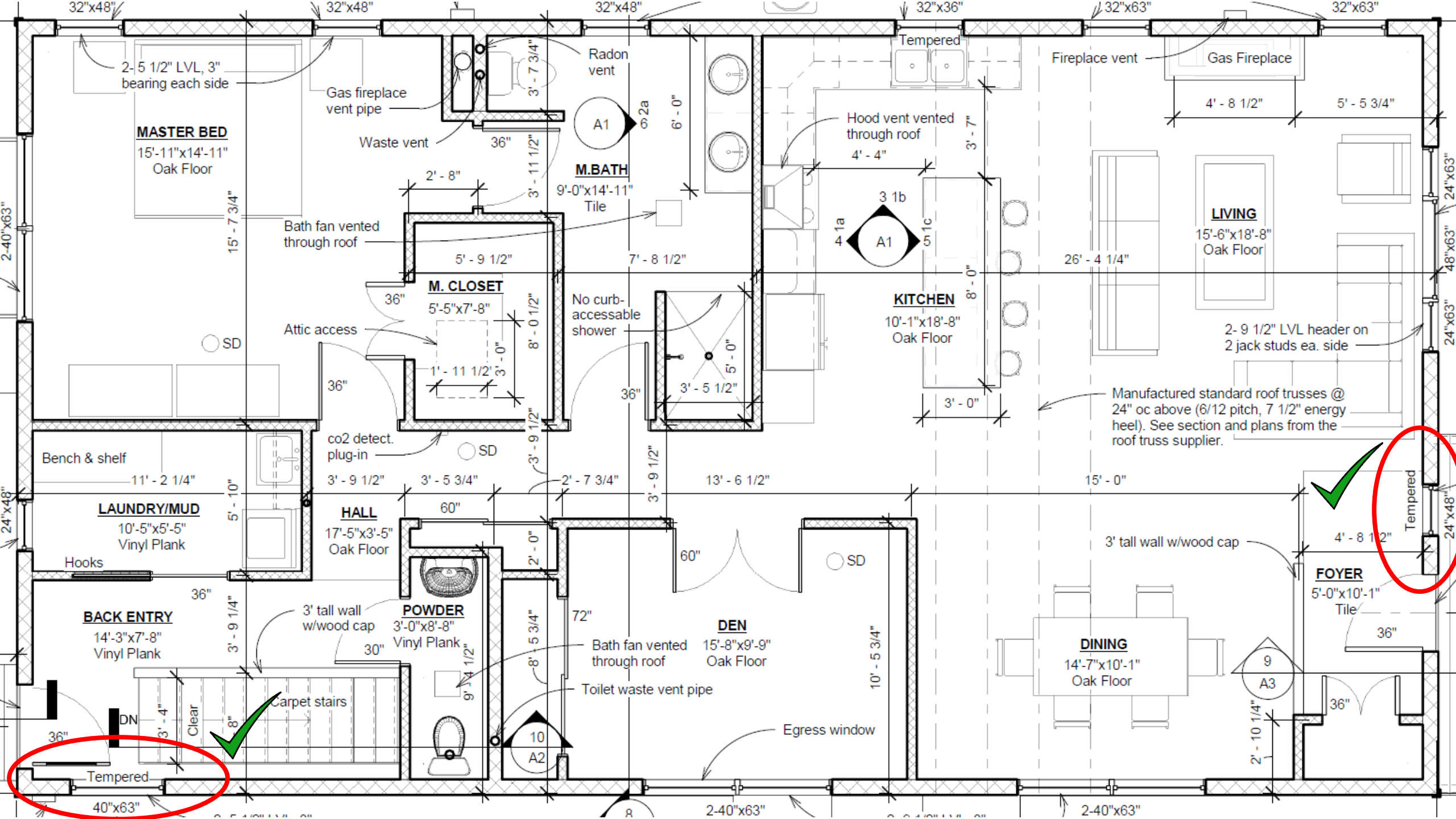
1. Where the glazing is within 24 inches (610 mm) of either side of the door in the plane of the door in a closed position.
2. Where the glazing is on a wall less than 180 degrees (3.14 rad) from the plane of the door in a closed position and within 24 inches (610 mm) of the hinge side of an in-swinging door.

Exceptions:

1. Decorative glazing.
2. Where there is an intervening wall or other permanent barrier between the door and the glazing.
3. Where access through the door is to a closet or storage area 3 feet (914 mm) or less in depth. Glazing in this application shall comply with Section R308.4.3.
4. Glazing that is adjacent to the fixed panel of patio doors.



Safety glazing required?

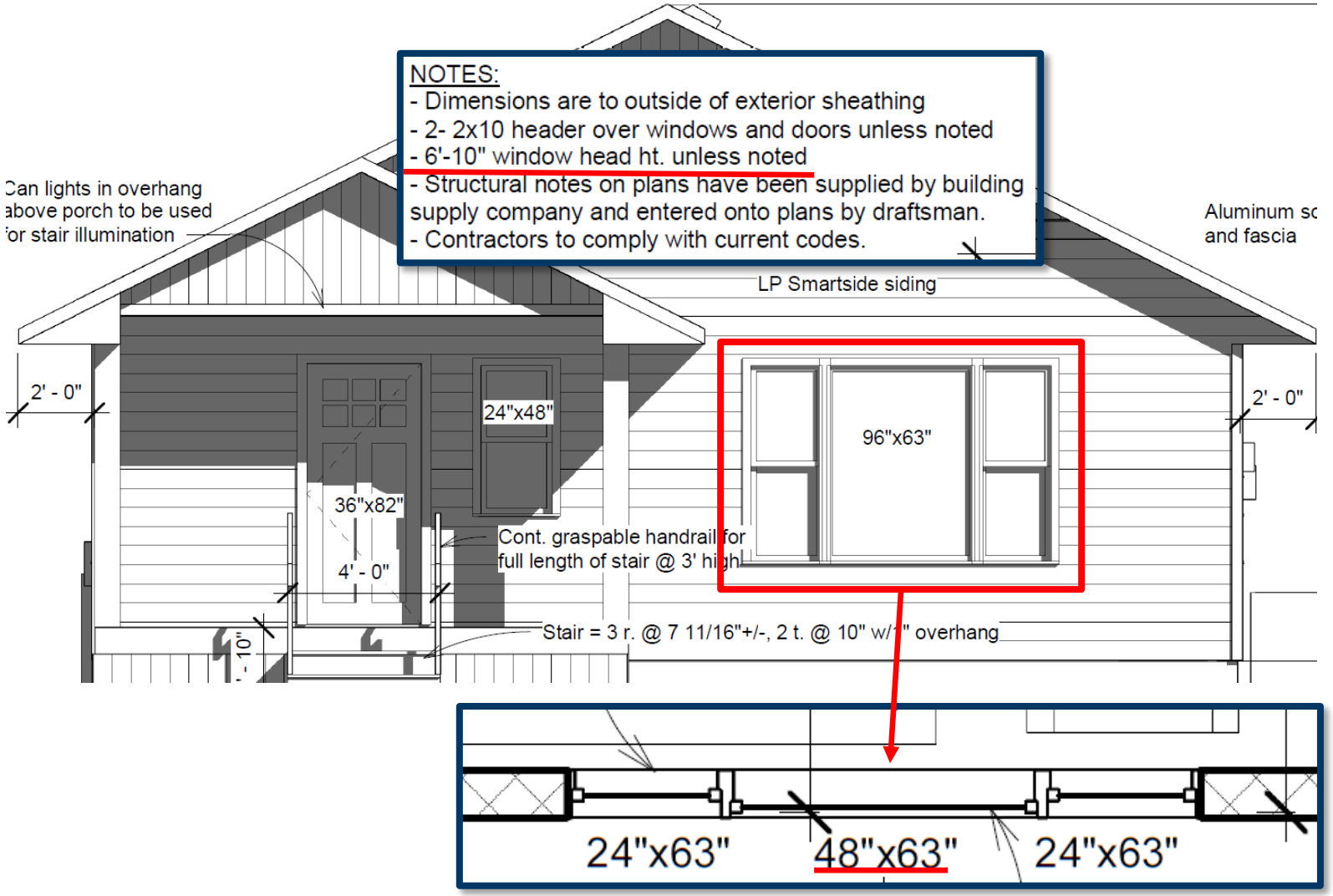

32"x48"
32"x48"
32"x48"
32"x36"
32"x63"
32"x63"
2- 5 1/2" LVL, 3" bearing each side
Gas fireplace vent pipe
Radon vent
Waste vent
36"
3' - 7 3/4"
3' - 11 1/2"
A1
6
2a
6' - 0"
MASTER BED
15'-11"x14'-11"
Oak Floor
15' - 7 3/4"
2' - 8"
M.BATH
9'-0"x14'-11"
Tile
Bath fan vented through roof
5' - 9 1/2"
7' - 8 1/2"
M. CLOSET
5'-5"x7'-8"
36"
8' - 0 1/2"
3' - 0"
1' - 11 1/2"
Attic access
SD
36"
No curb-accessable shower
5' - 0"
3' - 5 1/2"
36"
3' - 9 1/2"
co2 detect. plug-in
SD
Bench & shelf
11' - 2 1/4"
3' - 9 1/2"
3' - 5 3/4"
2' - 7 3/4"
13' - 6 1/2"
15' - 0"
LAUNDRY/MUD
10'-5"x5'-5"
Vinyl Plank
5' - 10"
HALL
17'-5"x3'-5"
Oak Floor
60"
2' - 0"
Hooks
36"
3' - 9 1/4"
BACK ENTRY
14'-3"x7'-8"
Vinyl Plank
3' tall wall w/wood cap
POWDER
3'-0"x8'-8"
Vinyl Plank
30"
9' - 4 1/2"
72"
8' - 5 3/4"
DEN
15'-8"x9'-9"
Oak Floor
Bath fan vented through roof
Toilet waste vent pipe
10' - 5 3/4"
60"
SD
Egress window
10
A2
DN
3' - 4"
Clear
8"
Carpet stairs
36"
Tempered
40"x63"
2-40"x63"
2-40"x63"
Tempered
Hood vent vented through roof
4' - 4"
3' - 7"
3 1b
1a
4
A1
1c
5
KITCHEN
10'-1"x18'-8"
Oak Floor
8' - 0"
3' - 0"
26' - 4 1/4"
Fireplace vent
Gas Fireplace
4' - 8 1/2"
5' - 5 3/4"
LIVING
15'-6"x18'-8"
Oak Floor
2- 9 1/2" LVL header on 2 jack studs ea. side
Manufactured standard roof trusses @ 24" oc above (6/12 pitch, 7 1/2" energy heel). See section and plans from the roof truss supplier.
3' tall wall w/wood cap
FOYER
5'-0"x10'-1"
Tile
4' - 8 1/2"
Tempered
36"
DINING
14'-7"x10'-1"
Oak Floor
9
A3
2' - 10 1/4"
36"
2-40"x63"
48"x63"
24"x63"
24"x63"
24"x48"
24"x48"

R308.4.3 Glazing in windows. Glazing in an individual fixed or operable panel that meets all of the following conditions shall be considered to be a hazardous location:

1. The exposed area of an individual pane is larger than 9 square feet (0.836 m^2).
2. The bottom edge of the glazing is less than 18 inches (457 mm) above the floor.
3. The top edge of the glazing is more than 36 inches (914 mm) above the floor.
4. One or more walking surfaces are within 36 inches (914 mm), measured horizontally and in a straight line, of the glazing.

Exceptions:

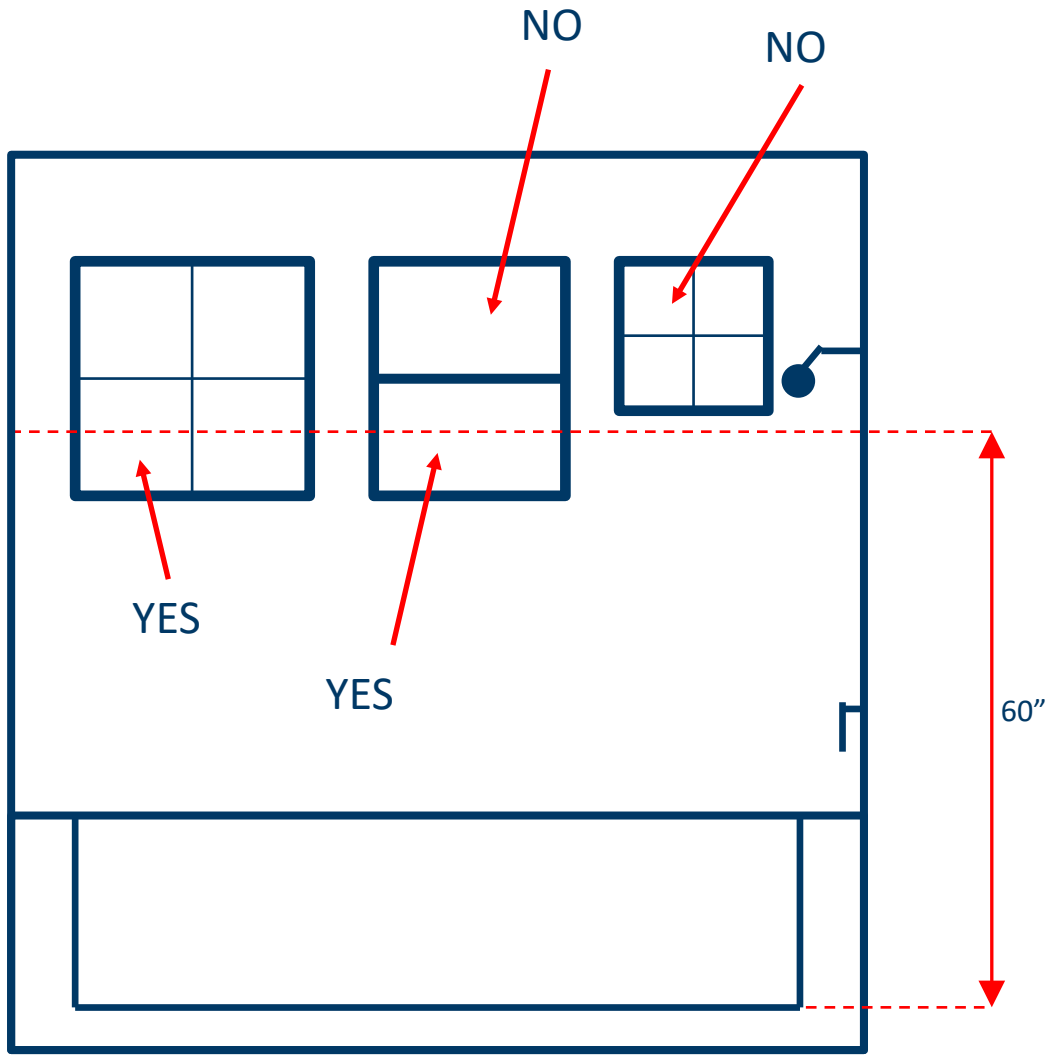
1. Decorative glazing.
2. Where glazing is adjacent to a walking surface and a horizontal rail is installed 34 to 38 inches (864 to 965 mm) above the walking surface. The rail shall be capable of withstanding a horizontal load of 50 pounds per linear foot (730 N/m) without contacting the glass and have a cross-sectional height of not less than $1^1/_2$ inches (38 mm).
3. Outboard panes in insulating glass units and other multiple glazed panels where the bottom edge of the glass is 25 feet (7620 mm) or more above *grade*, a roof, walking surfaces or other horizontal [within 45 degrees (0.79 rad) of horizontal] surface adjacent to the glass exterior.



- #1. 4 x 5 = 20sf Yes
- #2. 82" – 63" = 19" (Approximately) Maybe…?
- #3. Yes
- #4. Yes
- Must be Tempered? Maybe – contingent on criteria #2.

R308.4.5 Glazing and wet surfaces. Glazing in walls, enclosures or fences containing or facing hot tubs, spas, whirlpools, saunas, steam rooms, bathtubs, showers and indoor or outdoor swimming pools where the bottom exposed edge of the glazing is less than 60 inches (1524 mm) measured vertically above any standing or walking surface shall be considered to be a hazardous location. This shall apply to single glazing and each pane in multiple glazing.

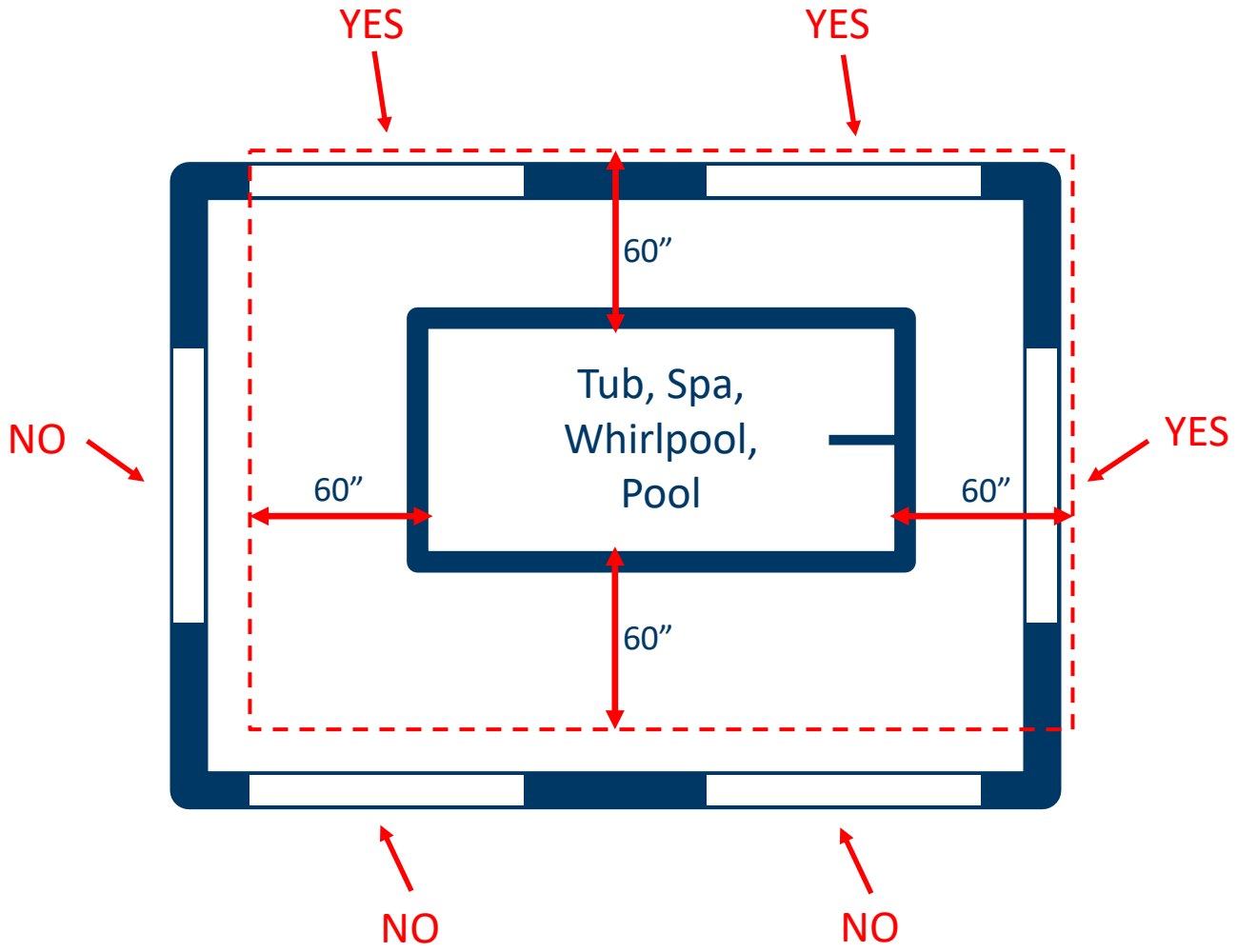
Exception: Glazing that is more than 60 inches (1524 mm), measured horizontally and in a straight line, from the water's edge of a bathtub, hot tub, spa, whirlpool or swimming pool or from the edge of a shower, sauna or steam room.



Safety glazing required?

R308.4.5 Glazing and wet surfaces. Glazing in walls, enclosures or fences containing or facing hot tubs, spas, whirlpools, saunas, steam rooms, bathtubs, showers and indoor or outdoor swimming pools where the bottom exposed edge of the glazing is less than 60 inches (1524 mm) measured vertically above any standing or walking surface shall be considered to be a hazardous location. This shall apply to single glazing and each pane in multiple glazing.

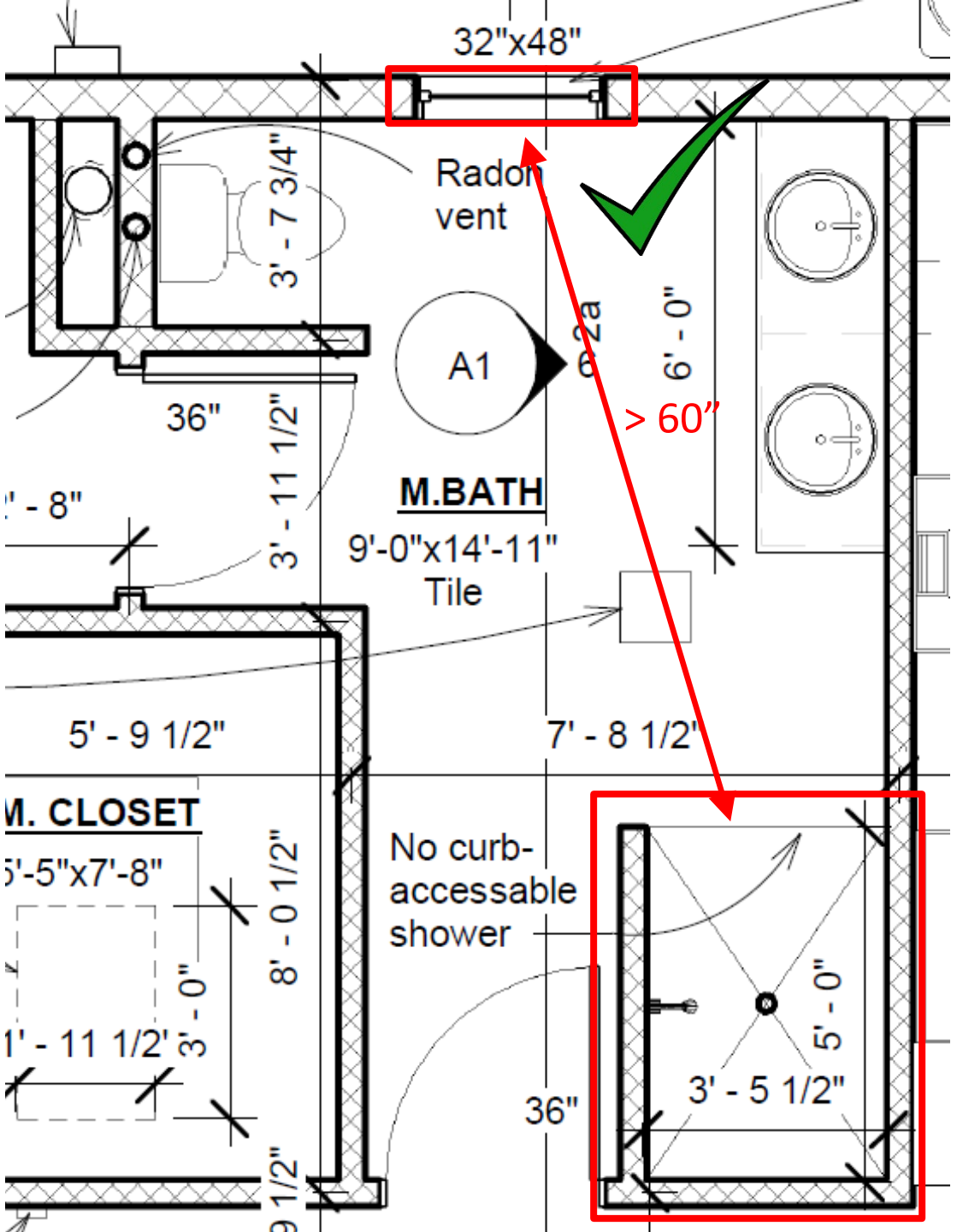
Exception: Glazing that is more than 60 inches (1524 mm), measured horizontally and in a straight line, from the water's edge of a bathtub, hot tub, spa, whirlpool or swimming pool or from the edge of a shower, sauna or steam room.

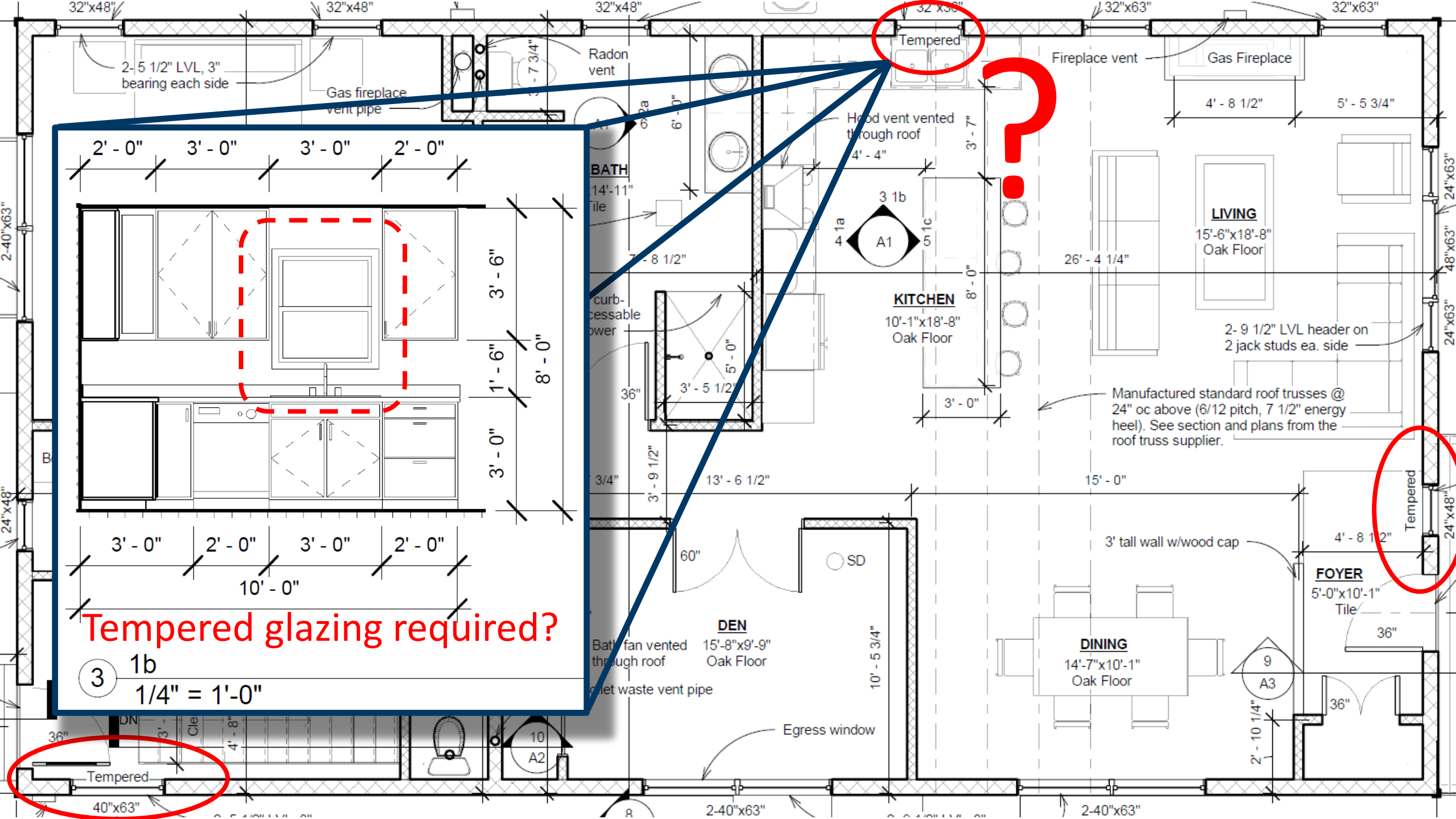


Safety glazing required?

R308.4.5 Glazing and wet surfaces. Glazing in walls, enclosures or fences containing or facing hot tubs, spas, whirlpools, saunas, steam rooms, bathtubs, showers and indoor or outdoor swimming pools where the bottom exposed edge of the glazing is less than 60 inches (1524 mm) measured vertically above any standing or walking surface shall be considered to be a hazardous location. This shall apply to single glazing and each pane in multiple glazing.

Exception: Glazing that is more than 60 inches (1524 mm), measured horizontally and in a straight line, from the water's edge of a bathtub, hot tub, spa, whirlpool or swimming pool or from the edge of a shower, sauna or steam room.




2' - 0"
3' - 0"
3' - 0"
2' - 0"
3' - 6"
1' - 6"
8' - 0"
3' - 0"
3' - 0"
2' - 0"
3' - 0"
2' - 0"
10' - 0"
Tempered glazing required?
3
1b
1/4" = 1'-0"
32"x48"
32"x48"
32"x48"
32"x63"
32"x63"
2- 5 1/2" LVL, 3" bearing each side
Gas fireplace vent pipe
Radon vent
Tempered
Fireplace vent
Gas Fireplace
4' - 8 1/2"
5' - 5 3/4"
Hood vent vented through roof
4' - 4"
3 1b
4
1a
A1
1c
5
BATH
14'-11"
Tile
curb-cessable shower
36"
3' - 5 1/2"
5' - 0"
KITCHEN
10'-1"x18'-8"
Oak Floor
26' - 4 1/4"
8' - 0"
3' - 7"
LIVING
15'-6"x18'-8"
Oak Floor
2- 9 1/2" LVL header on 2 jack studs ea. side
Manufactured standard roof trusses @ 24" oc above (6/12 pitch, 7 1/2" energy heel). See section and plans from the roof truss supplier.
3' - 0"
13' - 6 1/2"
15' - 0"
3' - 9 1/2"
60"
SD
DEN
15'-8"x9'-9"
Oak Floor
Bath fan vented through roof
toilet waste vent pipe
10' - 5 3/4"
DINING
14'-7"x10'-1"
Oak Floor
3' tall wall w/wood cap
FOYER
5'-0"x10'-1"
Tile
36"
9
A3
2' - 10 1/4"
Tempered
Egress window
10
A2
36"
Tempered
40"x63"
2-40"x63"
2-40"x63"
2-40"x63"
24"x63"
48"x63"
24"x48"

R308.4.6 Glazing adjacent to stairs and ramps. Glazing where the bottom exposed edge of the glazing is less than 36 inches (914 mm) above the plane of the adjacent walking surface of stairways, landings between flights of stairs and ramps shall be considered to be a hazardous location.

Exceptions:

1. Where glazing is adjacent to a walking surface and a horizontal rail is installed at 34 to 38 inches (864 to 965 mm) above the walking surface. The rail shall be capable of withstanding a horizontal load of 50 pounds per linear foot (730 N/m) without contacting the glass and have a cross-sectional height of not less than $1^1/_2$ inches (38 mm).
2. Glazing 36 inches (914 mm) or more measured horizontally from the walking surface.

R308.4.7 Glazing adjacent to the bottom stair landing. Glazing adjacent to the landing at the bottom of a stairway where the glazing is less than 36 inches (914 mm) above the landing and within a 60-inch (1524 mm) horizontal arc less than 180 degrees (3.14 rad) from the bottom tread nosing shall be considered to be a hazardous location. (See Figure R308.4.7.)

Exception: Where the glazing is protected by a *guard* complying with Section R312 and the plane of the glass is more than 18 inches (457 mm) from the *guard*.

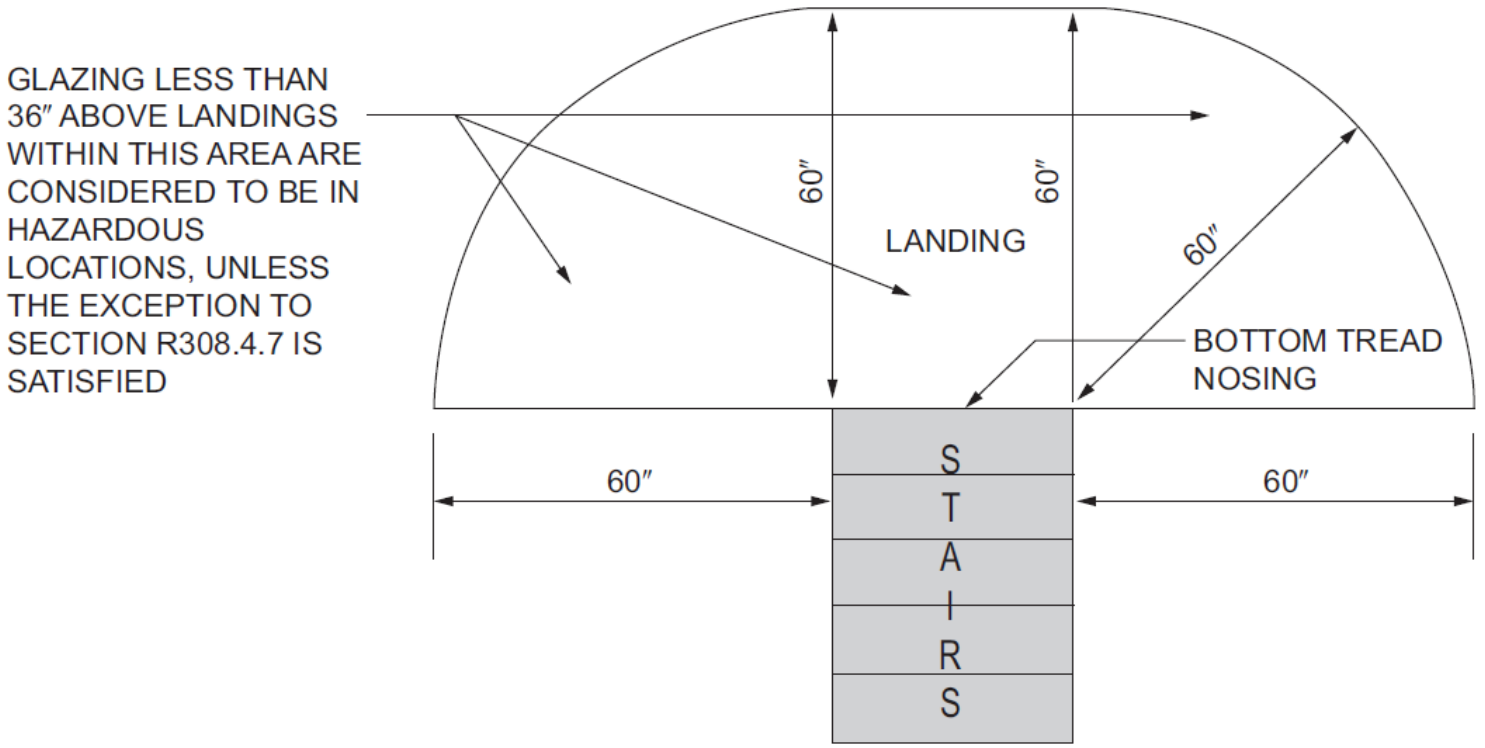
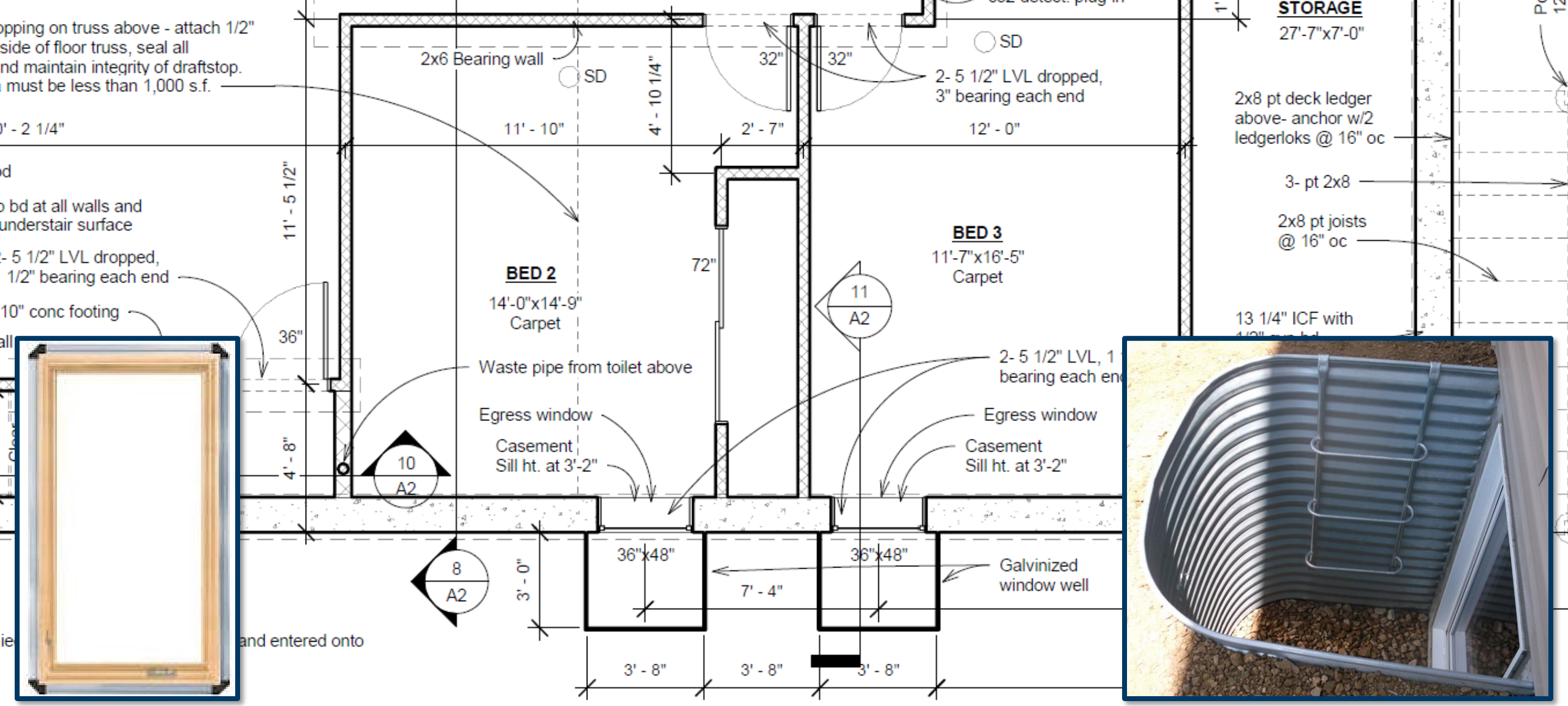


FIGURE R308.4.7
HAZARDOUS GLAZING LOCATIONS AT BOTTOM STAIR LANDINGS

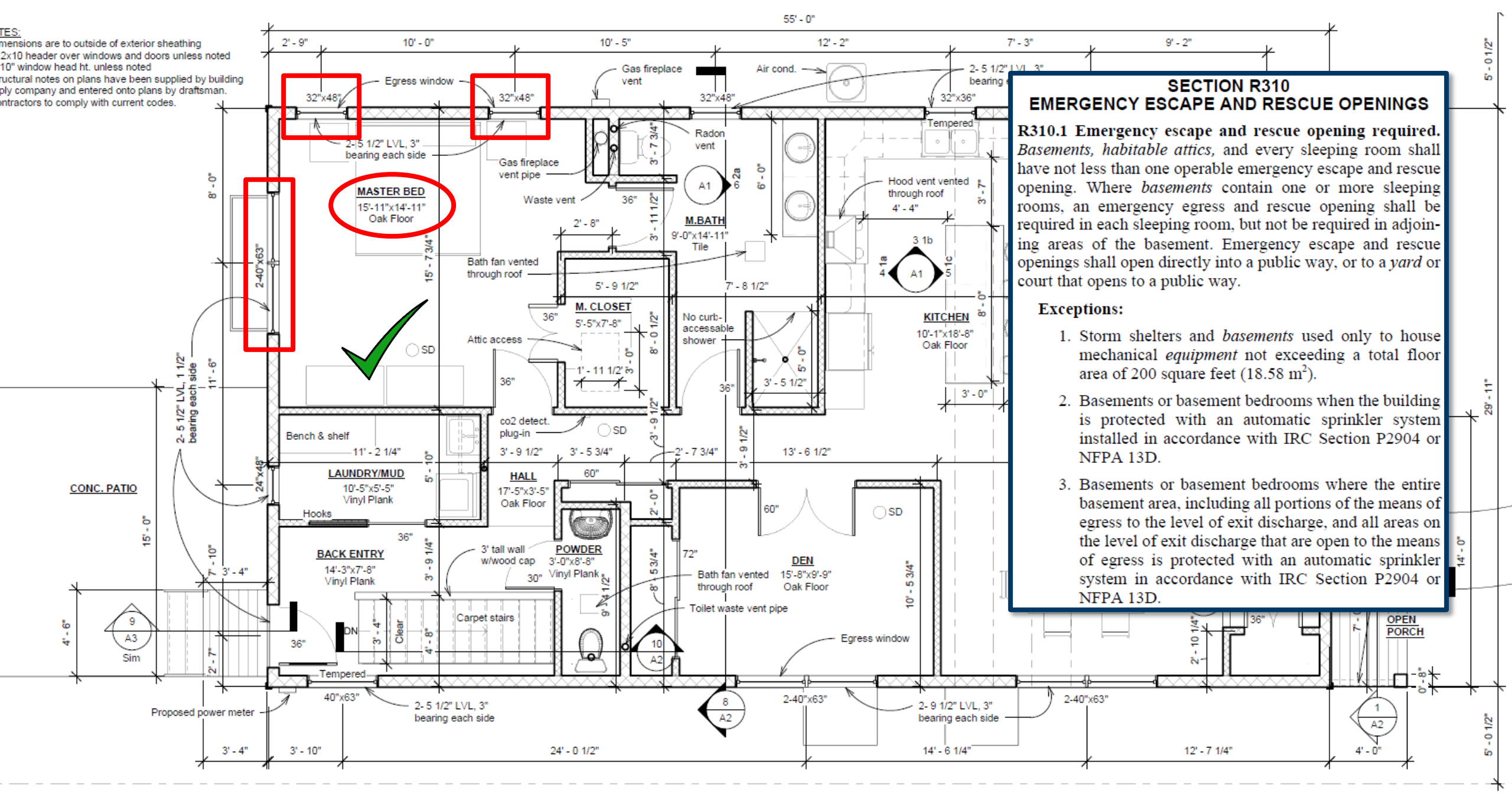


https://www.lowes.com

https://windowwellcovers.com/shop/ladders/window-well-egress-ladder/

Emergency Escape & Rescue Openings

TES:
mensions are to outside of exterior sheathing
2x10 header over windows and doors unless noted
10" window head ht. unless noted
ructural notes on plans have been supplied by building
ply company and entered onto plans by draftsman.
ontractors to comply with current codes.



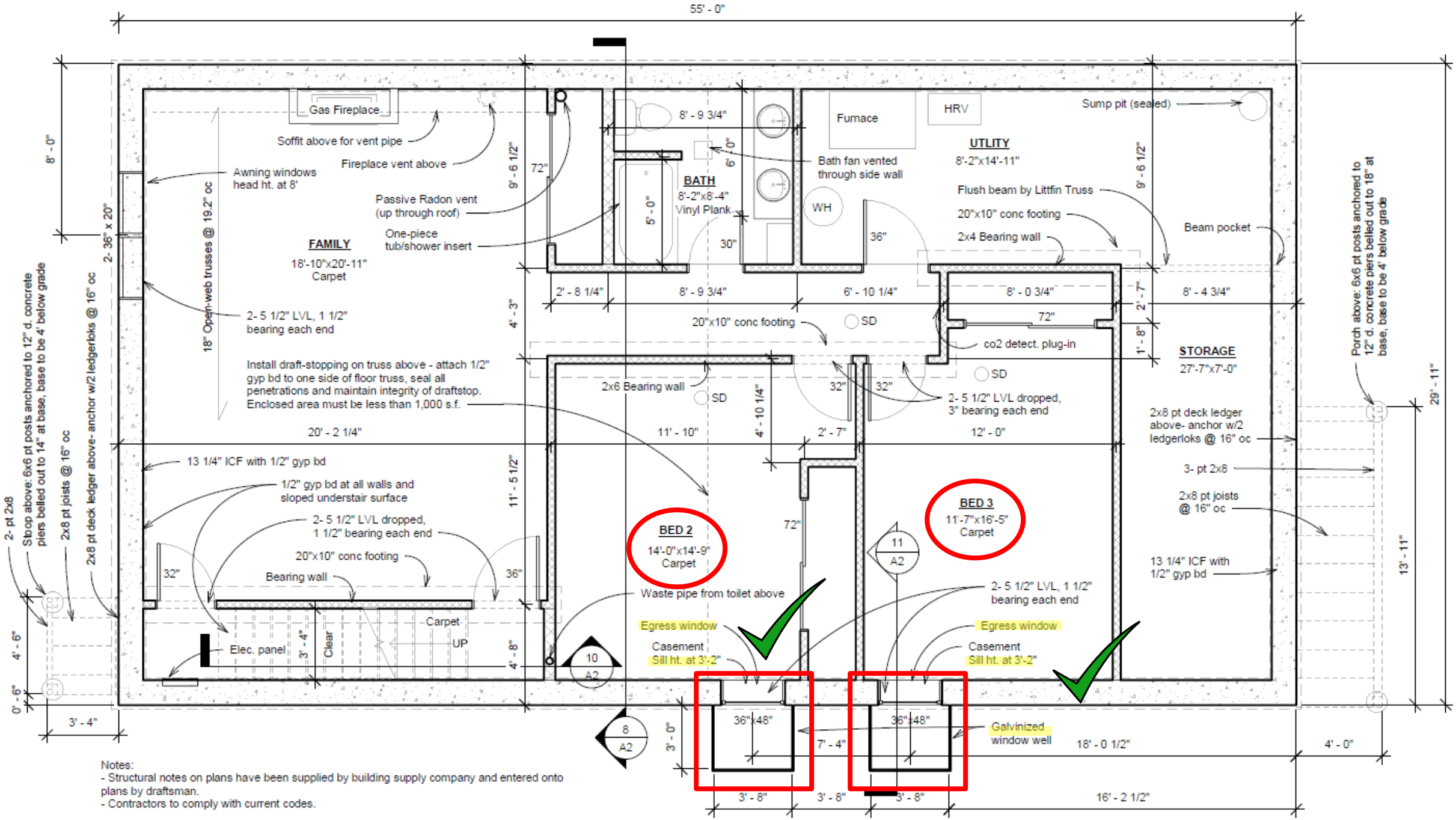
SECTION R310
EMERGENCY ESCAPE AND RESCUE OPENINGS

R310.1 Emergency escape and rescue opening required. *Basements, habitable attics,* and every sleeping room shall have not less than one operable emergency escape and rescue opening. Where *basements* contain one or more sleeping rooms, an emergency egress and rescue opening shall be required in each sleeping room, but not be required in adjoining areas of the basement. Emergency escape and rescue openings shall open directly into a public way, or to a *yard* or court that opens to a public way.

Exceptions:

1. Storm shelters and *basements* used only to house mechanical *equipment* not exceeding a total floor area of 200 square feet (18.58 m^2).
2. Basements or basement bedrooms when the building is protected with an automatic sprinkler system installed in accordance with IRC Section P2904 or NFPA 13D.
3. Basements or basement bedrooms where the entire basement area, including all portions of the means of egress to the level of exit discharge, and all areas on the level of exit discharge that are open to the means of egress is protected with an automatic sprinkler system in accordance with IRC Section P2904 or NFPA 13D.

② Main Level
1/4" = 1'-0"



Notes:
- Structural notes on plans have been supplied by building supply company and entered onto plans by draftsman.
- Contractors to comply with current codes.

1 Lower Level
1/4" = 1'-0"

R309.2 Carports. Carports shall be open on at least two sides. Carport floor surfaces may be concrete, asphalt, sand, gravel, crushed rock, or natural earth. Carports not open on at least two sides shall be considered a garage and shall comply with the provisions of this section for garages.

R309.3 Flood hazard areas. See Minnesota Rules, Chapter 1335.

R309.4 Automatic garage door opening systems. All automatic garage door opening systems that are installed, serviced, or repaired for garages serving residential buildings shall comply with the provisions of Minnesota Statutes, Sections 325F.82 and 325F.83.

R309.5 Fire sprinklers. Attached garages of two-family dwellings and townhouses shall be protected by fire sprinklers and installed in compliance with Section R313.3.

SECTION R310
EMERGENCY ESCAPE AND RESCUE OPENINGS

R310.1 Emergency escape and rescue opening required. *Basements, habitable attics,* and every sleeping room shall have not less than one operable emergency escape and rescue opening. Where *basements* contain one or more sleeping rooms, an emergency egress and rescue opening shall be required in each sleeping room, but not be required in adjoining areas of the basement. Emergency escape and rescue openings shall open directly into a public way, or to a *yard* or court that opens to a public way.

Exceptions:

1. Storm shelters and *basements* used only to house mechanical *equipment* not exceeding a total floor area of 200 square feet (18.58 m^2).
2. Basements or basement bedrooms when the building is protected with an automatic sprinkler system installed in accordance with IRC Section P2904 or NFPA 13D.
3. Basements or basement bedrooms where the entire basement area, including all portions of the means of egress to the level of exit discharge, and all areas on the level of exit discharge that are open to the means of egress is protected with an automatic sprinkler system in accordance with IRC Section P2904 or NFPA 13D.

R310.1.1 Operational constraints and opening control devices. Emergency escape and rescue openings shall be operational from the inside of the room without the use of keys, tools or special knowledge. Window opening control devices on windows serving as a required emergency escape and rescue opening shall comply with ASTM F2090.

R310.2 Emergency escape and rescue openings. Emergency escape and rescue openings shall have minimum dimensions as specified in this section.

R310.2.1 Minimum opening area. Emergency and escape rescue openings shall have a net clear opening of not less than 5.7 square feet (0.530 m^2). The net clear opening dimensions required by this section shall be obtained by the normal operation of the emergency escape and rescue opening from the inside. The net clear height of the opening shall be not less than 24 inches (610 mm) and the net clear width shall be not less than 20 inches (508 mm).

Exception: *Grade floor openings* or *below-grade openings* shall have a net clear opening area of not less than 5 square feet (0.465 m^2).

R310.2.2 Window sill height. Where a window is provided as the emergency escape and rescue opening, it shall have a sill height of not more than 44 inches (1118 mm) above the floor; where the sill height is below *grade*, it shall be provided with a window well in accordance with Section R310.2.3.

R310.2.3 Window wells. The horizontal area of the window well shall be not less than 9 square feet (0.9 m^2), with a horizontal projection and width of not less than 36 inches (914 mm). The area of the window well shall allow the emergency escape and rescue opening to be fully opened.

Exception: The ladder or steps required by Section R310.2.3.1 shall be permitted to encroach not more than 6 inches (152 mm) into the required dimensions of the window well.

R310.2.3.1 Ladder and steps. Window wells with a vertical depth greater than 44 inches (1118 mm) shall be equipped with a permanently affixed ladder or steps usable with the window in the fully open position. Ladders or steps required by this section shall not be required to comply with Section R311.7. Ladders or rungs shall have an inside width of not less than 12 inches (305 mm), shall project not less than 3 inches (76 mm) from the wall and shall be spaced not more than 18 inches (457 mm) on center vertically for the full height of the window well.

R310.2.3.2 Drainage. Window wells shall be designed for proper drainage by connecting to the building's foundation drainage system required by Section R405.1 or by an approved alternative method.

Exception: A drainage system for window wells is not required where the foundation is on well-drained soil or sand-gravel mixture soils in accordance with the United Soil Classification System, Group I Soils, as detailed in Table R405.1.

R310.2.4 Emergency escape and rescue openings under decks and porches. Emergency escape and rescue openings installed under decks and porches shall be fully openable and provide a path not less than 36 inches (914 mm) in height to a *yard* or court.

R310.2.5 Replacement windows. Replacement windows installed in buildings meeting the scope of this code shall be exempt from the maximum sill height requirements of Section R310.2.2 and the requirements of Section R310.2.1, provided that the replacement window meets the following conditions:

1. The replacement window is the manufacturer's largest standard size window that will fit within the existing frame or existing rough opening. The replacement window is of the same operating style as the existing window or a style that provides for an equal or greater window opening area than the existing window.
2. The replacement window is not part of a change of occupancy.

R310.2.5.1 Licensed facilities. Windows in rooms used for foster care or day care licensed or registered by the state of Minnesota shall comply with the provisions of Section R310.2.5, or all of the following conditions, whichever is more restrictive:

1. Minimum of 20 inches (508 mm) in clear opening width;
2. Minimum of 20 inches (508 mm) in clear opening height;
3. Minimum of 648 square inches (4.5 square feet) clear opening; and
4. Maximum of 48 inches (1219 mm) from the floor to the sill height.

R310.3 Emergency escape and rescue doors. Where a door is provided as the required emergency escape and rescue opening, it shall be a side-hinged door or a slider. Where the opening is below the adjacent grade, it shall be provided with an area well.

R310.3.1 Minimum door opening size. The minimum net clear height opening for any door that serves as an emergency and escape rescue opening shall be in accordance with Section R310.2.1.

R310.3.2 Area wells. Area wells shall have a width of not less than 36 inches (914 mm). The area well shall be sized to allow the emergency escape and rescue door to be fully opened.

R310.3.2.1 Ladder and steps. Area wells with a vertical depth greater than 44 inches (1118 mm) shall be equipped with a permanently affixed ladder or steps usable with the door in the fully open position. Ladders or steps required by this section shall not be required to comply with Section R311.7. Ladders or rungs shall have an inside width of not less than 12 inches (305 mm), shall project not less than 3 inches (76 mm) from the wall and shall be spaced not more than 18 inches (457 mm) on center vertically for the full height of the exterior stairwell.

R310.3.2.2 Drainage. Area wells shall be designed for proper drainage by connecting to the building's foundation drainage system required by Section R405.1 or by an *approved* alternative method.

Exception: A drainage system for area wells is not required where the foundation is on well-drained soil or sand-gravel mixture soils in accordance with the United Soil Classification System, Group I Soils, as detailed in Table R405.1.

R310.4 Bars, grilles, covers and screens. Where bars, grilles, covers, screens or similar devices are placed over emergency escape and rescue openings, area wells, or window wells, the minimum net clear opening size shall comply with Sections R310.2.1 through R310.2.3, and such devices shall be releasable or removable from the inside without the use of a key, tool, special knowledge or force greater than that required for the normal operation of the escape and rescue opening.

R310.5 Dwelling additions. Where *dwelling additions* contain sleeping rooms, an emergency escape and rescue opening shall be provided in each new sleeping room. Where *dwelling additions* have *basements*, an emergency escape and rescue opening shall be provided in the new *basement*.

Exceptions:

1. An emergency escape and rescue opening is not required in a new *basement* that contains a sleeping room with an emergency escape and rescue opening.
2. An emergency escape and rescue opening is not required in a new *basement* where there is an emergency escape and rescue opening in an existing *basement* that is *accessed* from the new *basement*.

R310.6 Alterations or repairs of existing basements. An emergency escape and rescue opening is not required where existing *basements* undergo alterations or repairs.

R310.6.1 Sleeping rooms in existing basements. New sleeping rooms created in an existing basement shall be provided with emergency escape and rescue openings in accordance with Section R310.1.

Exception: Emergency escape and rescue openings are not required to be provided where the entire basement area, including all portions of the means of egress to the level of exit discharge, and all areas on the level of exit discharge that are open to the means of egress are protected with an automatic sprinkler system in accordance with IRC Section P2904 or NFPA 13D.

SECTION R311
MEANS OF EGRESS

R311.1 Means of egress. *Dwellings* shall be provided with a means of egress in accordance with this section. The means of egress shall provide a continuous and unobstructed path of vertical and horizontal egress travel from all portions of the *dwelling* to the required egress door without requiring travel through a garage. The required egress door shall open directly into a public way or to a *yard* or court that opens to a public way.

R311.2 Egress door. Not less than one egress door shall be provided for each *dwelling* unit. The egress door shall be side-hinged, and shall provide a clear width of not less than 32 inches (813 mm) where measured between the face of the door and the stop, with the door open 90 degrees (1.57 rad). The clear height of the door opening shall be not less than 78 inches (1981 mm) in height measured from the top of the threshold to the bottom of the stop. Other doors shall not be required to comply with these minimum dimensions. Egress doors shall be readily openable from inside the *dwelling* without the use of a key or special knowledge or effort.

Means of Egress

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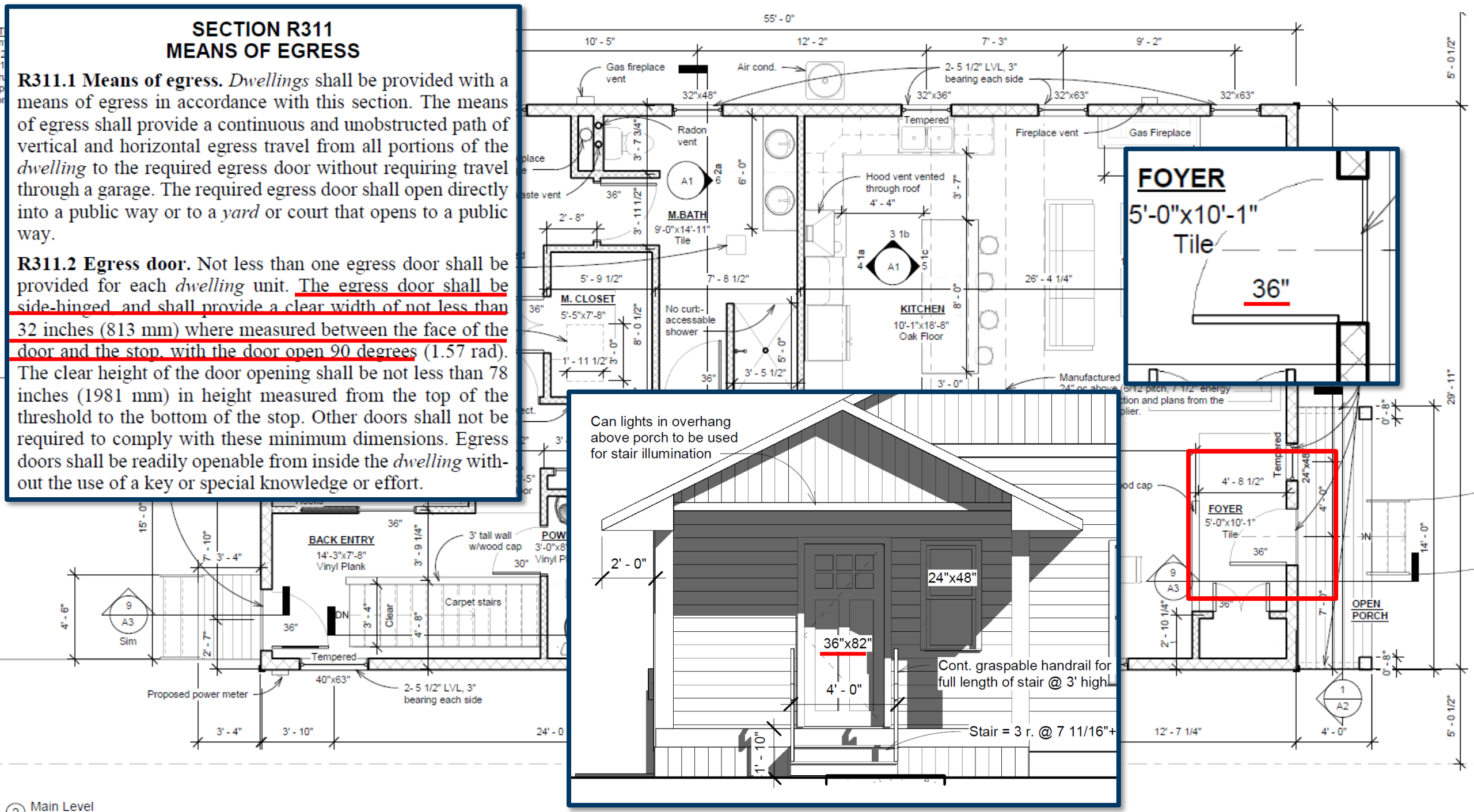
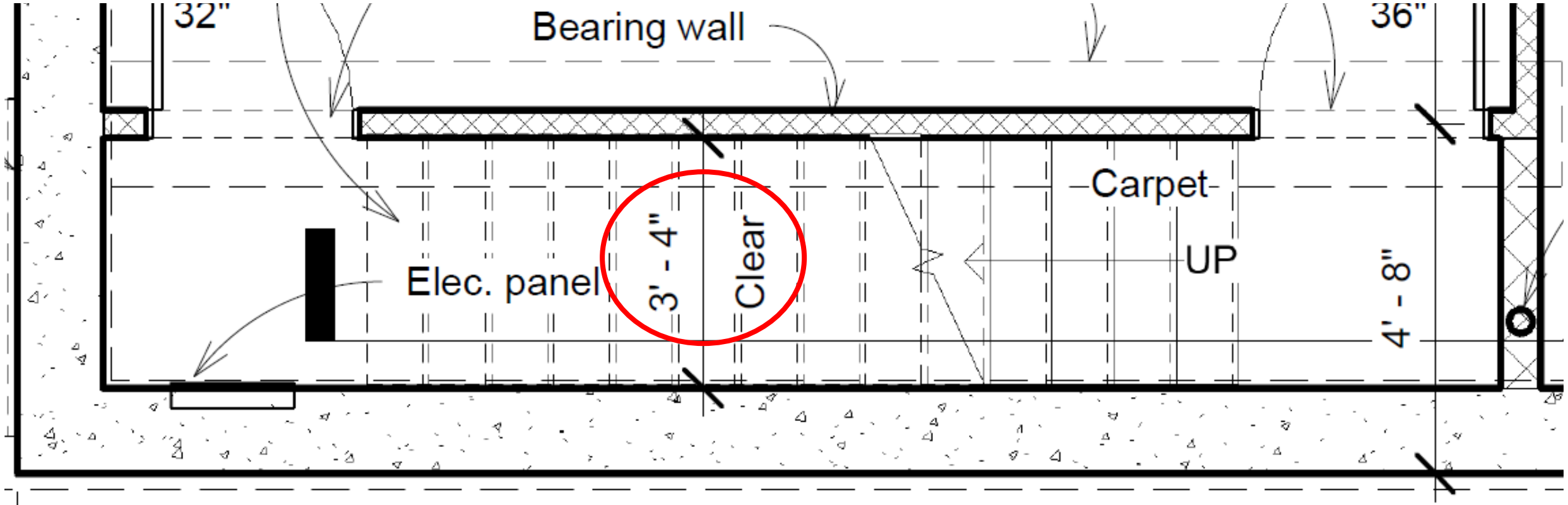


2 Main Level
1/4" = 1'-0"

R311.7.1.2 Width. Stairways shall be not less than 36 inches (914 mm) in clear width at all points above the permitted handrail height and below the required head-room height. Handrails shall not project more than 4.5 inches (114 mm) on either side of the stairway and the minimum clear width of the stairway at and below the handrail height, including treads and landings, shall be not less than $31^1/_2$ inches (787 mm) where a handrail is installed on one side and 27 inches (698 mm) where handrails are provided on both sides.

Exception: The width of spiral stairways shall be in accordance with Section R311.7.10.1.

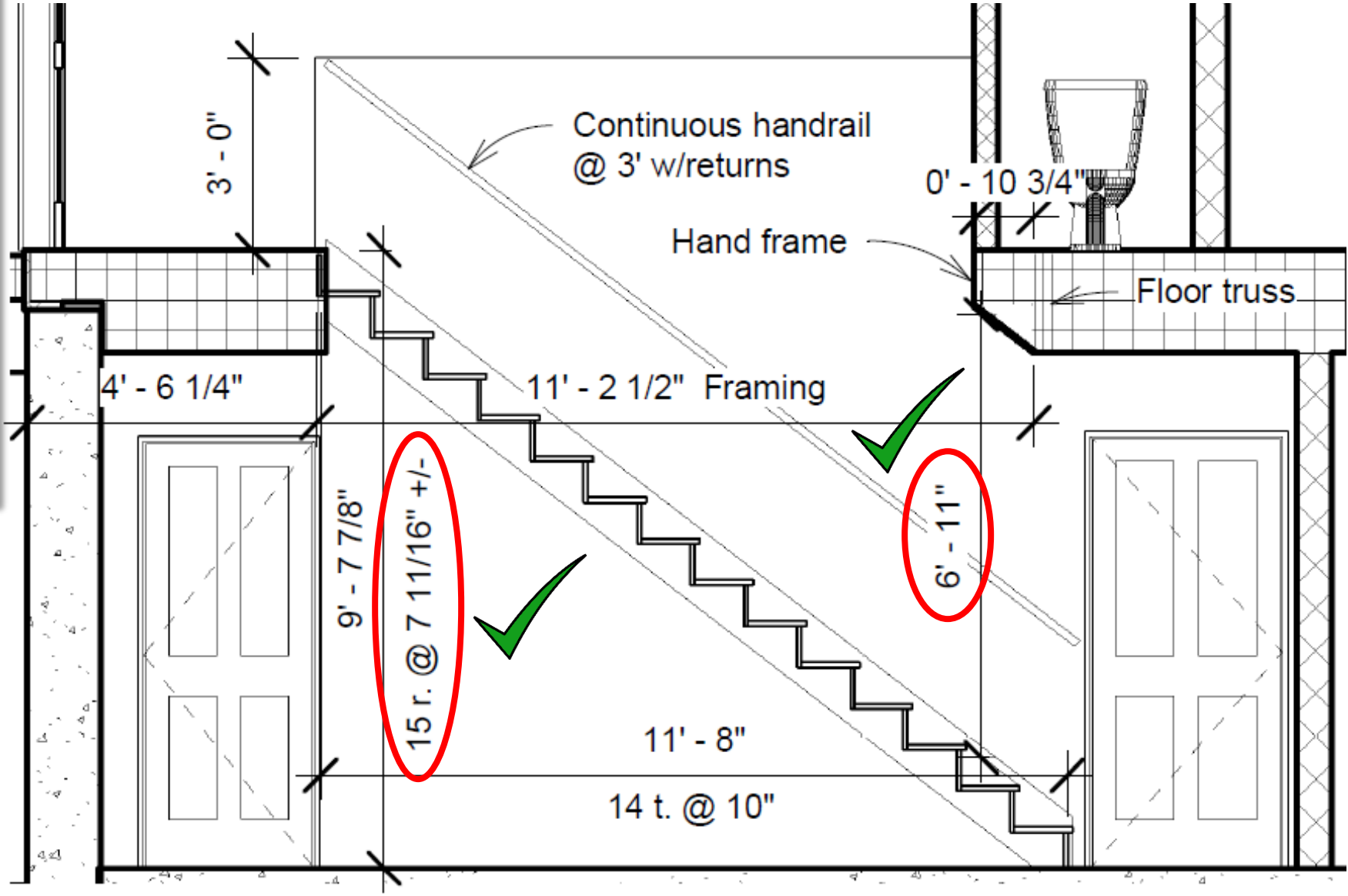


R311.7.2 Headroom. The minimum headroom in all parts of the stairway shall be not less than 6 feet 8 inches (2032 mm) measured vertically from the sloped line adjoining the tread nosing or from the floor surface of the landing or platform on that portion of the stairway.

Exceptions:

1. Where the nosings of treads at the side of a flight extend under the edge of a floor opening through which the stair passes, the floor opening shall be allowed to project horizontally into the required headroom a maximum of $4^{3}/_{4}$ inches (121 mm).
2. The minimum headroom for existing buildings shall be in accordance with Section R305.2.2.
3. The headroom for spiral stairways shall be in accordance with Section R311.7.10.1.

R311.7.3 Vertical rise. A flight of stairs shall not have a vertical rise larger than 151 inches (3835 mm) between floor levels or landings.



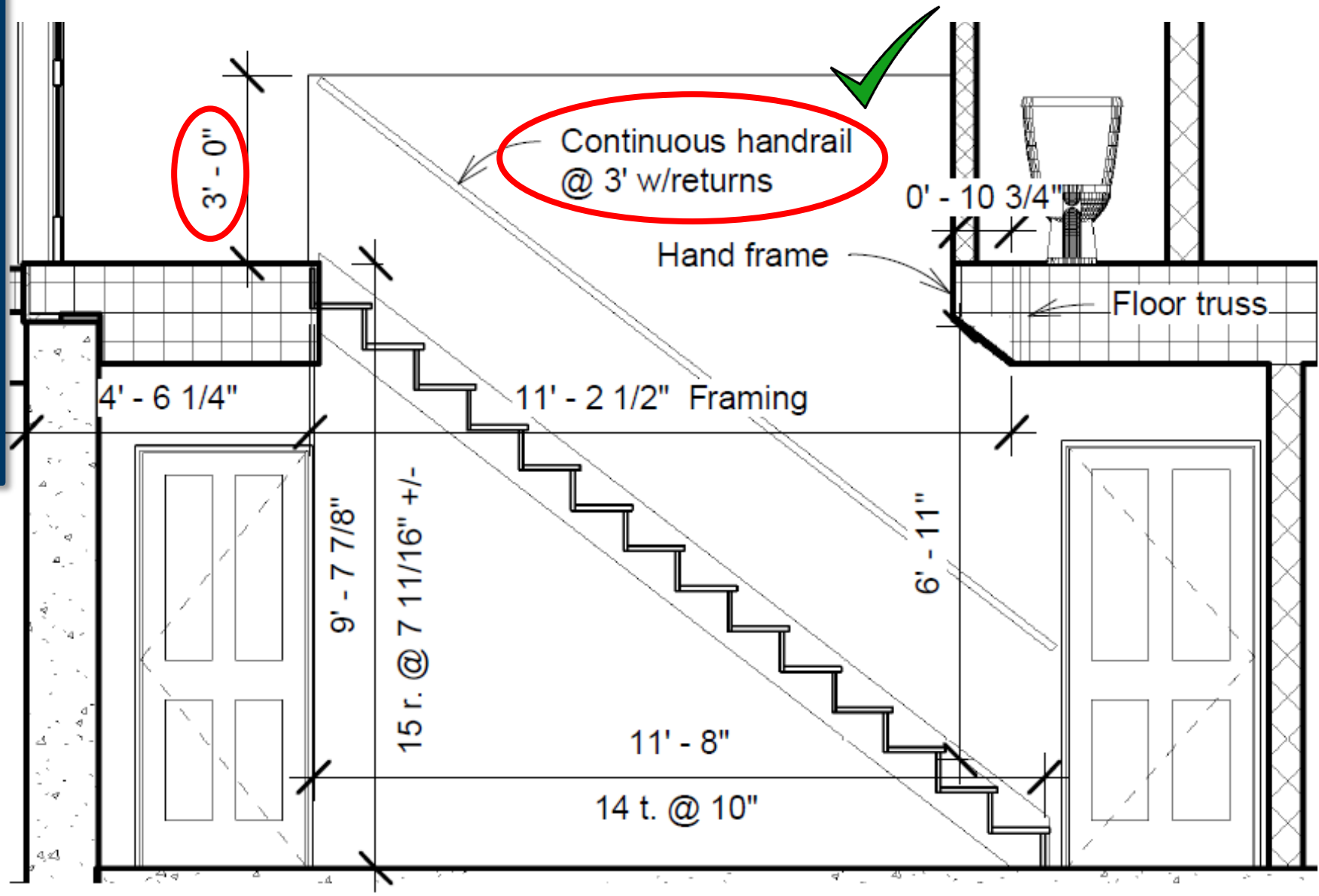
10 Section 2
1/4" = 1'-0"

R311.7.8 Handrails. Handrails shall be provided on not less than one side of each flight of stairs with four or more risers.

R311.7.8.1 Height. Handrail height, measured vertically from the sloped plane adjoining the tread nosing, or finish surface of ramp slope, shall be not less than 34 inches (864 mm) and not more than 38 inches (965 mm).

Exceptions:

1. The use of a volute, turnout or starting easing shall be allowed over the lowest tread.
2. Where handrail fittings or bendings are used to provide continuous transition between flights, transitions at winder treads, the transition from handrail to *guard*, or used at the start of a flight, the handrail height at the fittings or bendings shall be permitted to exceed 38 inches (956 mm).



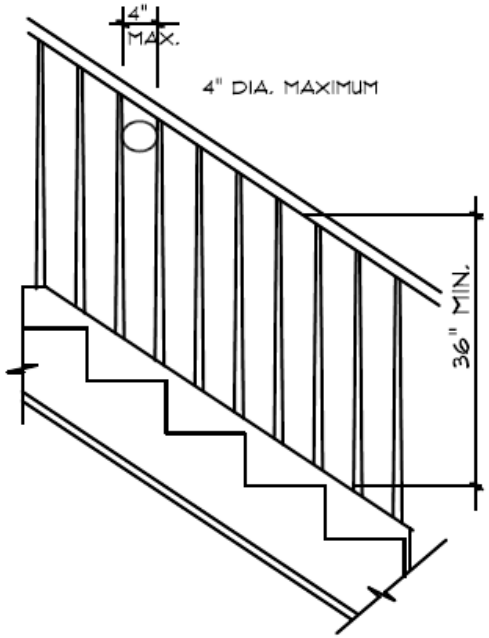
10 Section 2
1/4" = 1'-0"

STAIR DETAIL

Shall not allow passage of?

Shall not allow passage of?

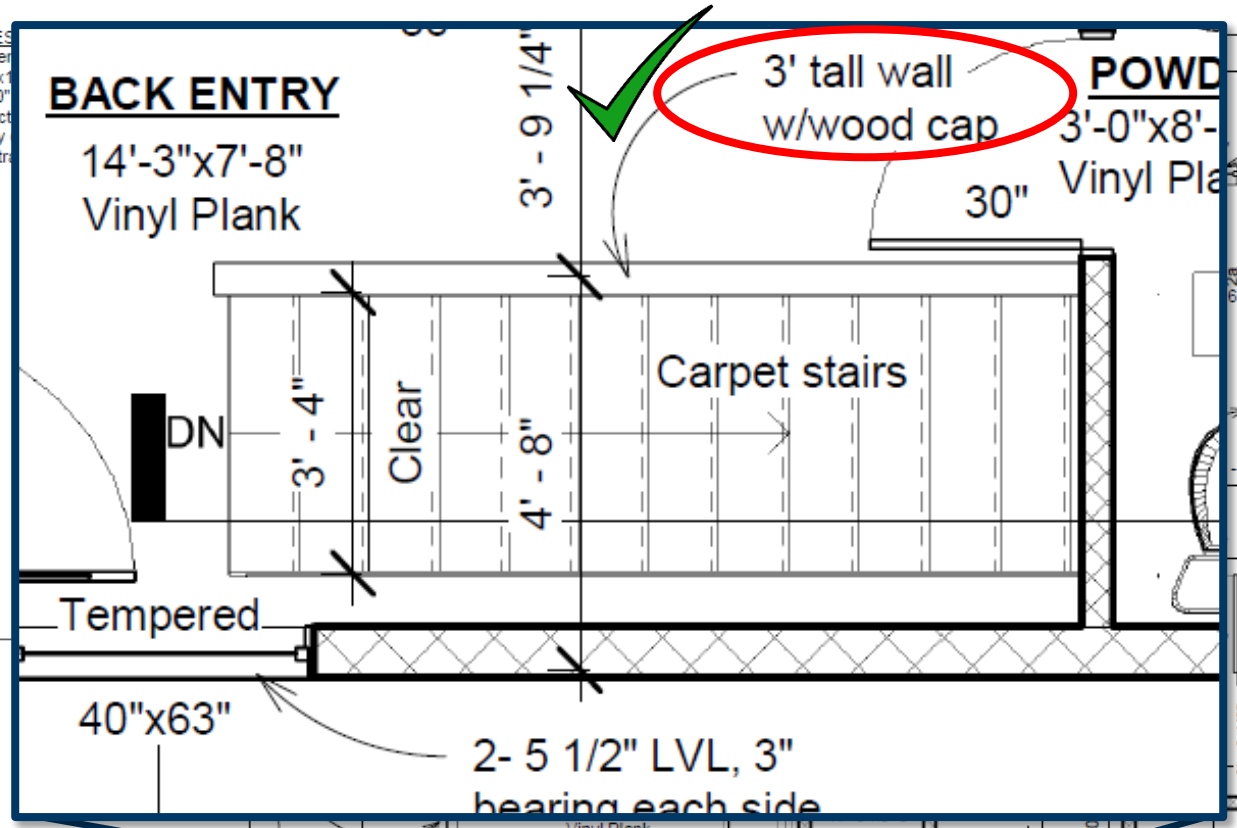
1/2" PLYWOOD SECURED TO DBL STAIR HDR W/4 - 8DCC NAILS PER STRINGER
STRINGER SECURED TO PLYWOOD W/4 - 8DCC NAILS PER STRINGER



- DOUBLE JOIST AROUND STAIR OPENING
- 3-2X12 STRINGERS
- 1X8 PINE RISERS
- 5/4 PRACTICAL BOARD TREADS SECURED TO STRINGERS W/4-16DCC NAILS PER STRINGER
- MAXIMUM RISE OF 7 3/4" & MINIMUM TREAD OF 10" A NOSING OF NOT LESS THAN 3/4" OR MORE THAN 1 1/2" IS REQUIRED. NOSING IS NOT REQUIRED IF TREAD IN MINIMUM OF 11". THE RISER MAY BE OPEN PROVIDED OPENING DOES NOT PERMIT THE PASSAGE OF A 4" SPHERE
- ENCLOSED UNDER SIDE OF STAIR WITH 1/2" SHEETROCK
- PROVIDE HANDRAIL 34" - 38" HIGH WITH 1 1/4" - 2" CROSS SECTIONAL DIMENSION TO BE CONTINUOUS & ENDS RETURNED TO WALL
- RAILING TO BE MINIMUM OF 36" IN HEIGHT WITH SPINDLES NOT TO PERMIT THE PASSAGE OF A 4" SPHERE
- 6'8" MIN HEADROOM MEASURED VERTICAL FROM THE STAIR NOSING
- 5/8 TYPE X SHEETROCK ON CEILING UNDER STEPS, 1/2 " ON WALLS

https://www.hometalk.com/32846117/half-wall-at-top-of-staircase?expand_all_questions=1

Guards & Window Fall Protection



SECTION R312
GUARDS AND WINDOW FALL PROTECTION

R312.1 Guards. *Guards* shall be provided in accordance with Sections R312.1.1 through R312.1.4.

R312.1.1 Where required. *Guards* shall be located along the open sides of floors, stairs, ramps, and landings that are located more than 30 inches (762 mm) measured vertically to the floor or *grade* below. Insect screening shall not be considered as a *guard*.

R312.1.2 Height. Required *guards* at open-sided walking surfaces, including stairs, porches, balconies or landings, shall be not less than 36 inches (914 mm) in height as measured vertically above the adjacent walking surface or the line connecting the *nosings*.

Exceptions:

1. *Guards* on the open sides of stairs shall have a height of not less than 34 inches (864 mm) measured vertically from a line connecting the *nosings*.
2. Where the top of the *guard* serves as a handrail on the open sides of stairs, the top of the *guard* shall be not less than 34 inches (864 mm) and not more than 38 inches (965 mm) as measured vertically from a line connecting the *nosings*.

② Main Level
1/4" = 1'-0"

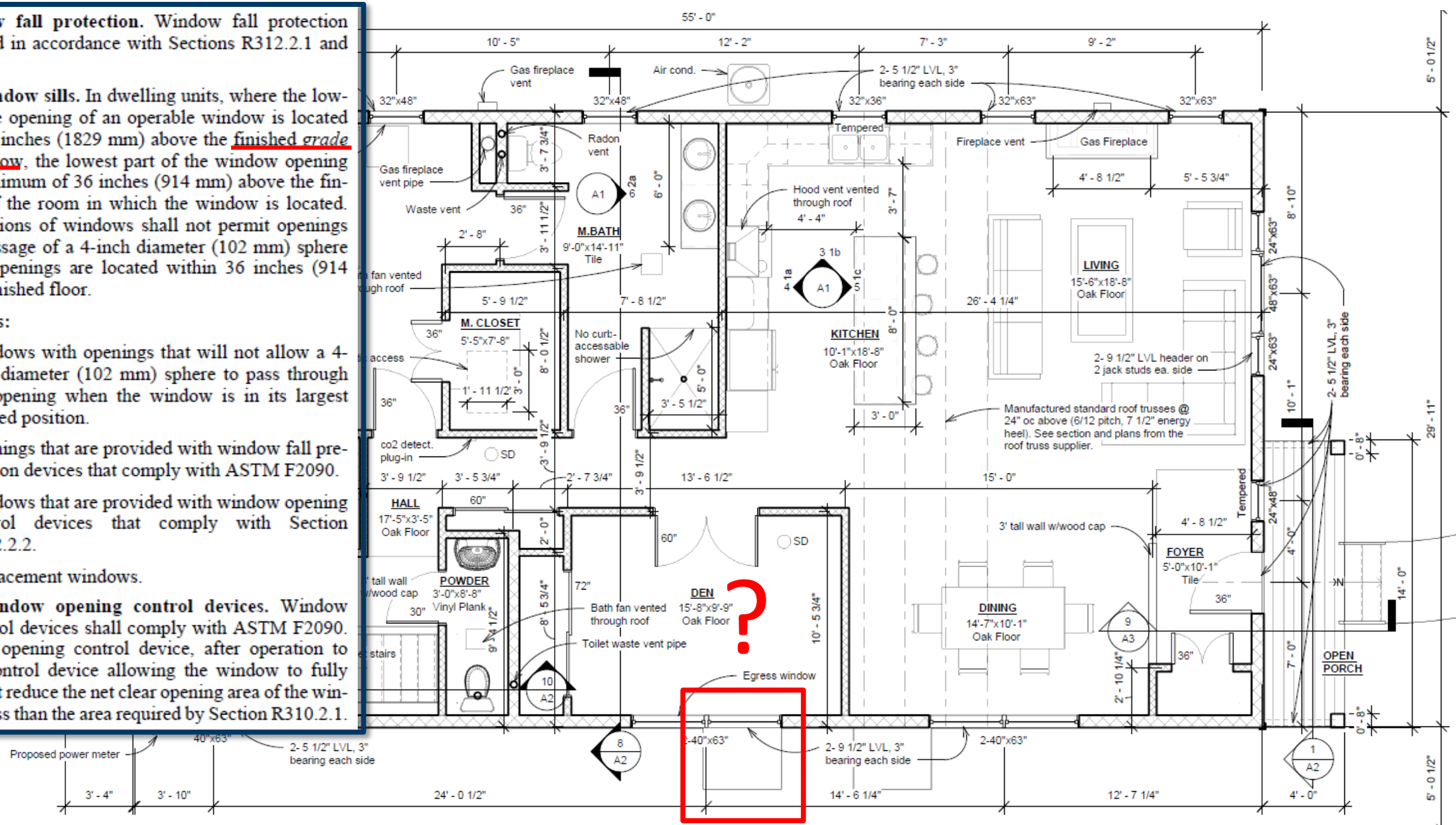
R312.2 Window fall protection. Window fall protection shall be provided in accordance with Sections R312.2.1 and R312.2.2.

R312.2.1 Window sills. In dwelling units, where the lowest part of the opening of an operable window is located more than 72 inches (1829 mm) above the finished grade or surface below, the lowest part of the window opening shall be a minimum of 36 inches (914 mm) above the finished floor of the room in which the window is located. Operable sections of windows shall not permit openings that allow passage of a 4-inch diameter (102 mm) sphere where such openings are located within 36 inches (914 mm) of the finished floor.

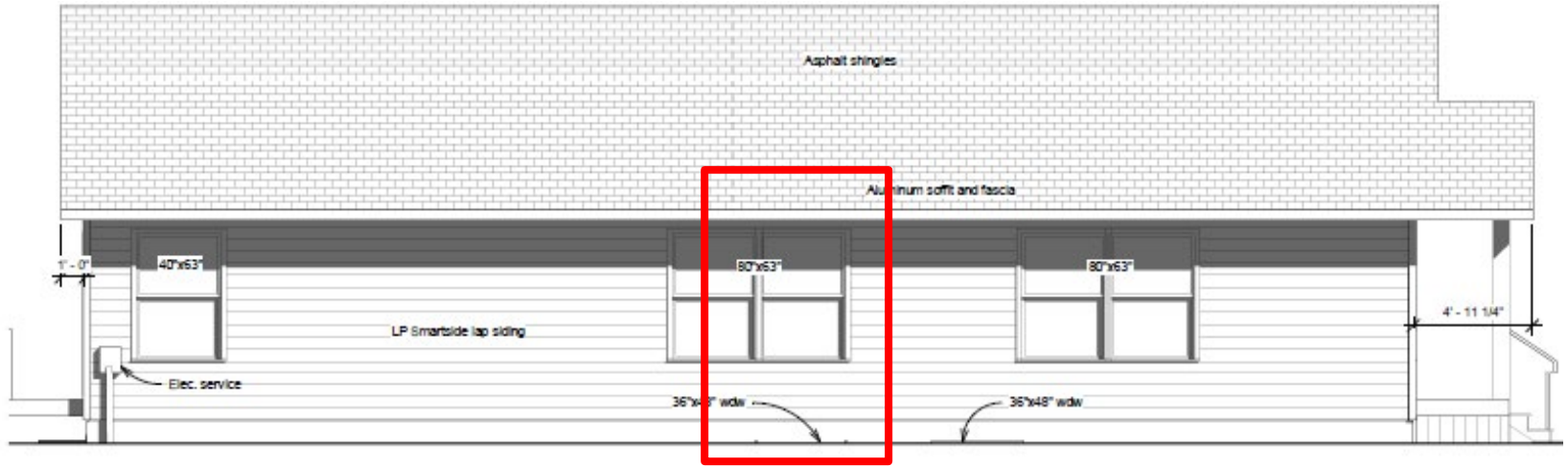
Exceptions:

1. Windows with openings that will not allow a 4-inch-diameter (102 mm) sphere to pass through the opening when the window is in its largest opened position.
2. Openings that are provided with window fall prevention devices that comply with ASTM F2090.
3. Windows that are provided with window opening control devices that comply with Section R312.2.2.
4. Replacement windows.

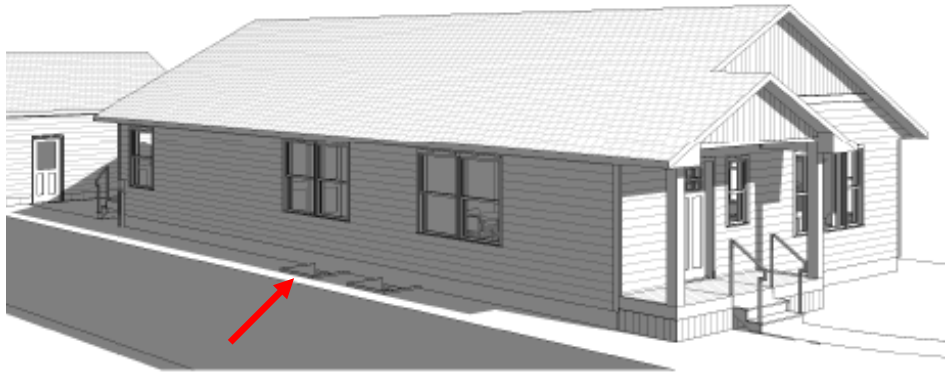
R312.2.2 Window opening control devices. Window opening control devices shall comply with ASTM F2090. The window opening control device, after operation to release the control device allowing the window to fully open, shall not reduce the net clear opening area of the window unit to less than the area required by Section R310.2.1.

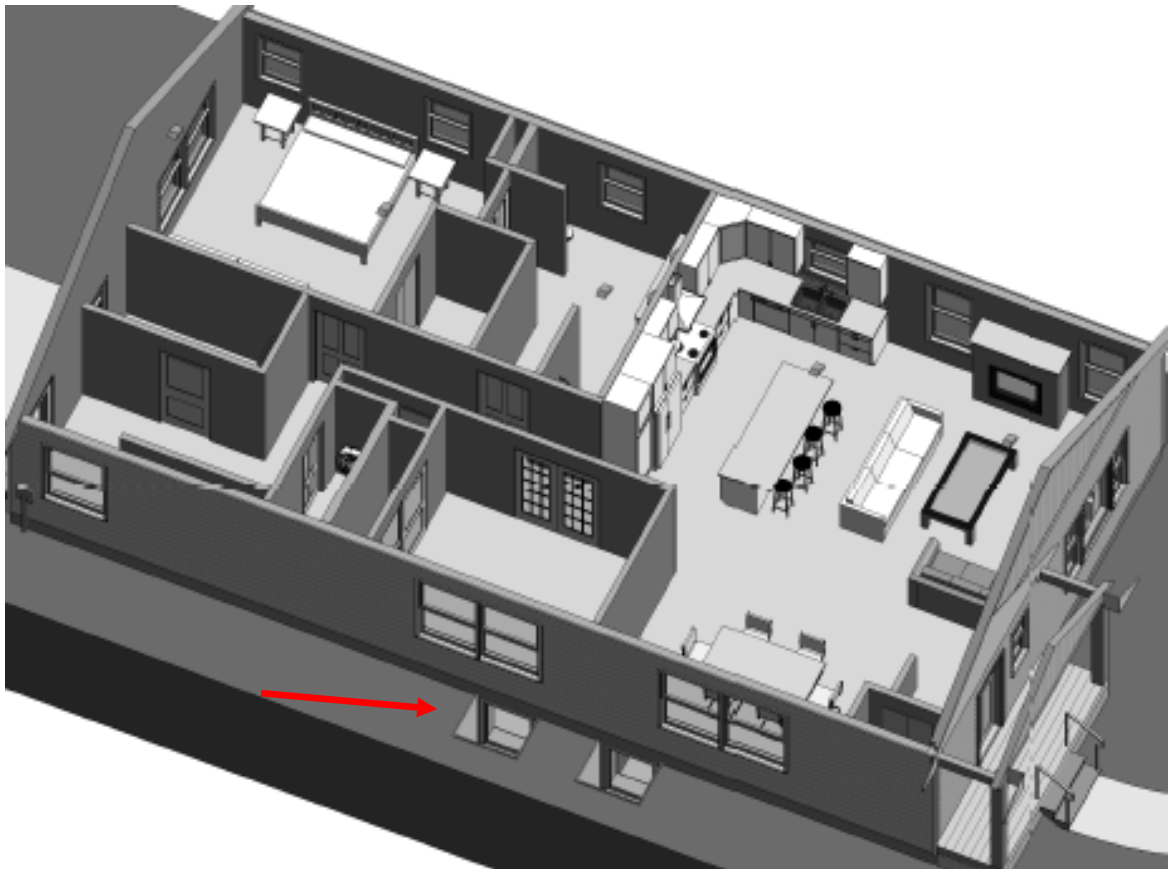


2 Main Level
1/4" = 1'-0"


Asphalt shingles
Aluminum soffit and fascia
1' - 0"
40"x63"
80"x63"
80"x63"
4' - 11 1/4"
LP Smartside lap siding
Elec. service
36"x48" wdw

⑥ South
1/4" = 1'-0"





Smoke/CO Alarms

R314.2.1 New construction. Smoke alarms shall be provided in *dwelling units*.

R314.2.2 Alterations, repairs and additions. An individual *dwelling unit* shall be equipped with smoke alarms located as required for new *dwellings* when:

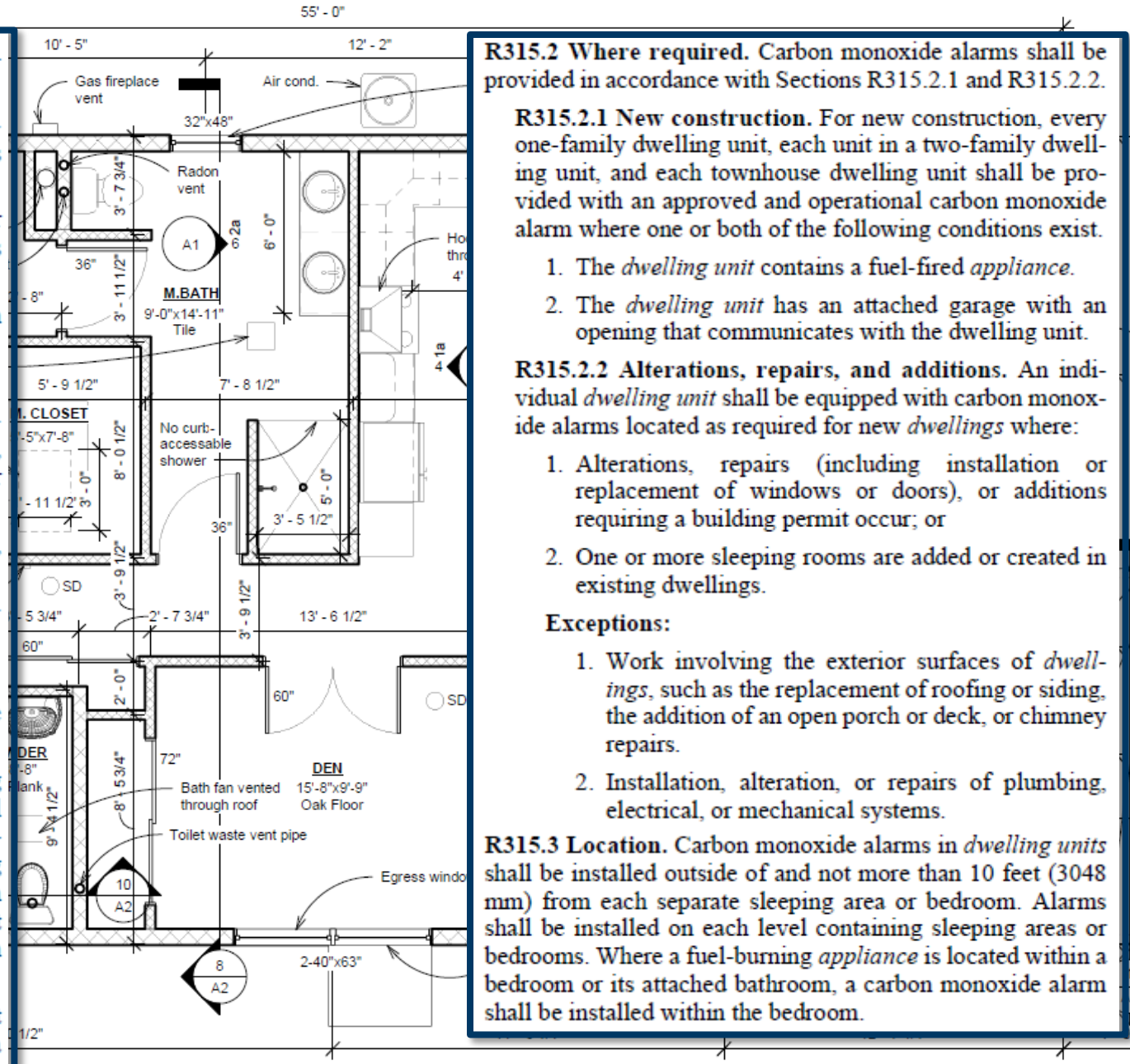
1. Alterations, repairs (including installation or replacement of windows or doors), or additions requiring a building permit occur; or
2. One or more sleeping rooms are added or created in existing dwellings.

Exceptions:

1. Work involving the exterior surfaces of *dwellings*, such as the replacement of roofing or siding, or the addition of a an open porch or deck, or chimney repairs.
2. Installation, alteration, or repairs of plumbing, electrical, or mechanical systems.

R314.3 Location. Smoke alarms shall be installed in the following locations:

1. In each sleeping room.
2. Outside each separate sleeping area in the immediate vicinity of the bedrooms.
3. On each additional *story* of the *dwelling*, including *basements* and *habitable attics* and not including crawl spaces and uninhabitable *attics*. In *dwellings* or *dwelling units* with split levels and without an intervening door between the adjacent levels, a smoke alarm installed on the upper level shall suffice for the adjacent lower level provided that the lower level is less than one full *story* below the upper level.
4. Smoke alarms shall be installed not less than 3 feet (914 mm) horizontally from the door or opening of a bathroom that contains a bathtub or shower unless this would prevent placement of a smoke alarm required by



R315.2 Where required. Carbon monoxide alarms shall be provided in accordance with Sections R315.2.1 and R315.2.2.

R315.2.1 New construction. For new construction, every one-family dwelling unit, each unit in a two-family dwelling unit, and each townhouse dwelling unit shall be provided with an approved and operational carbon monoxide alarm where one or both of the following conditions exist.

1. The *dwelling unit* contains a fuel-fired *appliance*.
2. The *dwelling unit* has an attached garage with an opening that communicates with the dwelling unit.

R315.2.2 Alterations, repairs, and additions. An individual *dwelling unit* shall be equipped with carbon monoxide alarms located as required for new *dwellings* where:

1. Alterations, repairs (including installation or replacement of windows or doors), or additions requiring a building permit occur; or
2. One or more sleeping rooms are added or created in existing dwellings.

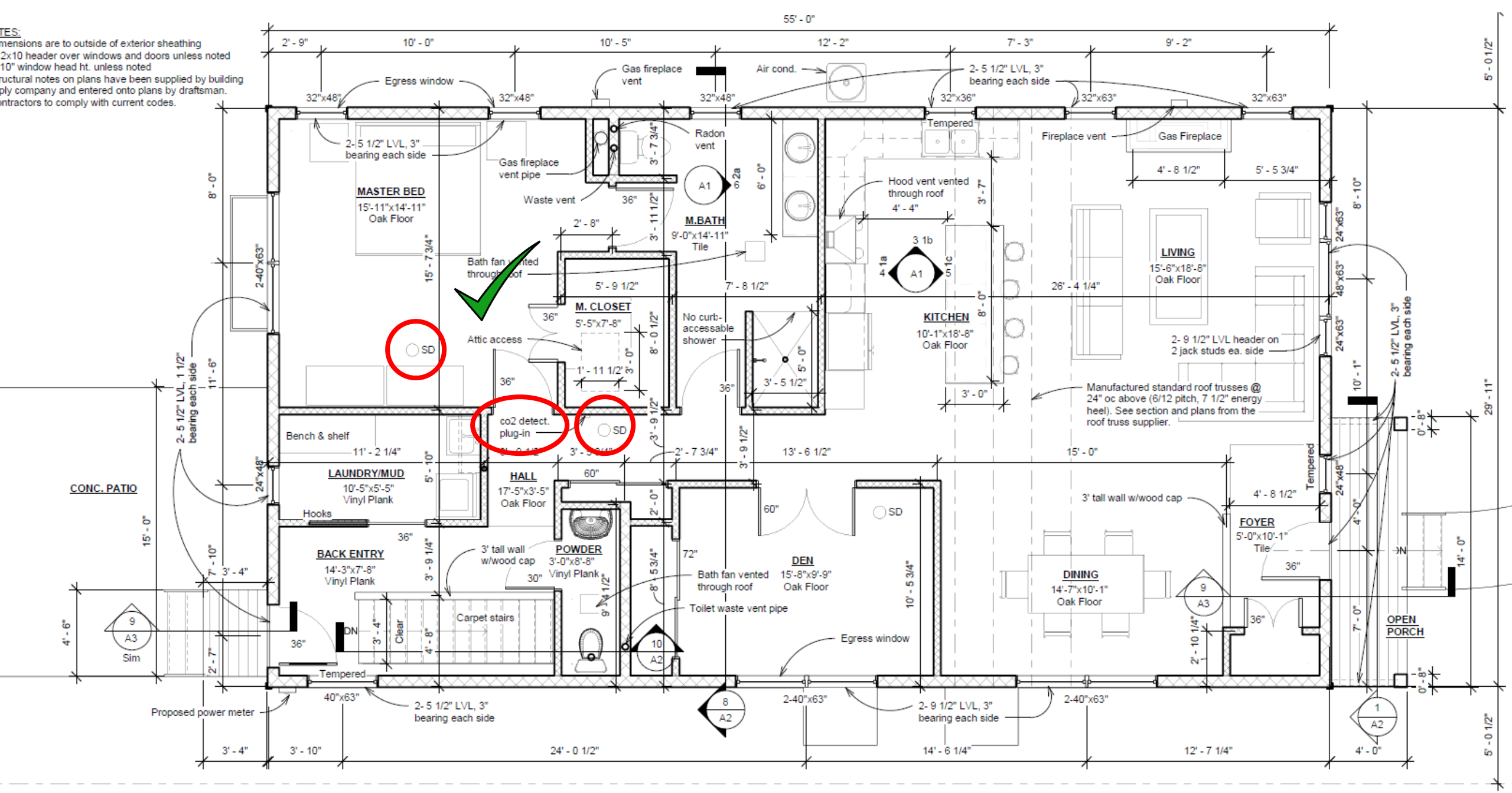
Exceptions:

1. Work involving the exterior surfaces of *dwellings*, such as the replacement of roofing or siding, the addition of an open porch or deck, or chimney repairs.
2. Installation, alteration, or repairs of plumbing, electrical, or mechanical systems.

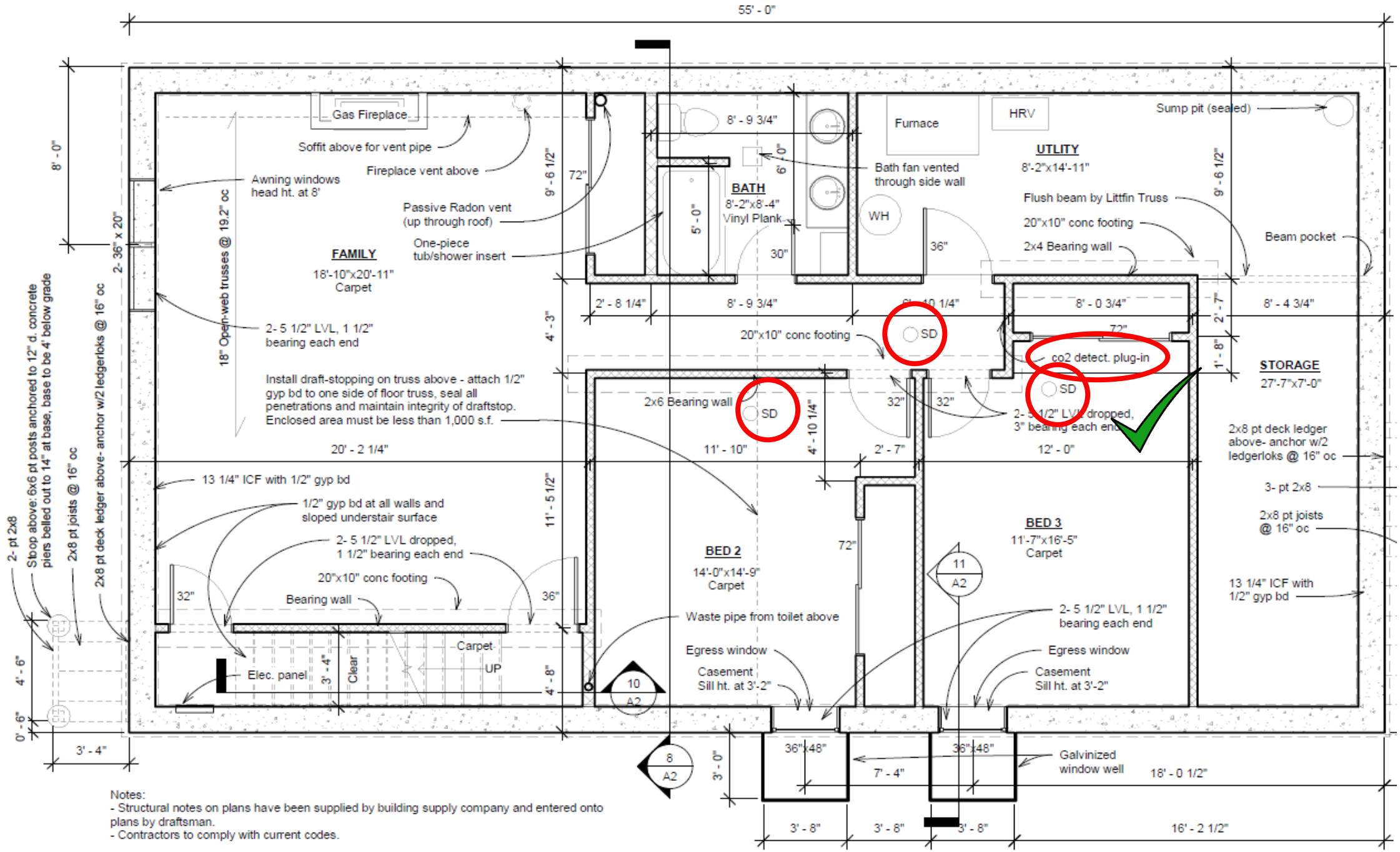
R315.3 Location. Carbon monoxide alarms in *dwelling units* shall be installed outside of and not more than 10 feet (3048 mm) from each separate sleeping area or bedroom. Alarms shall be installed on each level containing sleeping areas or bedrooms. Where a fuel-burning *appliance* is located within a bedroom or its attached bathroom, a carbon monoxide alarm shall be installed within the bedroom.

Main Level
1/4" = 1'-0"

TES:
mensions are to outside of exterior sheathing
2x10 header over windows and doors unless noted
10" window head ht. unless noted
ructural notes on plans have been supplied by building
ply company and entered onto plans by draftsman.
ontractors to comply with current codes.



2 Main Level
1/4" = 1'-0"



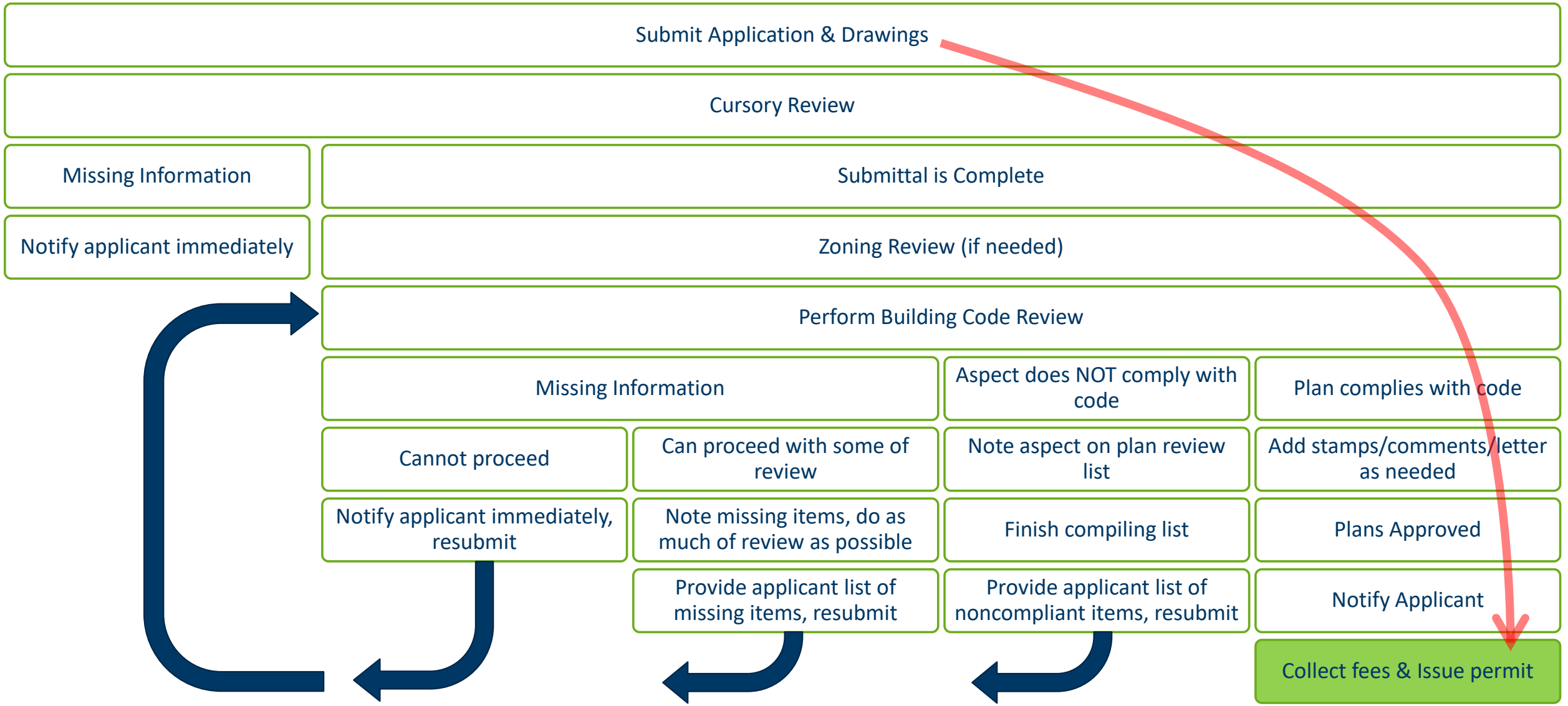
Notes:
- Structural notes on plans have been supplied by building supply company and entered onto plans by draftsman.
- Contractors to comply with current codes.

1 Lower Level
1/4" = 1'-0"

SAC & WAC Fees

- SAC = Sewer Availability Charge.
- WAC = Water Access Charge.
- Each single-family home must pay 1 SAC & WAC fee when first connected to city sewer & water.
- Fees are set by Metropolitan Council (MET Council)
- Fees are collected by the city and paid to MET Council.
- More information: Metropolitan Council (metrocouncil.org)

Permit Application Process



Credits of Images

DESCRIPTION/LINK/DATE RETREIVED
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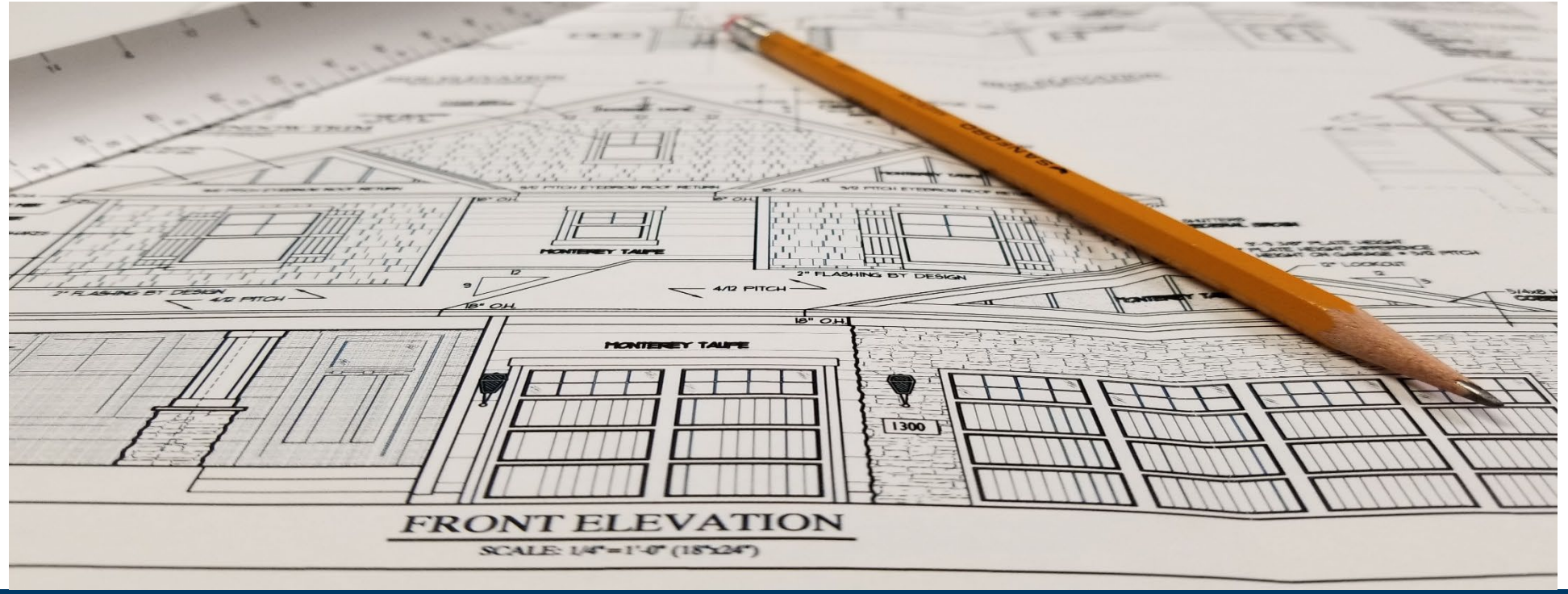
Example of shed http://maxpixel.freegreatpicture.com/static/photo/1x/Storage-House-Construction-Shed-Building-2093438.jpg labeled for reuse with modification, retrieved 7/19/2017
Steel Master Steel Single-Car Carport https://c1.staticflickr.com/3/2728/4203868970_bafbe92078_b.jpg, labeled for reuse with modification, retrieved 7/19/2017
Computer, Keyboard https://pixabay.com/p-70506/?no_redirect Free images on Pi, retrieved 7/21/2017
https://upload.wikimedia.org/wikipedia/commons/2/2d/Bispingen_verr%C3%BCcktes_Haus_auf_dem_Kopf.jpg building design – Wikipedia, retrieved 7/25/2017
Traditional red wooden house with green grass roof https://c1.staticflickr.com/3/2426/3889648857_b32cb4e51a_z.jpg?zz=1 Labeled for reuse with modification, retrieved 7/26/2017
ICC Logo, https://www.iccsafe.org/
MN Rules 1300.0120 Subp. 7 Application for a Permit https://codes.iccsafe.org/content/document/935/10905009



Residential Plan Review

(The End)

Steve Shold

steve.shold@state.mn.us

Construction Code Representative
Code Services
Construction Codes and Licensing

DEPARTMENT OF LABOR AND INDUSTRY
CONSTRUCTION CODES AND LICENSING