

**APPENDIX U: SOLAR-READY PROVISIONS – DETACHED ONE- AND TWO-FAMILY DWELLINGS, MULTIPLE SINGLE-FAMILY DWELLINGS (TOWNHOUSES)**  
(Adopted as amended)

Delete APPENDIX U and replace as follows:

**SECTION AU101 (RB101) SCOPE**

**AU101.1 (RB101.1) General.** These provisions shall be applicable for new construction, except additions.

**SECTION AU102 (RB102) GENERAL DEFINITIONS**

**SOLAR-READY ZONE.** A section or sections of the roof or building overhang designated and reserved for the future installation of a solar photovoltaic or solar thermal system.

**SECTION AU103 (RB103) SOLAR-READY ZONE**

**AU103.1 (RB103.1) General.** New detached one- and two-family dwellings, and multiple single-family dwellings (townhouses) with not less than 600 ft<sup>2</sup> (55.74 m<sup>2</sup>) of roof area oriented between 110° and 270° of true north shall comply with sections AU103.2 through AU103.8 (RB103.2 through RB103.8).

**EXCEPTIONS:**

1. New residential buildings with a permanently installed on-site renewable energy system.
2. A building with a solar-ready zone that is shaded for more than 70% of daylight hours annually.
3. Buildings and structures as designed and shown in construction documents that do not meet the conditions for a solar-ready zone area.

**AU103.2 (RB103.2) Construction Document Requirements for Solar Ready Zone.** Construction documents shall indicate the solar ready zone where applicable.

**AU103.3 (RB103.3) Solar-Ready Zone Area.** The total solar-ready zone area shall consist of an area not less than 300 ft<sup>2</sup> (27.87 m<sup>2</sup>) exclusive of mandatory access or set back areas as required by 527 CMR. New multiple single-family dwellings (townhouses) three stories or less in height above grade plane and with a total floor area less than or equal to 2,000 ft<sup>2</sup> (185.8 m<sup>2</sup>) per dwelling shall have a solar-ready zone area of not less than 150 ft<sup>2</sup> (13.94 m<sup>2</sup>). The solar-ready zone shall be composed of areas not less than five feet (1,524 mm) in width and not less than 80 ft<sup>2</sup> (7.44 m<sup>2</sup>) exclusive of access or set back areas as required by 527 CMR.

This project does not contain any south facing roof areas.



**PROPOSED ISOMETRIC**

**TABLE N1102.1.2 (R402.1.2) INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT\***

CLIMATE ZONE	FENESTRATION U-FACTOR <sup>b</sup>	SKYLIGHT <sup>a</sup> U-FACTOR <sup>b</sup>	GLAZED FENESTRATION SHGC <sup>c,e</sup>	CEILING R-VALUE	WOOD FRAME WALL R-VALUE	MASS WALL R-VALUE <sup>f</sup>	FLOOR R-VALUE	BASEMENT <sup>g</sup> WALL R-VALUE	SLAB <sup>h</sup> R-VALUE & DEPTH	CRAWL SPACE <sup>i</sup> WALL R-VALUE
1	NR	0.75	0.25	30	13	3/4	13	0	0	0
2	0.40	0.65	0.25	38	13	4/6	13	0	0	0
3	0.35	0.55	0.25	38	20 or 13 + 5 <sup>a</sup>	8/13	19	5/13 <sup>f</sup>	0	5/13
4 except Marine	0.35	0.55	0.40	49	20 or 13 + 5 <sup>a</sup>	8/13	19	10/13	10, 2 ft	10/13
5 and Marine 4	0.30	0.55	NR	49	20 or 13 + 5 <sup>a</sup>	13/17	30 <sup>g</sup>	15/19	10, 2 ft	15/19
6	0.32	0.55	NR	49	20 + 5 or 13 + 10 <sup>a</sup>	15/20	30 <sup>g</sup>	15/19	10, 4 ft	15/19
7 and 8	0.32	0.55	NR	49	20 + 5 or 13 + 10 <sup>a</sup>	19/21	38 <sup>g</sup>	15/19	10, 4 ft	15/19

- For SI: 1 foot = 304.8 mm.
- R-values are minimums. U-factors and SHGC are maximums. When insulation is installed in a cavity which 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.
  - The fenestration U-factor column excludes skylights. The SHGC column applies to all glazed fenestration. Exception: Skylights may be excluded from glazed fenestration SHGC requirements in Climate Zones 1 through 3 where the SHGC for such skylights does not exceed 0.30.
  - "15/19" means R-15 continuous insulation on the interior or exterior of the home or R-19 cavity insulation at the interior of the basement wall. "15/19" shall be permitted to be met with R-13 cavity insulation on the interior of the basement wall plus R-5 continuous insulation on the interior or exterior of the home. "10/13" means R-10 continuous insulation on the interior or exterior of the home or R-13 cavity insulation at the interior of the basement wall.
  - R-5 shall be added to the required slab edge R-values for heated slabs. Insulation depth shall be the depth of the footing or 2 feet, whichever is less in Zones 1 through 3 for heated slabs.
  - There are no SHGC requirements in the Marine Zone.
  - Basement wall insulation is not required in warm-humid locations as defined by Figure N1101.10 and Table N1101.10.
  - Or insulation sufficient to fill the framing cavity. R-19 minimum.
  - The first value is cavity insulation, the second value is continuous insulation, so "13+5" means R-13 cavity insulation plus R-5 continuous insulation.
  - The second R-value applies when more than half the insulation is on the interior of the mass wall.

**TABLE R301.2(1) CLIMATIC AND GEOGRAPHIC DESIGN CRITERIA**

GROUND SNOW LOAD	WIND DESIGN				SEISMIC DESIGN CATEGORY <sup>1</sup>	SUBJECT TO DAMAGE FROM			WINTER DESIGN TEMP <sup>2</sup>	ICE BARRIER UNDERLAYMENT REQUIRED <sup>3</sup>	FLOOD HAZARDS <sup>4</sup>	AIR FREEZING INDEX <sup>5</sup>	MEAN ANNUAL TEMP <sup>6</sup>
	Speed <sup>1</sup> (mph)	Topographic effects <sup>2</sup>	Special wind region <sup>3</sup>	Wind-borne debris zone <sup>4</sup>		Weathering <sup>5</sup>	Frost line depth <sup>6</sup>	Termite <sup>7</sup>					
40	128	NO	NO	NO	B	Severe	48"						

- For SI: 1 pound per square foot = 0.0479 kPa, 1 mile per hour = 0.447 m/s.
- Weathering may require a higher strength concrete or grade of masonry than necessary to satisfy the structural requirements of this code. The weathering column shall be filled in with the weathering index, "negligible," "moderate" or "severe" for concrete as determined from Figure R301.2(3). The grade of masonry units shall be determined from ASTM C34, C55, C62, C73, C90, C129, C145, C216 or C652.
  - The frost line depth may require deeper footings than indicated in Figure R403.1(1). The jurisdiction shall fill in the frost line depth column with the minimum depth of footing below finish grade.
  - The jurisdiction shall fill in this part of the table to indicate the need for protection depending on whether there has been a history of local subterranean termite damage.
  - The jurisdiction shall fill in this part of the table with the wind speed from the basic wind speed map [Figure R301.2(4)A]. Wind exposure category shall be determined on a site-specific basis in accordance with Section R301.2.1.4.
  - The outdoor design dry-bulb temperature shall be selected from the columns of 97<sup>th</sup>-percent values for winter from Appendix D of the International Plumbing Code. Deviations from the Appendix D temperatures shall be permitted to reflect local climates or local weather experience as determined by the building official.
  - The jurisdiction shall fill in this part of the table with the seismic design category determined from Section R301.2.2.1.
  - The jurisdiction shall fill in this part of the table with (a) the date of the jurisdiction's entry into the National Flood Insurance Program (date of adoption of the first code or ordinance for management of flood hazard areas), (b) the date(s) of the Flood Insurance Study and (c) the panel numbers and dates of the currently effective FIRMs and FBFMs or other flood hazard map adopted by the authority having jurisdiction, as amended.
  - In accordance with Sections R905.1.2, R905.4.3.1, R905.5.3.1, R905.6.3.1, R905.7.3.1 and R905.8.3.1, where there has been a history of local damage from the effects of ice damming, the jurisdiction shall fill in this part of the table with "YES." Otherwise, the jurisdiction shall fill in this part of the table with "NO."
  - The jurisdiction shall fill in this part of the table with the 100-year return period air freezing index (BF-days) from Figure R403.3(2) or from the 100-year (99 percent) value on the National Climatic Data Center data table "Air Freezing Index-USA Method (Base 32°F)."
  - The jurisdiction shall fill in this part of the table with the mean annual temperature from the National Climatic Data Center data table "Air Freezing Index-USA Method (Base 32°F)."
  - In accordance with Section R301.2.1.5, where there is local historical data documenting structural damage to buildings due to topographic wind speed-up effects, the jurisdiction shall fill in this part of the table with "YES." Otherwise, the jurisdiction shall indicate "NO" in this part of the table.
  - In accordance with Figure R301.2(4)A, where there is local historical data documenting unusual wind conditions, the jurisdiction shall fill in this part of the table with "YES" and identify any specific requirements. Otherwise, the jurisdiction shall indicate "NO" in this part of the table.
  - In accordance with Section R301.2.1.2.1, the jurisdiction shall indicate the wind-borne debris wind zone(s). Otherwise, the jurisdiction shall indicate "NO" in this part of the table.

To be completed by the local permitting jurisdiction.

Siding Color and style TBD by owner and builder.

New Roof slopes to match existing.

Trim to match existing House Profiles. Material TBD.

PT deck and stairs per the APA "Residential Deck Frame Construction Guide" based on the 2012 IRC.

Guardrails not shown for clarity but are required for walking surfaces greater than 30" above the surrounding terrain.

Stairway to be a minimum of 36" clear width and include a required handrail mounted inside the guardrails.

Handrails are required for stairways with 4 or more risers.

Provided gutters and downspouts to collect rainwater from the roof and direct it away from the foundation. (Not Shown)

**Garage Door Opening Protection**

**R302.5.1 Opening protection.** Openings from a private garage directly into a room used for sleeping purposes shall not be permitted. Other openings between the garage and residence shall be equipped with solid wood doors not less than 1 3/4 inches (35 mm) in thickness, solid or honeycomb-core steel doors not less than 1 1/4 inches (35 mm) thick, or 20-minute fire-rated doors, equipped with a self-closing device.

**R303.4 Mechanical ventilation.** Where the air infiltration rate of a dwelling unit is 5 air changes per hour or less where tested with a blower door at a pressure of 0.2 inch w.c (50 Pa) in accordance with Section N1102.4.1.2, the dwelling unit shall be provided with whole-house mechanical ventilation in accordance with Section M1507.3.

Floor Area (SQ FT)	ASHRAE Standard 62.2 Table 4.1a Continuous Whole-Building Ventilation Rate in cfm				
	Number of Bedrooms				
	0-1	2-3	4-5	6-7	> 7
<1500	30	45	60	75	90
1501-3000	45	60	75	90	105
3001-4500	60	75	90	105	120
4501-6000	75	90	105	120	135
6001-7500	90	105	120	135	150
>7500	105	120	135	150	165

REVISION TABLE	
NUMBER	DATE / DESCRIPTION

**COVER**

Project Description:  
**Barn: 2nd Floor Expansion / Roof Raise**

Project Owner:  
**Hackanson**  
19 Hastings Street  
Mendon, MA

DATE:

12/1/2019

SCALE:

SHEET:

**A-0**

All NEW framing and construction to be in accordance with MA Code 780 CMR 9th Edition and IRC 2015 for 1 & 2 Family Residential Construction. While good faith effort has been made to incorporate as much of that information as practical in these documents, human error or omission is possible. It is the licensed builder's responsibility to review these documents prior to construction and to proceed in accordance with applicable codes.



**EXISTING SOUTH ELEVATION**

NTS



**EXISTING NORTH ELEVATION**

NTS



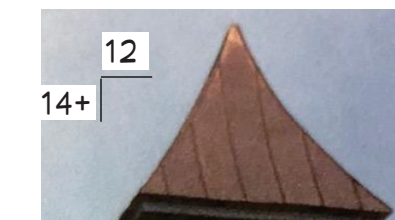
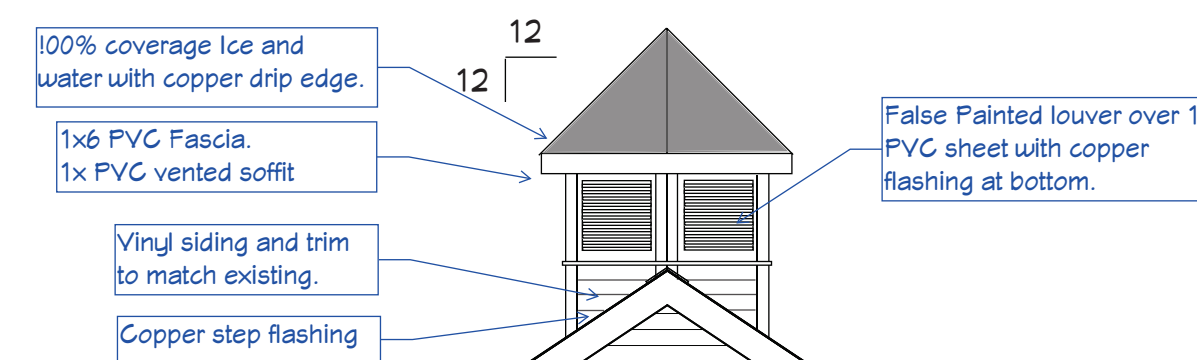
**EXISTING NORTH ELEVATION**

NTS

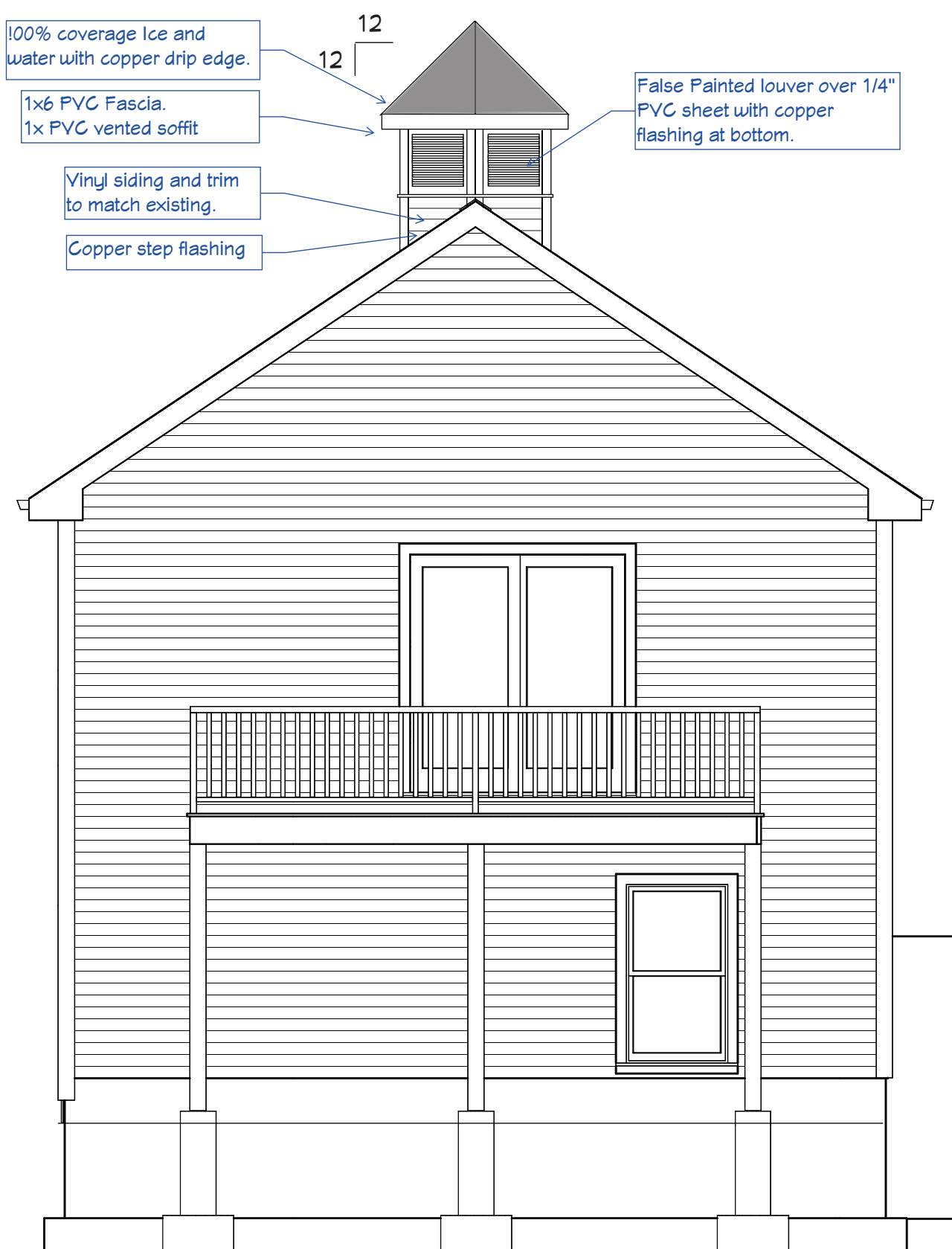


**SOUTH ELEVATION**

1/4" = 1'-0"



Suggestion:  
 Copper standing seam Cupola Roof.  
 Contact Bob Sweet  
 Mendon MA  
 Actual roof slope TBD.



**NORTH ELEVATION**

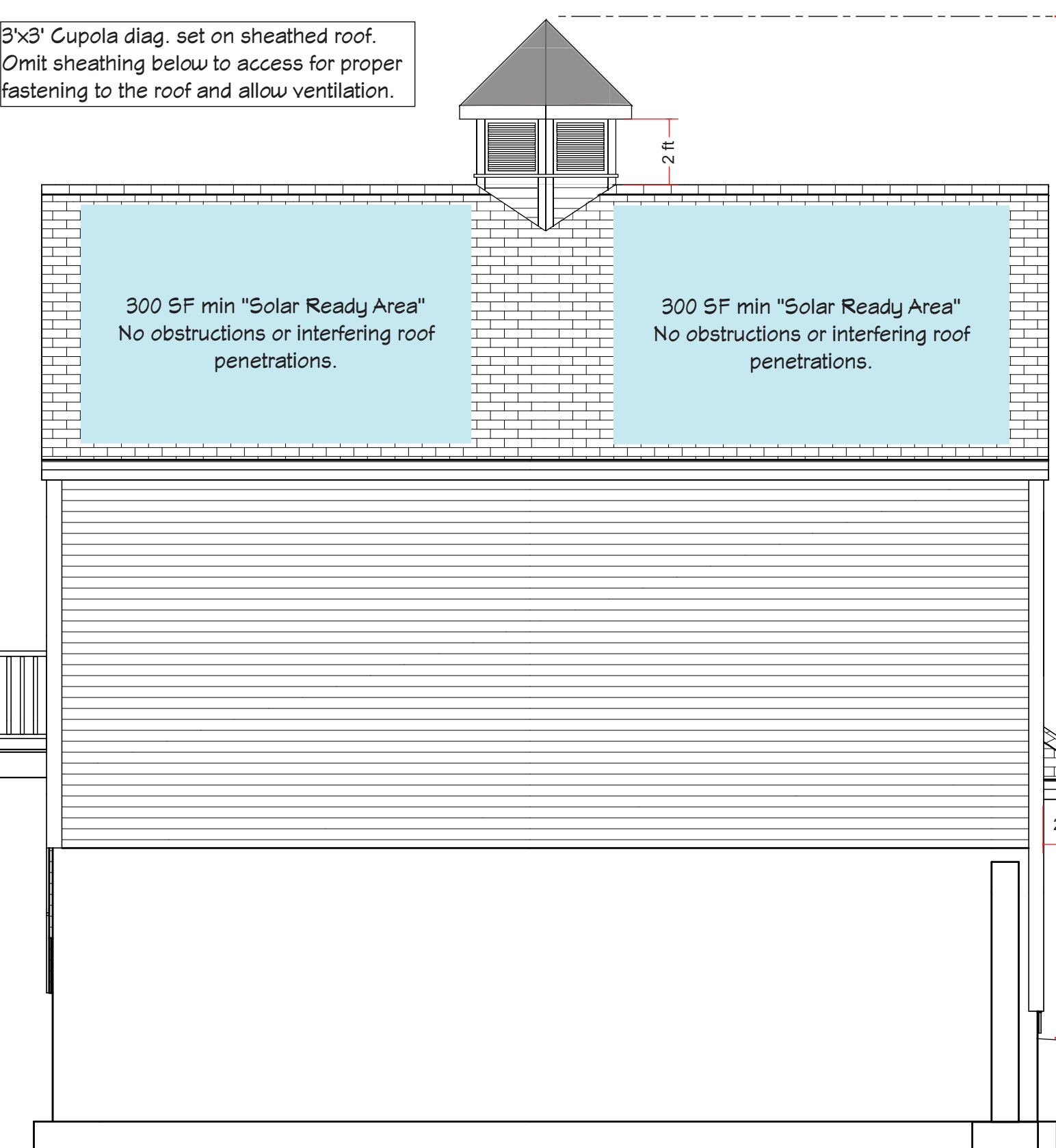
1/4" = 1'-0"



**EAST ELEVATION**

1/4" = 1'-0"

3'x3' Cupola diag. set on sheathed roof. Omit sheathing below to access for proper fastening to the roof and allow ventilation.



**WEST ELEVATION**

1/4" = 1'-0"

**NARRATIVE:**

Demolish existing roof, roof framing, 2nd level windows and doors, 1st level siding, all interior walls, stairway, all exterior siding and trim and properly dispose.  
 Add new 2nd floor code compliant framing on top of the existing 2x6 floor framing with new 3/4" sub-floor set at the same level as the existing 2nd floor sub-floor of the 2-story home on this property.  
 Build new Garage space, mud room, stairway, and 2nd level finished exercise space with bathroom per this set of plans.  
 Provide new siding TBD  
 Provide new roofing TBD  
 Provide new Trim to match existing house.  
 Provide gutters and downspouts to direct rainwater away from the foundation/s.

All NEW framing and construction to be in accordance with MA Code 780 CMR 9th Edition and IRC 2015 for 1 & 2 Family Residential Construction. While good faith effort has been made to incorporate as much of that information as practical in these documents, human error or omission is possible. It is the licensed builder's responsibility to review these documents prior to construction and to proceed in accordance with applicable codes.

REVISION TABLE  
 NUMBER DATE DESCRIPTION

**ELEVATIONS**

Project Description:  
**Barn: 2nd Floor Expansion / Roof Raise**

Project Owner:  
**Hackanson**  
 19 Hastings Street  
 Mendon, MA

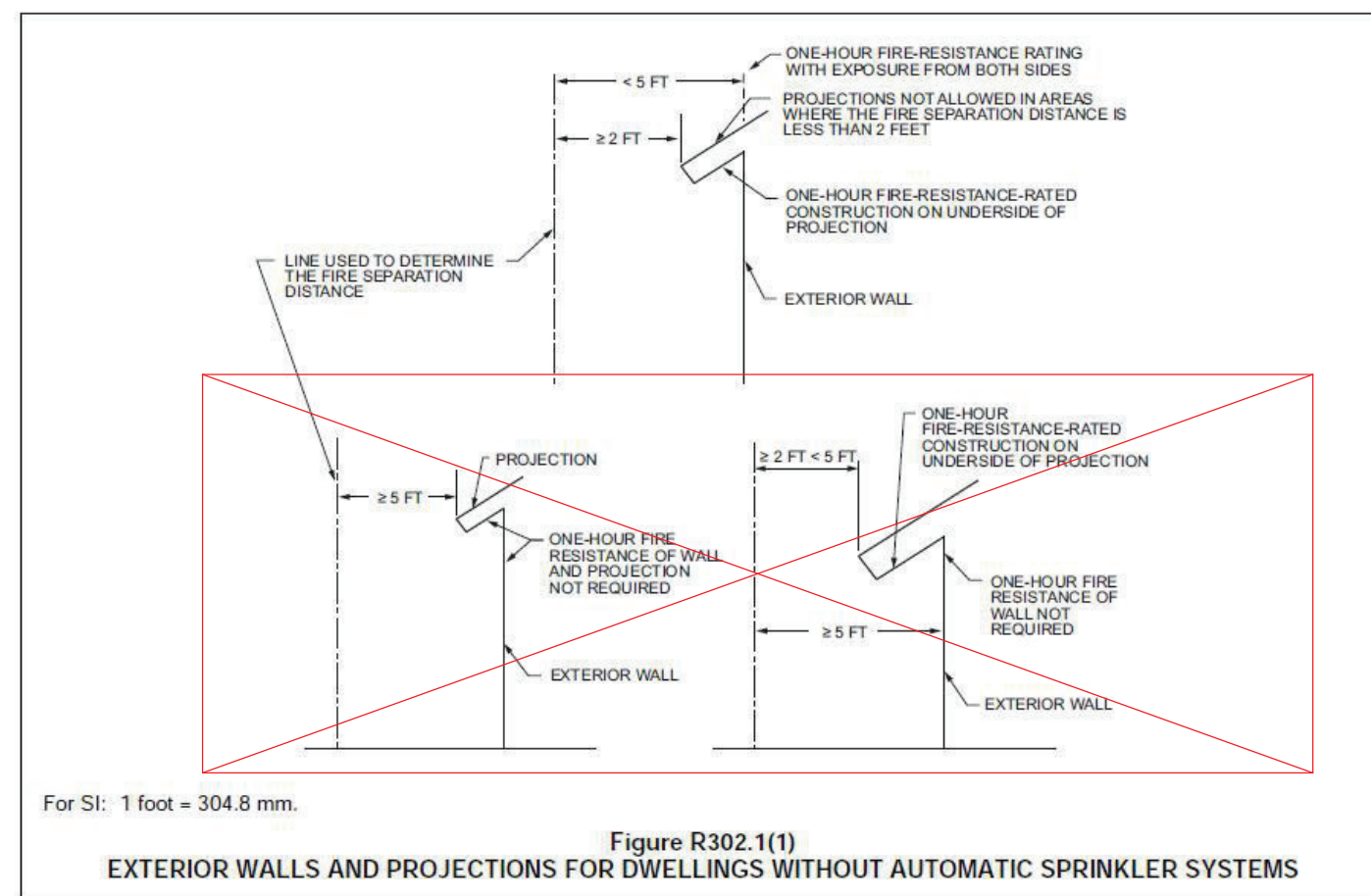
DATE:  
 12/1/2019

SCALE:

SHEET:

**A-1**

**SECTION R302  
FIRE-RESISTANT CONSTRUCTION**  
R302.1 Exterior walls. Construction, projections, openings and penetrations of exterior walls of dwellings and accessory buildings shall comply with Table R302.1(1), or dwellings equipped throughout with an automatic sprinkler system installed in accordance with Section P2904 shall comply with Table R302.1(2).  
The exterior rated walls are required to be an assembly that has been tested in accordance with either ASTM E119 or UL 263.



For SI: 1 foot = 304.8 mm.

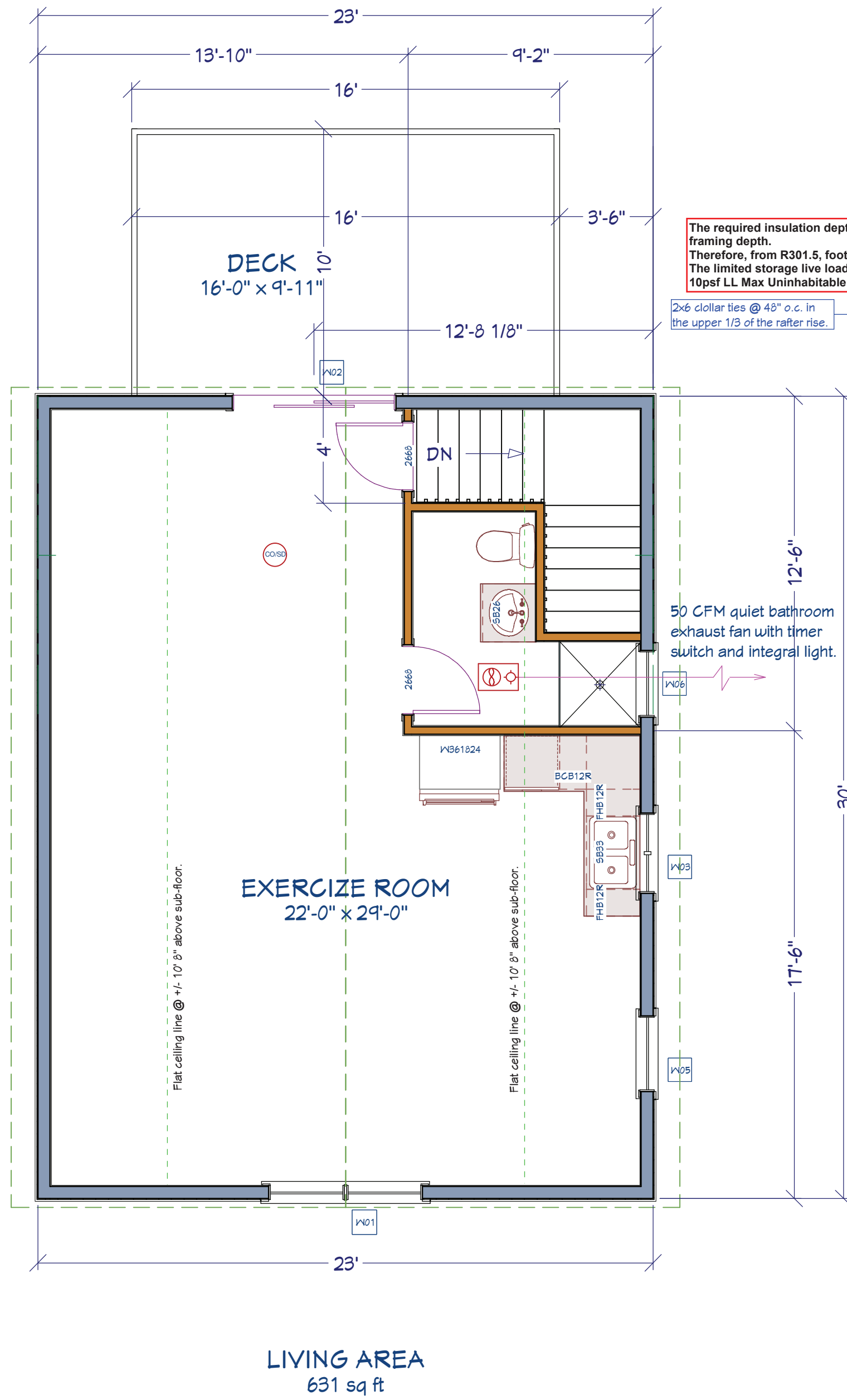
**TABLE R302.1(1)  
EXTERIOR WALLS**

EXTERIOR WALL ELEMENT	FIRE-RESISTANCE RATING	MINIMUM FIRE-RESISTANCE RATING	MINIMUM FIRE SEPARATION DISTANCE
Walls	Fire-resistance rated	1 hour—tested in accordance with ASTM E119 or UL 263 with exposure from both sides	< 5 feet
	Not fire-resistance rated	0 hours	≥ 5 feet
Projections	Not allowed	N/A	< 2 feet
	Fire-resistance rated	1 hour on the underside <sup>b</sup>	≥ 2 feet to < 5 feet
Openings in walls	Not fire-resistance rated	0 hours	≥ 5 feet
	Not allowed	N/A	< 3 feet
Penetrations	25% maximum of wall area	0 hours	3 feet
	Unlimited	0 hours	5 feet
Penetrations	All	Comply with Section R302.4	< 3 feet
	All	None required	3 feet

For SI: 1 foot = 304.8 mm.  
N/A = Not Applicable.  
a. Roof eave fire-resistance rating shall be permitted to be reduced to 0 hours on the underside of the eave if fireblocking is provided from the wall top plate to the underside of the roof sheathing.  
b. Roof eave fire-resistance rating shall be permitted to be reduced to 0 hours on the underside of the eave provided that gable vent openings are not installed.

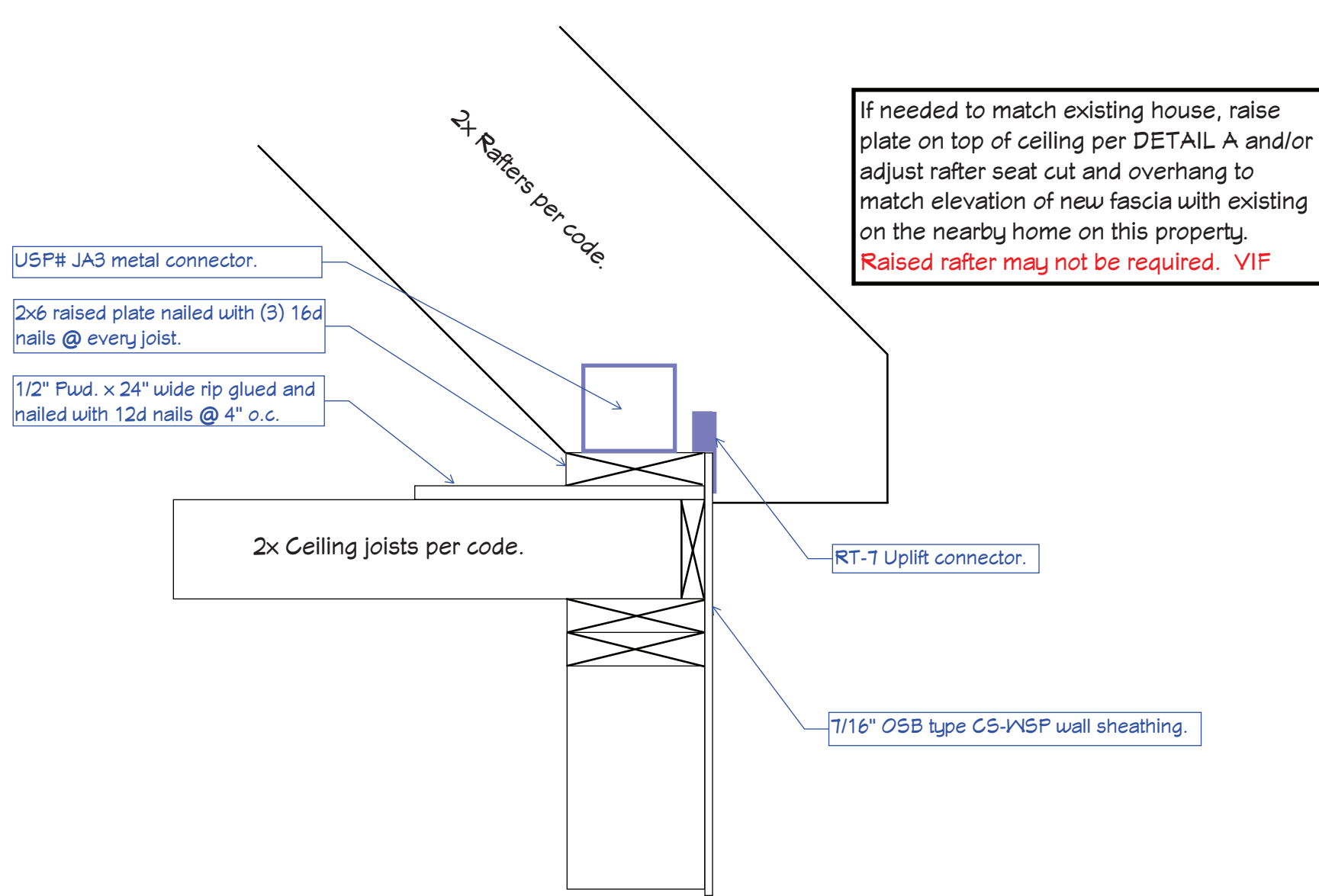
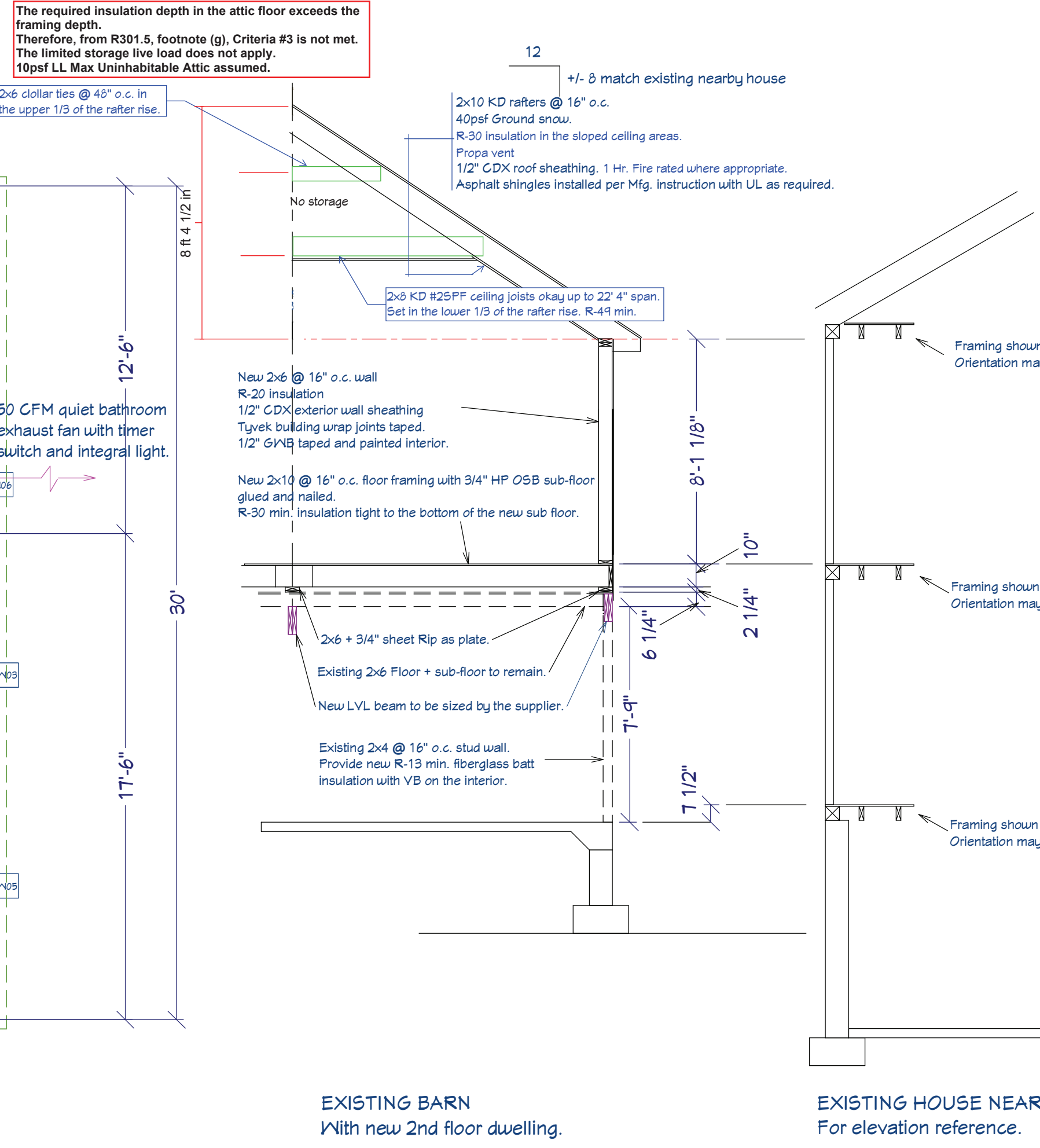
This building is within 5' of portions of the adjacent building. 1-Hour Fire rated construction required on this side of the building for all components within 5' of adjacent structures. Since the adjacent building on the next property is within 4' of the exterior wall of this building, The entire west wall should be 1 Hour Rated interior and exterior.

Since the eaves are also required to be of fire resistant construction, a continuous vented eave is impossible. Therefore, insulation to be installed in the rafters as a "Hot Roof". Water based closed cell spray applied expanding foam to be used to achieve R-38 min. as an integral VB.



**WINDOW SCHEDULE**

NUMBER	QTY	LABEL	SIZE	R/O	EGRESS	TEMPERED	COMMENTS
W01	1	5450MU	5450	70"X61"			
W02	1	606B	606B L EX	74"X83"	YES		
W03	1	3032DC	3032DC	37"X39"			
W04	2	21050DH	21050DH	35"X61"			
W05	1	21050DH	21050DH	35"X61"	YES		
W06	1	2620AVN	2620AVN	31"X25"			



**Raised Rafter  
Detail A - NTS**

**General Notes:**  
Dimensions are to face of framing or Foundation  
Interior walls are 2x4 studs @ 16" o.c.  
Exterior walls and other insulated walls adjacent to unconditioned space are 2x6 stud framed @ 16" o.c. U.N.O.

Provide separate switched light fixture connections over vanities and in each bathroom ceiling. Additionally provide a 50 CFM quiet exhaust fan (Can be combined with ceiling light) with a timer switch.

Provide GFCI double outlet on the wall adjacent to each vanity.

SD indicates smoke detector.  
CO indicates CO2 detector.  
HD indicates heat detector.

Interconnect all SD, CO, HD, and SD/CO devices in the new structure and the existing home to sound an alarm when any or all are activated. Provide and install in accordance with current code requirements. The existing home systems must also be brought up to current standards.

SD/CO detectors within 20 ft. of a kitchen or bathroom must be "Photo-electric" type.

All detection devices must be hard wired AC power with battery backup unless existing ceiling finishes must be removed to install the hard wiring.

Electric lighting and outlets are to be provided as required by code. Additional outlets, fixtures, or other equipment are optional and are to be coordinated between the owner and the builder prior to rough in.

Exterior security and decorative lighting is not shown but should be provided at the owner's discretion.

ENERGY CONSERVATION per MA STRETCH ENERGY CODE for new work.

**Ceiling Framing Notes:**

- Ceiling joists to be 2x8 KD #25PF @ 16" o.c.
- Joists supported by flush framing members to be hung from same with metal joist hangers. Connect opposing joists across the bottom of the supporting girder with LSTA21 metal straps or similar to provide a continuous rafter tie.
- Headers for exterior wall openings to be per R602.7(1)
- Headers for interior bearing wall openings to be per R602.7(2)

**ROOF CONSTRUCTION NOTES:**

- All rafters are 2x10 KD #25PF @ 16" o.c. U.N.O.
- Ridge boards are 2x12KD + 2x4KD to cover the rafter slash cuts. U.N.O.
- Overlay roof rafters to bear on 2x KD valley cleats.
- Cleats are to be properly fastened through the lower roof sheathing into the lower roof rafters.
- Provide 1/2" CDX sheathing and 15# roof felt -OR- 1/2" "Zip-Roof" sheathing system with taped seams.
- Provide ice and water shield as follows: 2-rows x 36" wide at eaves, 1-row 36" wide at rakes and centered in valleys.
- Provide aluminum drip edge around the perimeter of all roof areas. Provide step flashing wherever a sloped roof meets a wall.
- Provide roof shingles to match existing. At a minimum, cover all new roof areas plus existing areas disturbed by this construction.
- Provide a continuous vented ridge and soffits.
- Soffit and rake overhangs to match existing. Adjust seat / plate bearing heights to accommodate. Min. seat cut = 1-3/4"
- Rafters supported by perpendicular ridge beams should be connected with toe nails per code PLUS (1) JA3 metal 90 deg. framing connector set low on the rafter slash cut.
- Rafters supported by sloped valley or hip beams should be connected with toe nails per code PLUS (1) MP9 bendable metal framing connector set low on the rafter slash cut.

All NEW framing and construction to be in accordance with MA Code 780 CMR 9th Edition and IRC 2015 for 1 & 2 Family Residential Construction. While good faith effort has been made to incorporate as much of that information as practical in these documents, human error or omission is possible. It is the licensed builder's responsibility to review these documents prior to construction and to proceed in accordance with applicable codes.

Project Description:  
**Barn: 2nd Floor Expansion /  
Roof Raise**

Project Owner:  
**Hackanson**  
19 Hastings Street  
Mendon, MA

DATE:  
12/1/2019

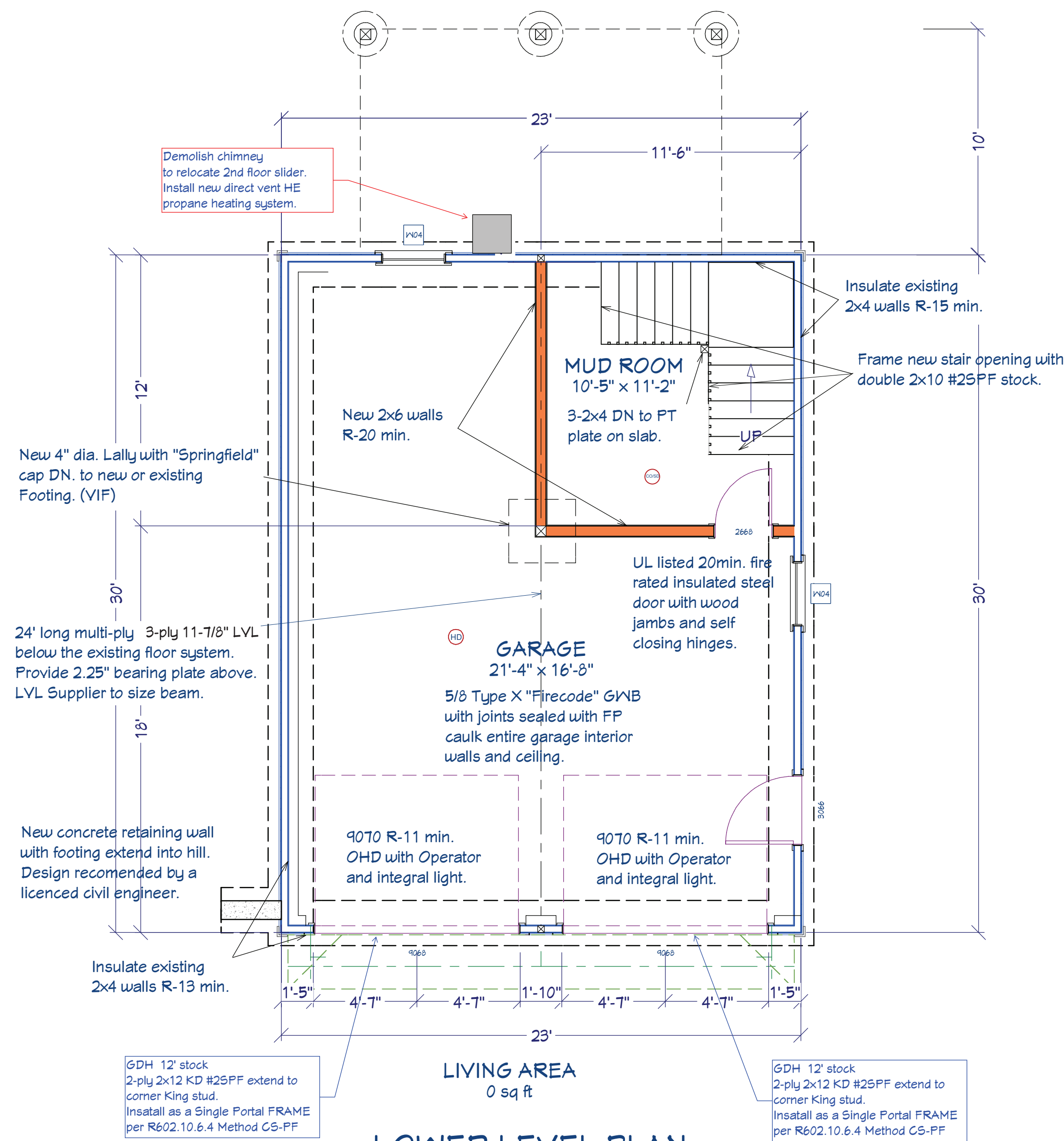
SCALE:

SHEET:  
**A-2**

REVISION TABLE

NUMBER	DATE	DESCRIPTION

UPPER LEVEL  
PLAN



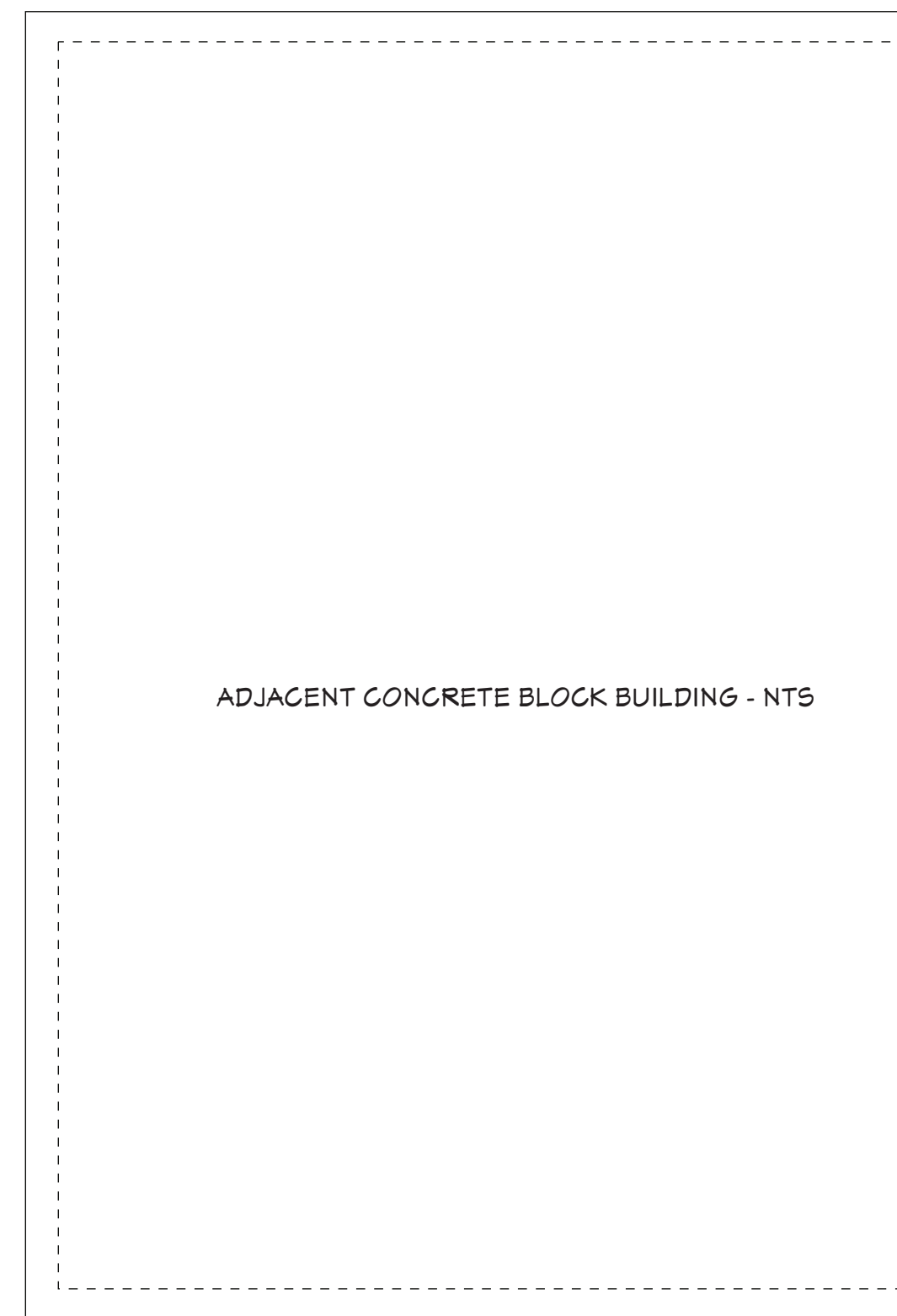
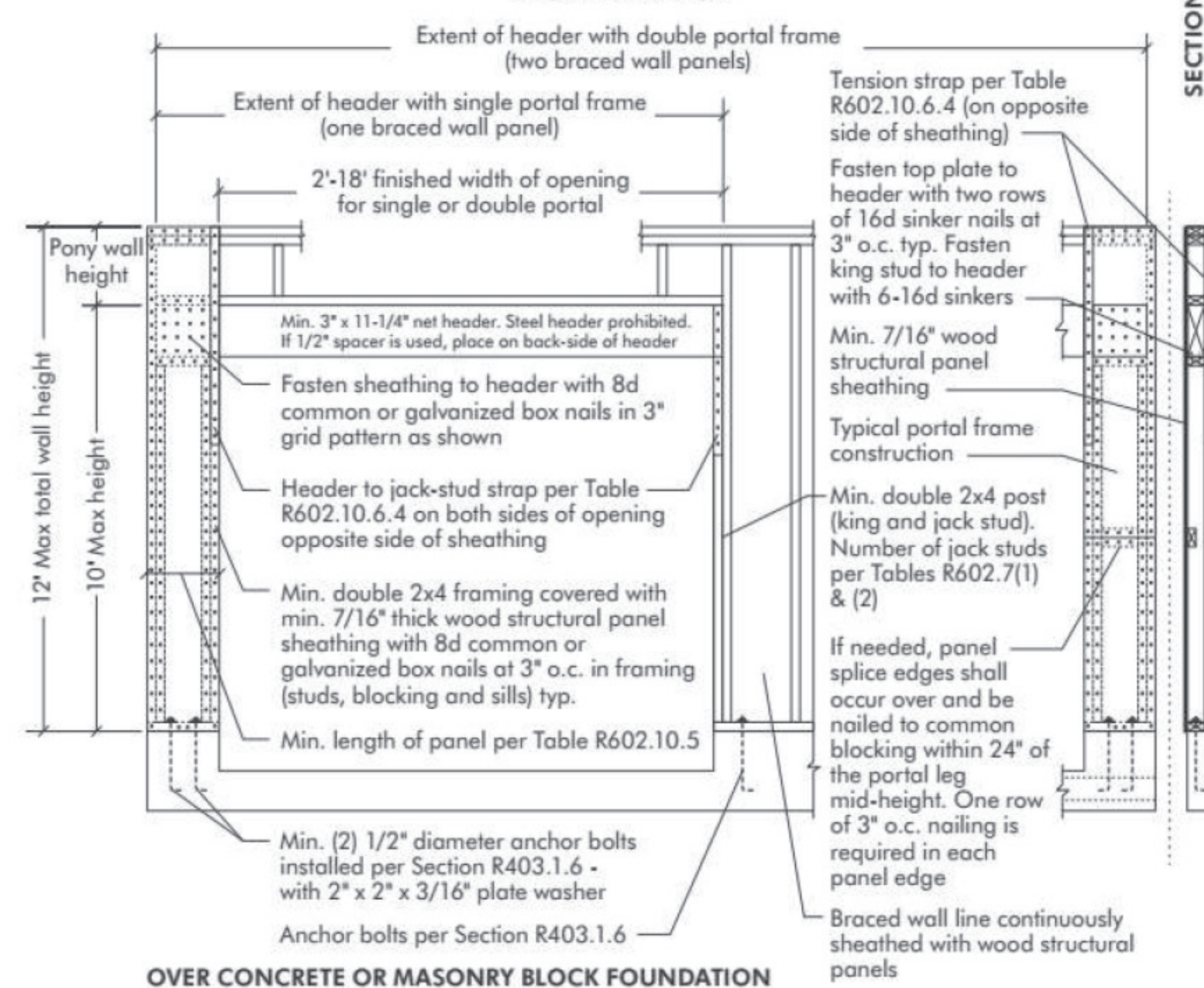
**LOWER LEVEL PLAN**

Foundation  
1/4" = 1'-0"

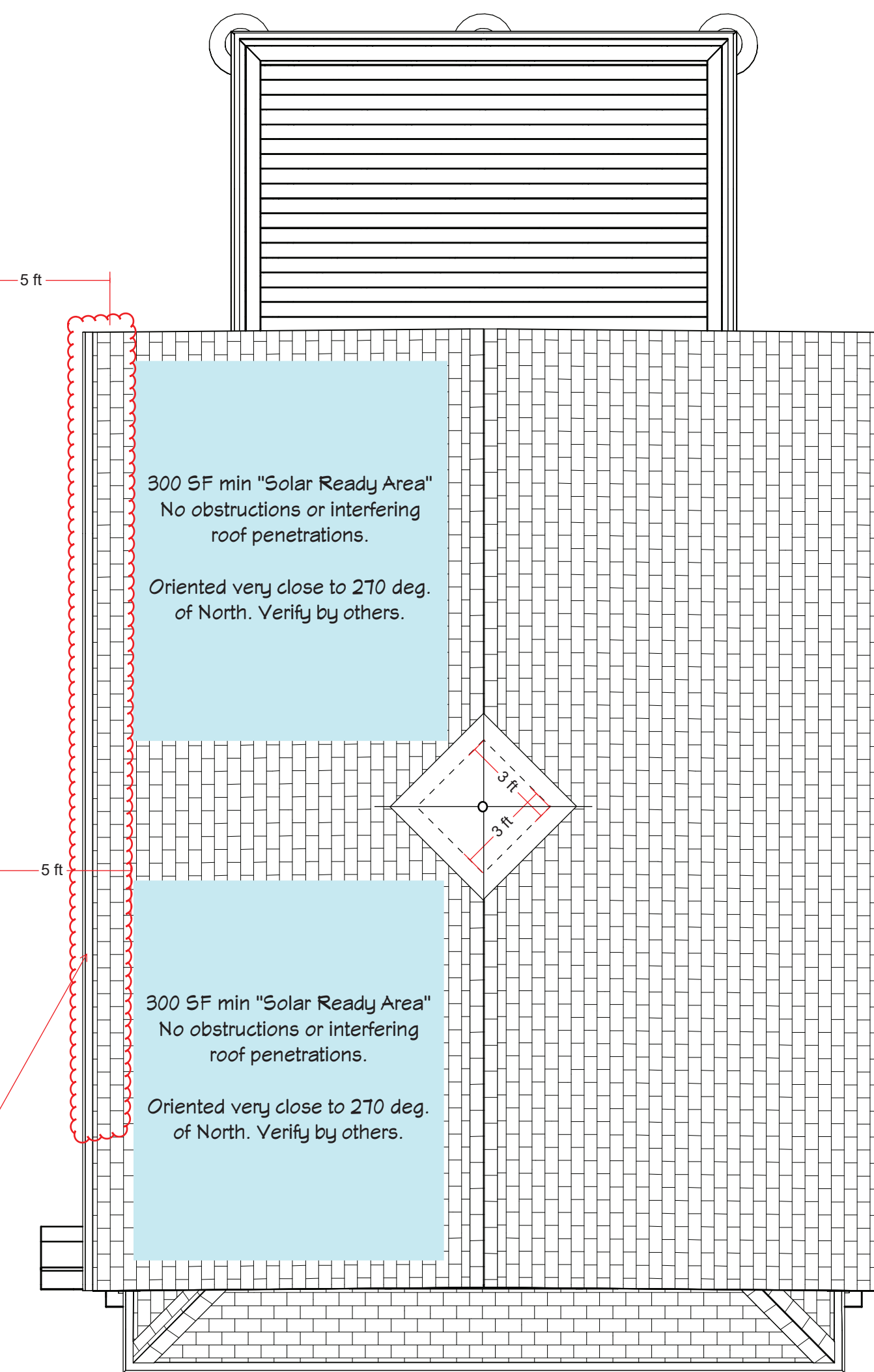
2015 INTERNATIONAL RESIDENTIAL CODE® COMMENTARY

FIGURE R602.10.6.4

METHOD CS-PF—CONTINUOUSLY SHEATHED PORTAL FRAME PANEL CONSTRUCTION  
FRONT ELEVATION

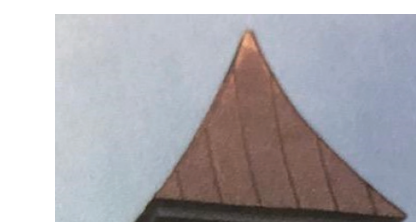
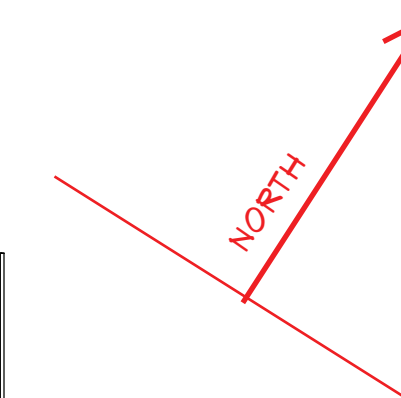


New construction within 5' of adjacent building fascia to be 1-Hour Fire rated construction inside and out. See Sheet A-2



**ROOF PLAN**

1/4" = 1'-0"  
No South Facing Roof Areas



Suggestion:  
Copper standing seam Cupola Roof.  
Contact Bob Sweet  
Mendon MA

REVISION TABLE	
NUMBER	DATE / DESCRIPTION

**LOWER LEVEL PLAN**

Project Description:  
**Barn: 2nd Floor Expansion / Roof Raise**

Project Owner:  
**Hackanson**  
19 Hastings Street  
Mendon, MA

DATE:  
12/1/2019

SCALE:

SHEET:

**A-3**

All NEW framing and construction to be in accordance with MA Code 780 CMR 9th Edition and IRC 2015 for 1 & 2 Family Residential Construction. While good faith effort has been made to incorporate as much of that information as practical in these documents, human error or omission is possible. It is the licensed builder's responsibility to review these documents prior to construction and to proceed in accordance with applicable codes.