Xcel Energy®

What to Look for Series Commercial Roofs

What are the requirements?

How should it be shown on the plans?

How should it be installed in the field?

What should I be looking for?

SHUMS CODA ASSOCIATES

Group 14 ENGINEERING

BUILDTank inc.

What are the requirements?
Commercial Roofs

Insulation Requirements

C103.2 (2018 & 2021)

- Insulation R-values and type of insulation listed on plans

C303.1.1 & C303.1.1.1 (2018 & 2021)

- Provide insulation certificate
    - R-value, Thickness (initial and settled), Density, #of bags, and Coverage area
- Attic markers every 300 sq ft with numbers in 1 inch height facing access opening

Insulation Entirely Above Deck

C402.2.1 (2018) C402.1.4.1, C402.1.4.1.1 & C402.1.4.1.3 (2021)

- U-factor of roof assembly shall not exceed Table C402.1.4 or it shall meet the minimum values of Table C402.1.3
- If using assembly U-factor option—the roof slope thickness must use the average thickness in inches with the R-value per inch in calculations—only for U-Factor, C-factor, F-Factor option
- Continuous insulation must have a minimum of 2 layers
- All joints and seams in layers must be staggered exceptions gutter edge, roof drain or scupper

Metal Buildings

Table C402.1.3 footnote b (2018) Table C402.1.3 footnote b (2021)

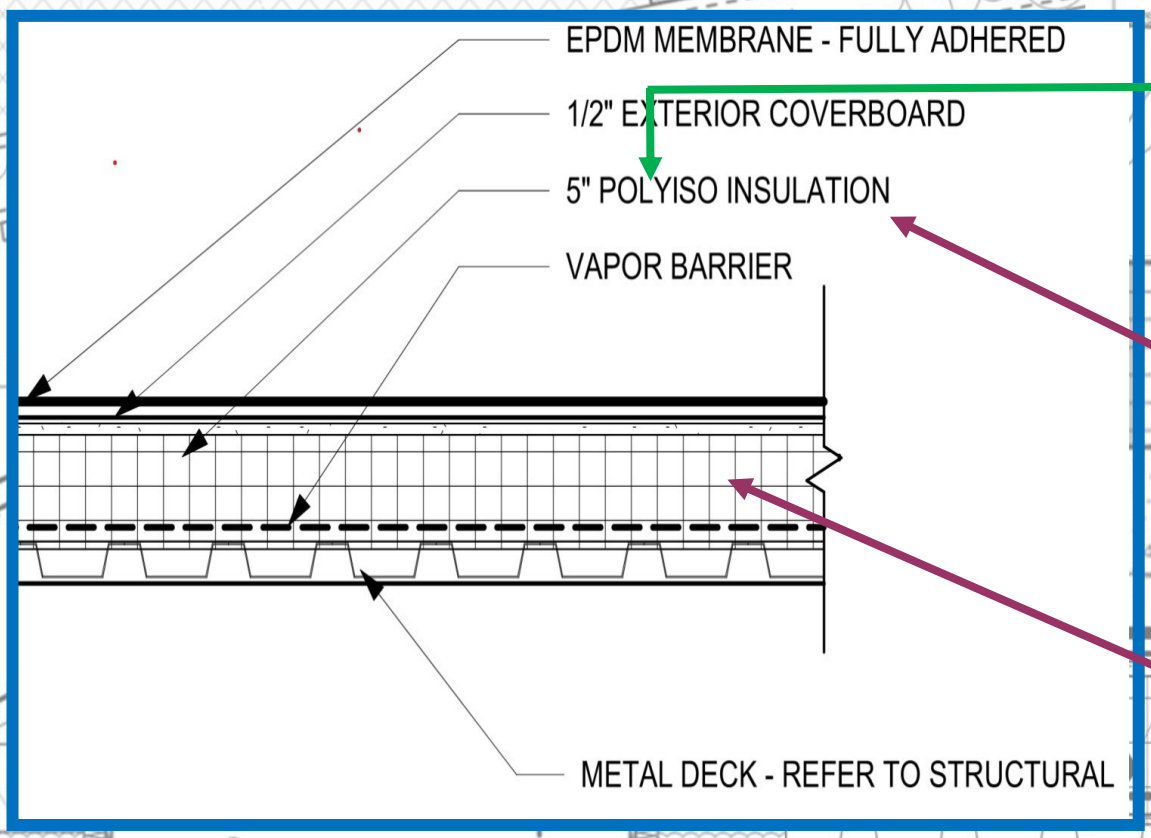
- If using the R-value based method a thermal spacer must be included in the linear system or you must use the U-Factor, C-Factor, F-Factor option

Attic and Other

C402.2.1 (2018) C402.1.4.1.2 (2021)

- Insulation on suspended removable ceiling tiles are not to be considered as part of the thermal envelope

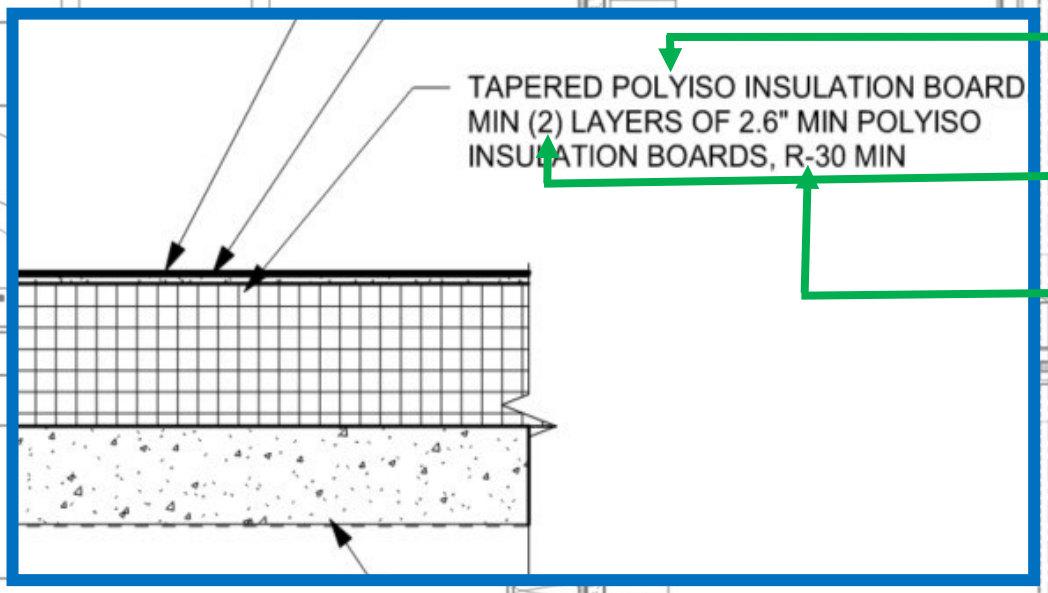
Commercial Roofs
Insulation Entirely Above Deck
for Plan Review



Type of insulation has been provided

Insulation R-values has not been provided

Insulation does not have a minimum of 2 layers



Type of insulation provided

2 layers of insulation provided on plans

R-value of insulation provided

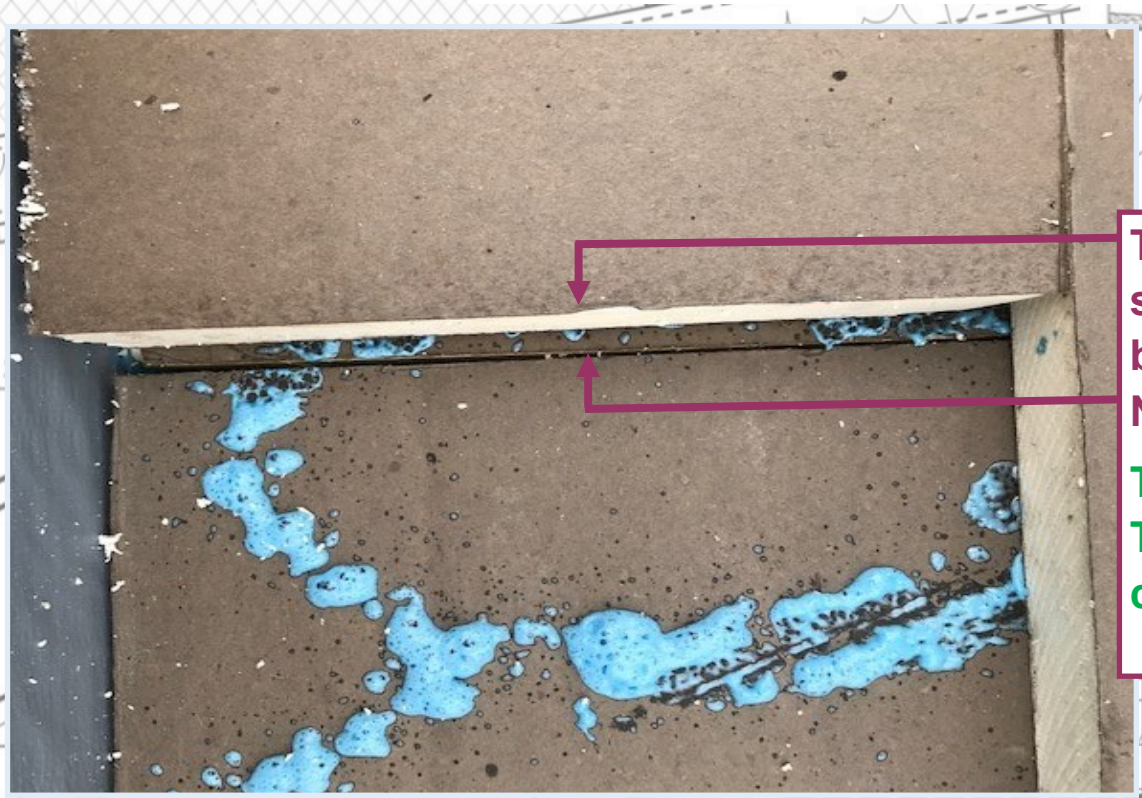
SHUMS CODA ASSOCIATES

Group 14 ENGINEERING

BUILDTank inc.

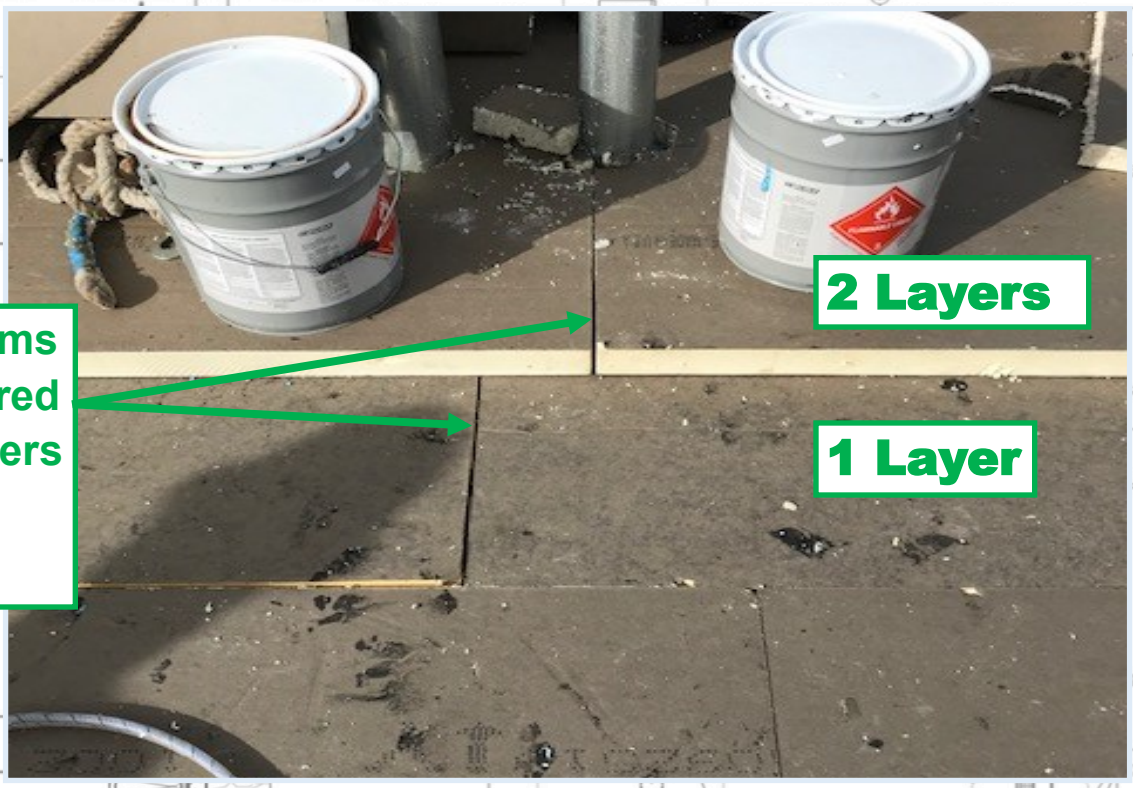
Xcel Energy®

Commercial Roofs
Insulation Entirely Above Deck for Inspection



The joints and seams have not been staggered— Not a good install

There are 2 layers That meets the code



The joints and seams have been staggered and there are 2 layers installed– Good install

SHUMS CODA ASSOCIATES

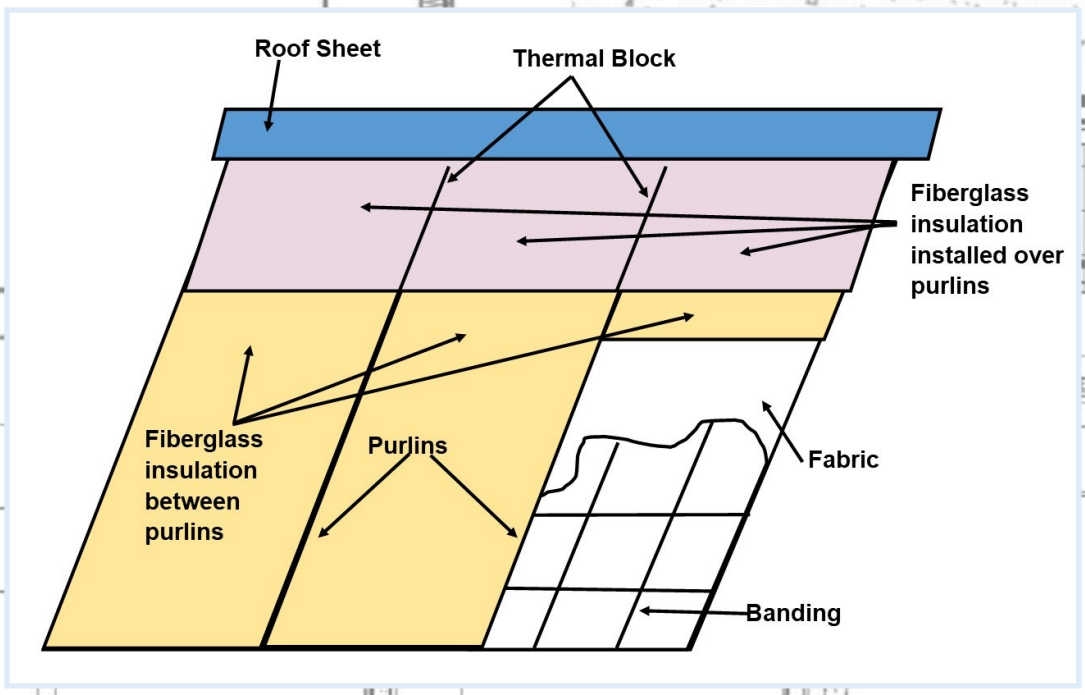
Group 14 ENGINEERING

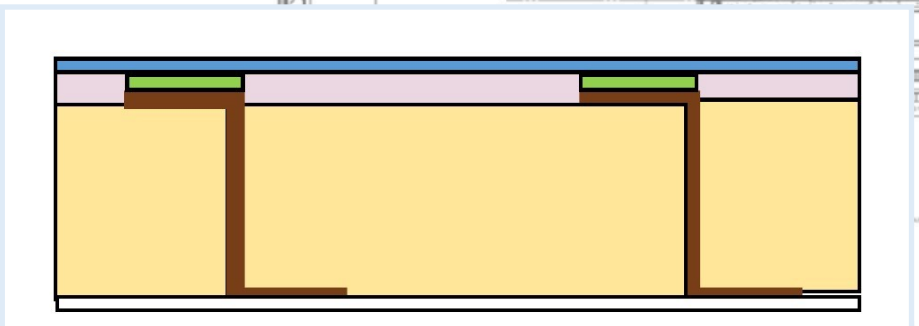
BUILDTank inc.

Commercial Roofs
Metal Buildings Design

Linear System Includes the Following Items:

- Continuous vapor barrier liner membrane
  - Installed below purlins an uninterrupted by any framing members
- Uncompressed unfaced insulation resting on top of liner membrane and between purlins
- Multilayers required the second R-value is for unfaced insulation draped over purlins
  - The layer over purlins will be compress by roofing when attached

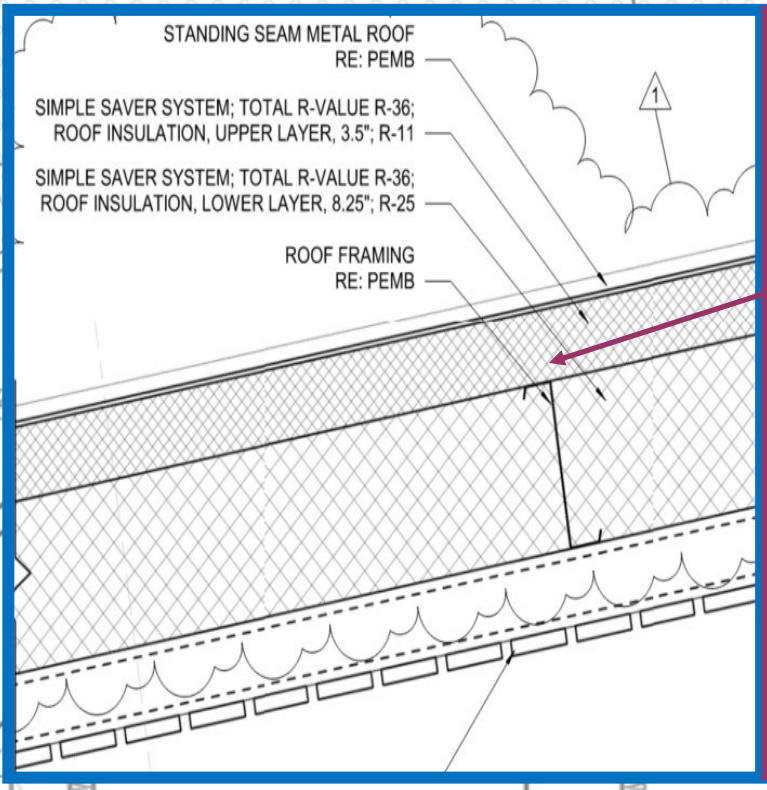




Xcel Energy®

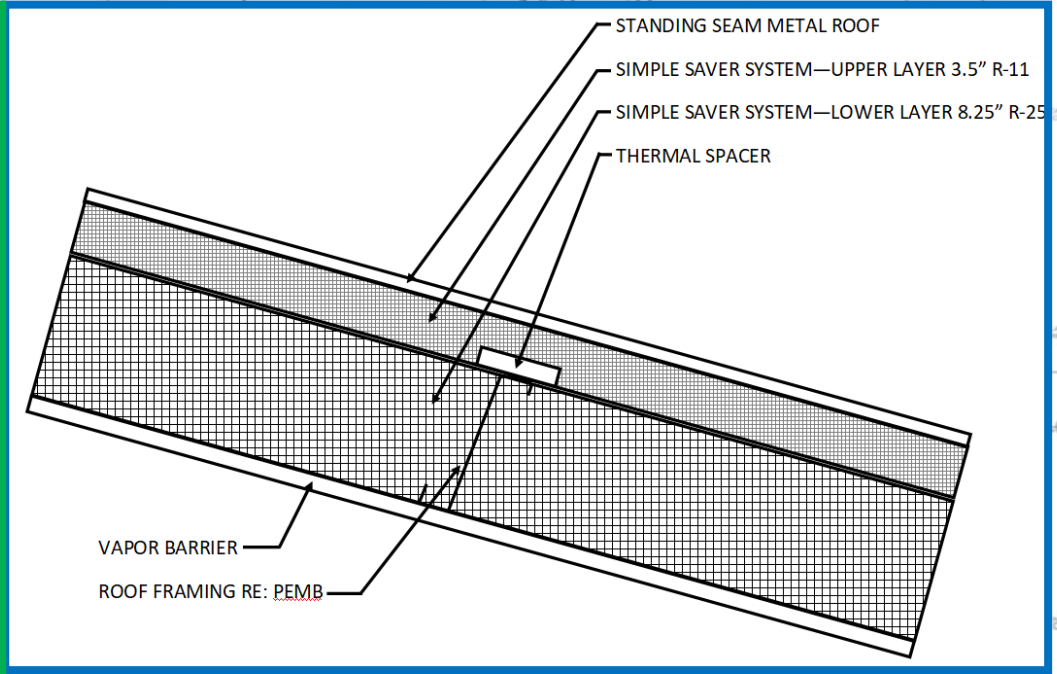
Commercial Roofs

Metal Roof for Plan Review



There are many systems available to be utilized with metal buildings. This system is common, but it is not shown to have a thermal spacer. Many of these systems contain options for with thermal spacer and without thermal spacer. It can not use the R-value path if no thermal spacer is provided, it must use the U-factor, C-factor, F-factor path. This may be a good design if they use the correct path for it, or have a thermal spacer.

This design contains all of the components required including the two layers of insulation, thermal spacer, and a vapor barrier. This is a good design.

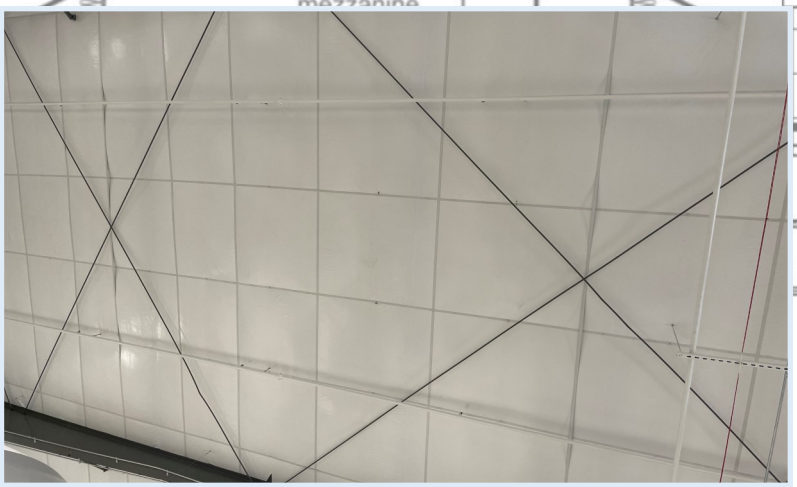


SHUMS CODA ASSOCIATES Group 14 ENGINEERING BUILDTank inc.

Commercial Roofs
Metal Buildings for Inspections

Metal building roofs may require multiple inspections to be able to verify the entire system. These can be combined with other inspections. Determine when you want to verify each layer or component.

This metal building roof has not had any of the system installed.

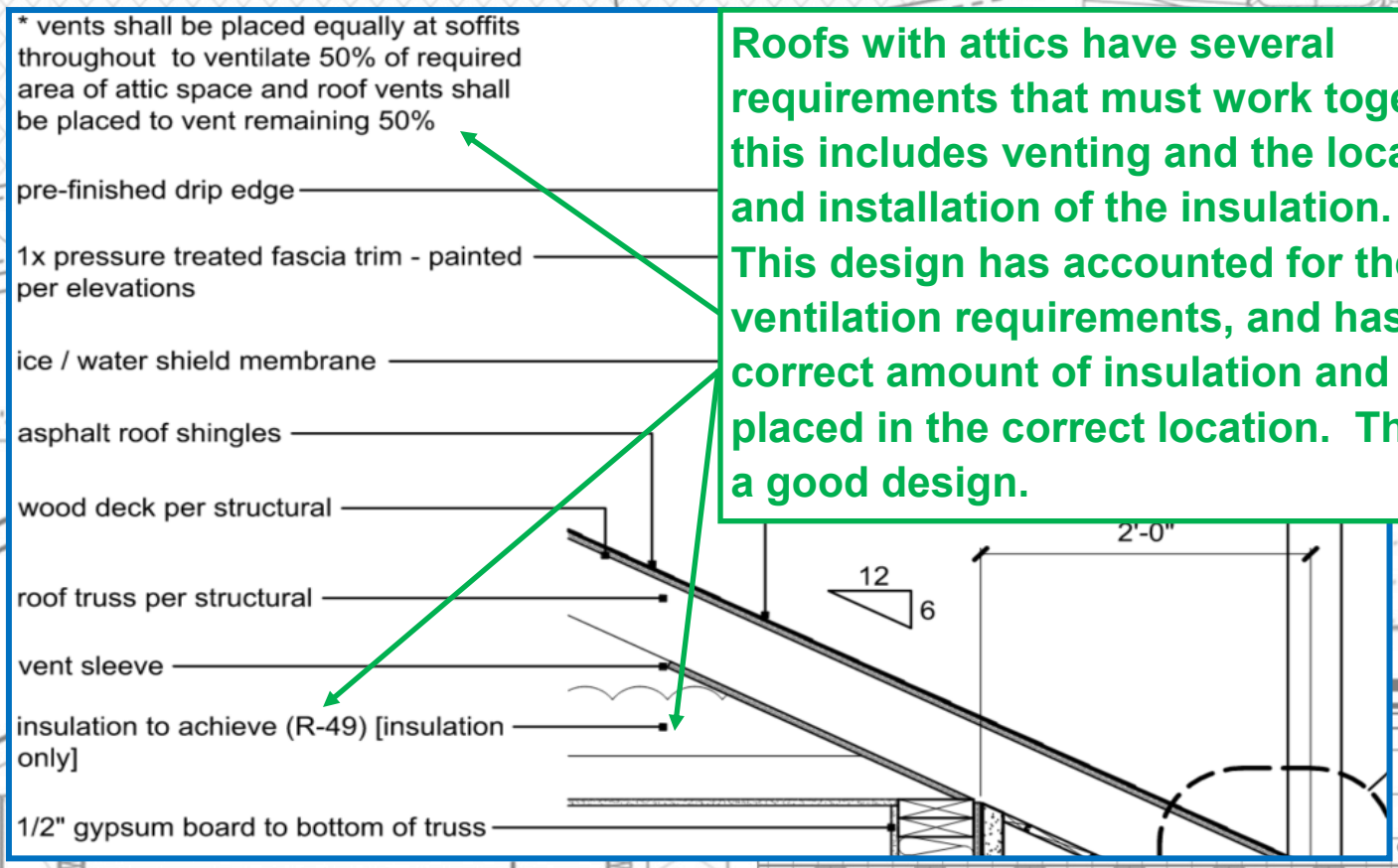


This metal building roof has had the system installed. Not able to verify anything but the continuous vapor barrier installation. No insulation nor thermal spacer is verifiable at this stage.

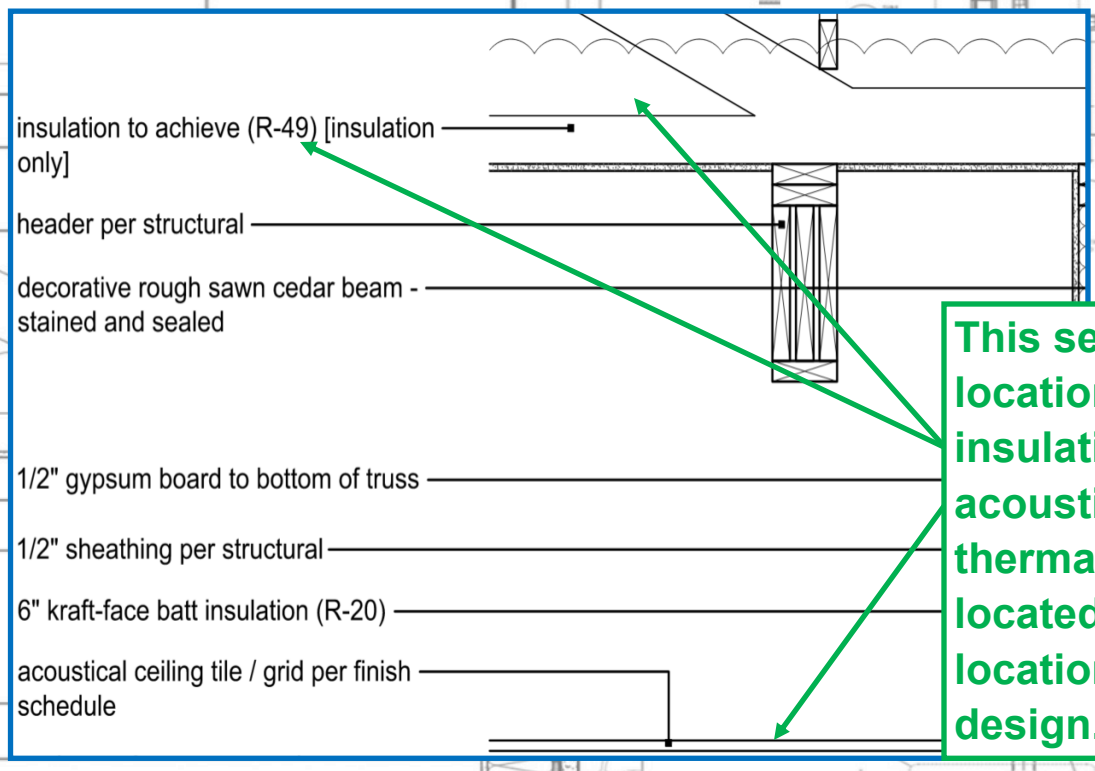
- For metal buildings two insulation inspections may be required. Or
- Perform one inspection:
  - Inspect that the layer between purlins is installed with the correct R-value, which can be seen from below.
  - Inspected the upper layer over the purlins with the correct R-value and the thermal spacer, if utilized, from above.
- Before final inspect verify that the vapor barrier has been installed

Commercial Roofs

Attic Roofs for Plan Reviews



Roofs with attics have several requirements that must work together this includes venting and the location and installation of the insulation. This design has accounted for the ventilation requirements, and has the correct amount of insulation and placed in the correct location. This is a good design.



This section calls out the location of the attic insulation and calls out the acoustic ceiling tile. The thermal envelope is located in the correct location. This is a good design.

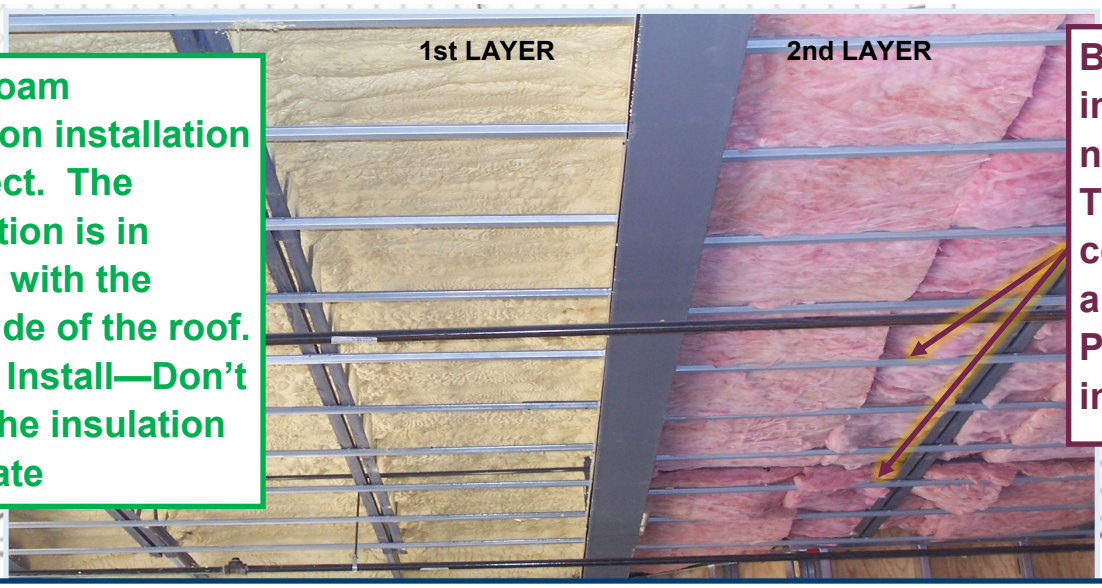
SHUMS CODA ASSOCIATES Group 14 BUILDTank inc.

Xcel Energy®

Commercial Roofs

Attic Roofs for Inspections

Spray foam insulation installation is correct. The installation is in contact with the underside of the roof. – Good Install—Don't forget the insulation certificate



Batt insulation installation is not correct. The batts are compressed and stuffed– Partially bad installation

This design is for an unvented attic space which not only has to comply with the roof insulation R-values found in Tables C402.1.3 or C402.1.4, or other compliance path options but must also comply with the requirements found in the Chapter 12 of the IBC for unvented attic or enclosed rafter spaces. This design contains the design for condensation control meeting 5.1.3. The insulation values found in Table 1202.3 of the IBC is the minimum air-impermeable values of the assembly, but the roof must meet the roof insulation values of the IECC also.

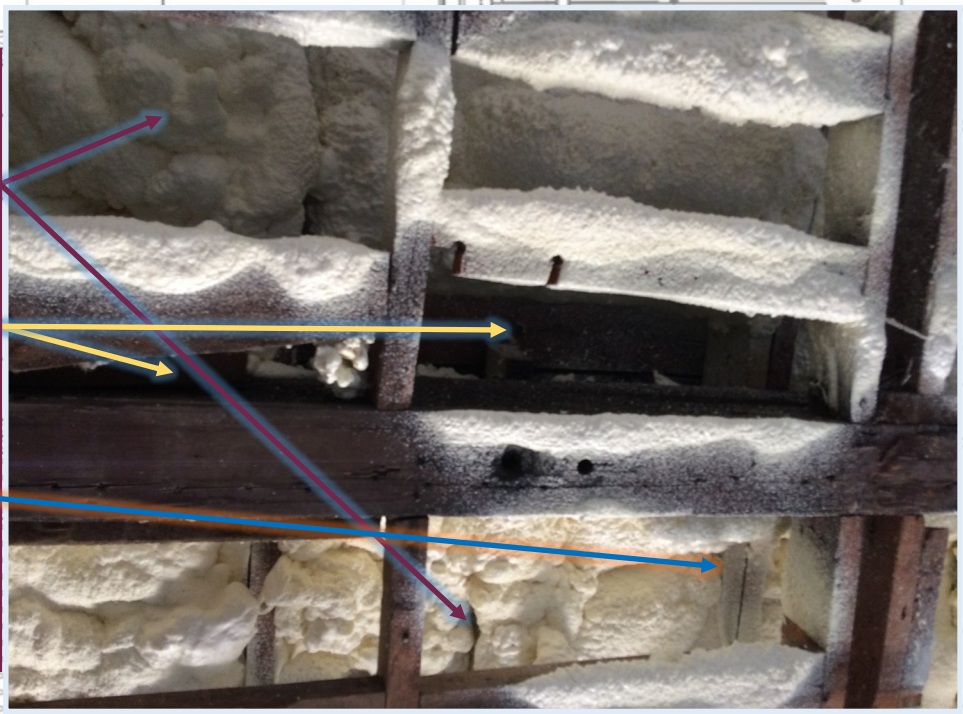
The enclosed rafter is not correct

The thickness of insulation is not consistent

There are locations within the rafters that do not contain any insulation

The insulation is not in contact with the underside of the roof decking

This is a bad installation



SHUMS CODA ASSOCIATES

Group 14 ENGINEERING

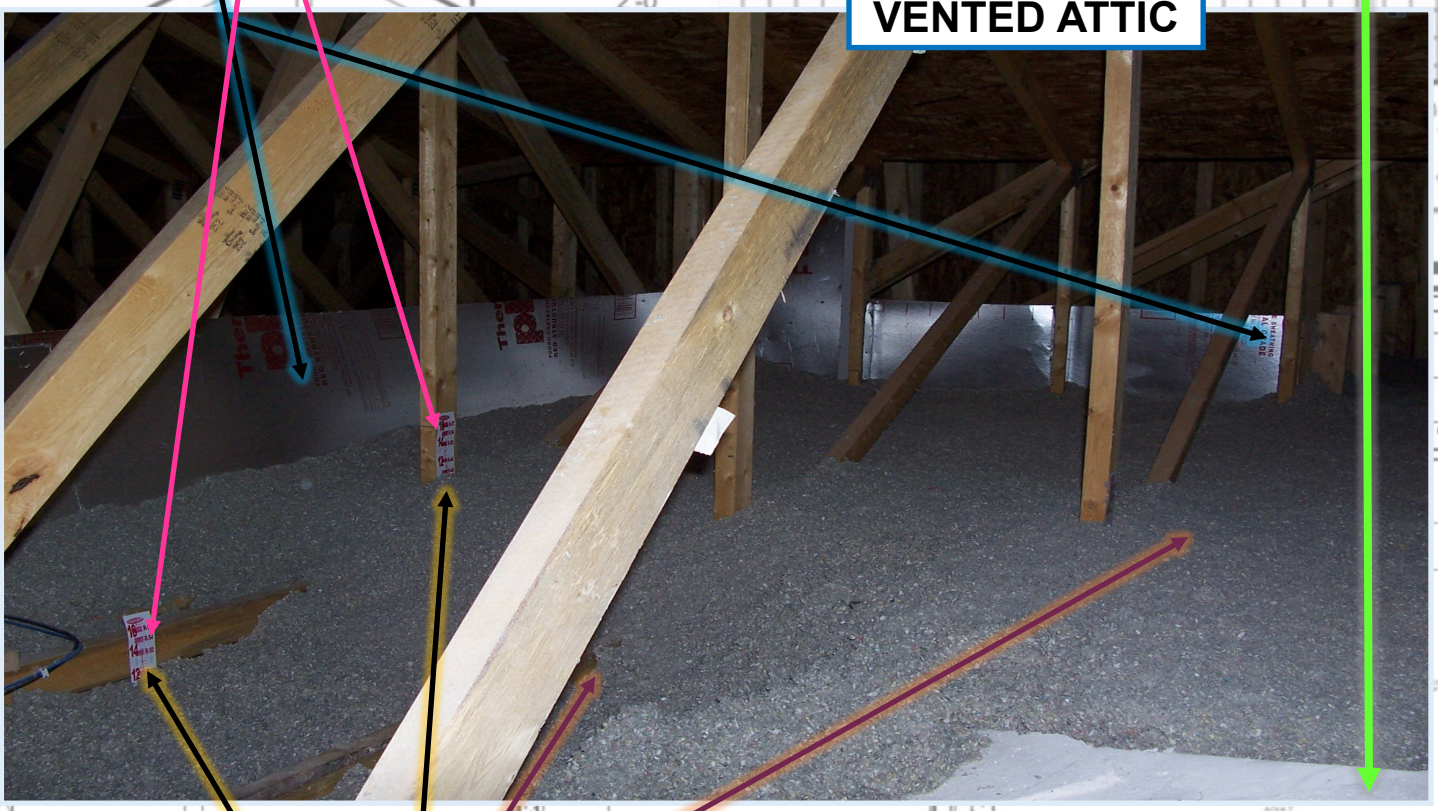
BUILDTank inc.

Commercial Roofs

Attic Roofs for Inspections

Good Installations

- Insulation dams have been provided at ceiling height changes for full insulation depth install.
- Insulation depth markers have been provided.
- Insulation depth markers are facing access opening.



Bad Installation or Missing Items:

- Blown in insulation depth is not consistent—(this could be to settling or a poor installation)
- Insulation depth markers do not appear to installed at the same level—changes the appearance of the insulation depth
- Missing the insulation certificate