WELCOME

VENTED and UNVENTED

Roof/Deck Systems

OPTIMIZE

Envelope Engineering Ltd.

AGENDA

- WHY IMPORTANT
- CODE
- THEORY
- EXAMPLES
- QUALITY CONTROL

WHY IMPORTANT

IMPORTANT

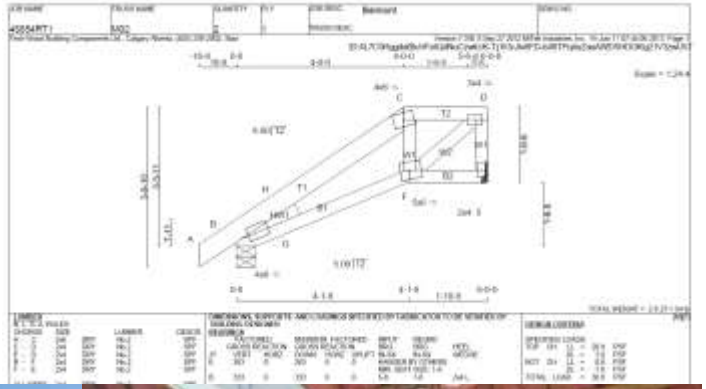
- More “attic rain”
- Complex buildings
- Longer warranty periods

IMPORTANT

- Design considerations
- Think about options early in process
- Design, construction, cost, sequencing

IMPORTANT

- Vented isn't only option
- Doesn't always work



IMPORTANT

- “The Ventilation of Insulated Roofs” - Ottawa 1985 NRCAN

CONCLUSION

To reduce the risk of problems resulting from condensation or hoarfrost in the roof space, it is recommended that the relative humidity inside the building be kept at a low level, and that the ceiling be made as airtight as possible. The total net vent area should be at least equal to 1/300th or 1/150th of the insulated ceiling area (depending on the type of roof space), and be distributed between the upper and lower parts of the roof. Air circulation should be unrestricted by insulation material or the roof framing.

Attic ventilation in the Canadian North presents a more difficult design problem. The intense cold, the short drying season, the fine snow and the high winds have proven conventional venting techniques unsatisfactory. Designing for these conditions may require more elaborate solutions and should be undertaken only by those experienced in cold climate design.

IMPORTANT

IMPORTANT

OPTIMIZE
Envelope Engineering Ltd.

awareness *responsibility* *standards*

CODE

CODE

9.19.1. Venting

9.19.1.1. Required Venting

1) Except where it can be shown to be unnecessary, where insulation is installed between a ceiling and the underside of the roof sheathing, a space shall be provided between the insulation and the sheathing, and vents shall be installed to permit the transfer of moisture from the space to the exterior. (See Appendix A.)

A-9.19.1.1.(1) Venting of Attic or Roof Spaces. Controlling the flow of moisture by air leakage and vapour diffusion into attic or roof spaces is necessary to limit moisture-induced deterioration. Given that imperfections normally exist in the vapour barriers and air barrier systems, recent research indicates that venting of attic or roof spaces is generally still required. The exception provided in Article 9.19.1.1. recognizes that some specialized ceiling-roof assemblies, such as those used in some factory-built buildings, have, over time, demonstrated that their construction is sufficiently tight to prevent excessive moisture accumulation. In these cases, ventilation would not be required.

CODE

- Insulation on top – no venting required
- Insulation below
  - Vent as per 9.19 or
  - Prove it is not required
- Fire code – solid soffits

CODE

2014 ABC – 1 page on VENTING requirements

9.19.1.2. Vent Requirements

1) Except as provided in Sentence (2), the unobstructed vent area shall be not less than 1/300 of the insulated ceiling area.

2) Where the roof slope is less than 1 in 6 or in roofs that are constructed with roof joists, the unobstructed vent area shall be not less than 1/150 of the insulated ceiling area.

3) Required vents may be roof type, eave type, gable-end type or any combination thereof, and shall be distributed

a) uniformly on opposite sides of the *building*,
b) with not less than 25% of the required openings located at the top of the space, and
c) with not less than 25% of the required openings located at the bottom of the space.

4) Except where each joist space is separately vented, roof joist spaces shall be interconnected by installing purlins not less than 38 mm by 38 mm on the top of the roof joists.

5) Vents shall comply with CAN3-A93-M, "Natural Airflow Ventilators for Buildings."

Standard WITHDRAWN

CODE

- “In particular, the rule requiring an attic ventilation ratio of 1:300 does not appear to have been justified at the time of its promulgation. The research that was intended to substantiate the rule fails to support it. The promulgation of the 1:300 rule went forward.” *The History of Attic Ventilation Regulation and Research, William B. Rose*

- “However, we believe it should not be a regulated practice.” *ASHRAE Journal*

CODE

2009 IRC, Section R806.4; 2012 IRC, Section R806.5, Unvented attic assemblies

Unvented attic assemblies (spaces between the ceiling joists of the top story of the roof rafters) shall be permitted if all of the following conditions are met:

1. the unvented attic space is completely contained within the building thermal envelope
2. no interior vapor retarders are installed on the ceiling side (attic floor) of the unvented attic assembly [2009 IRC]; no interior Class I vapor retarders are installed on the ceiling side (attic floor) of the unvented attic assembly [2012 IRC]
3. where wood shingles or shakes are used, a minimum ¼ inch vented air space separates the shingles or shakes and the roofing underlayment above the structural sheathing
4. in Climate Zones 5, 6, 7 and 8, any air-impermeable insulation shall be a vapor retarder, or shall have a vapor retarder coating or covering in direct contact with the underside of the insulation [2009 IRC]; in Climate Zones 5, 6, 7 and 8, any air-impermeable insulation shall be a Class II vapor retarder, or shall have a Class III vapor retarder coating or covering in direct contact with the underside of the insulation [2012 IRC]
5. either Items 5.1, 5.2 or 5.3 shall be met, depending on the air permeability of the insulation directly under the structural roof sheathing

CODE

- Commercial
  - All insulation on top
  - Simpliest
  - Often most expensive
  - Difficult tie-ins

CODE

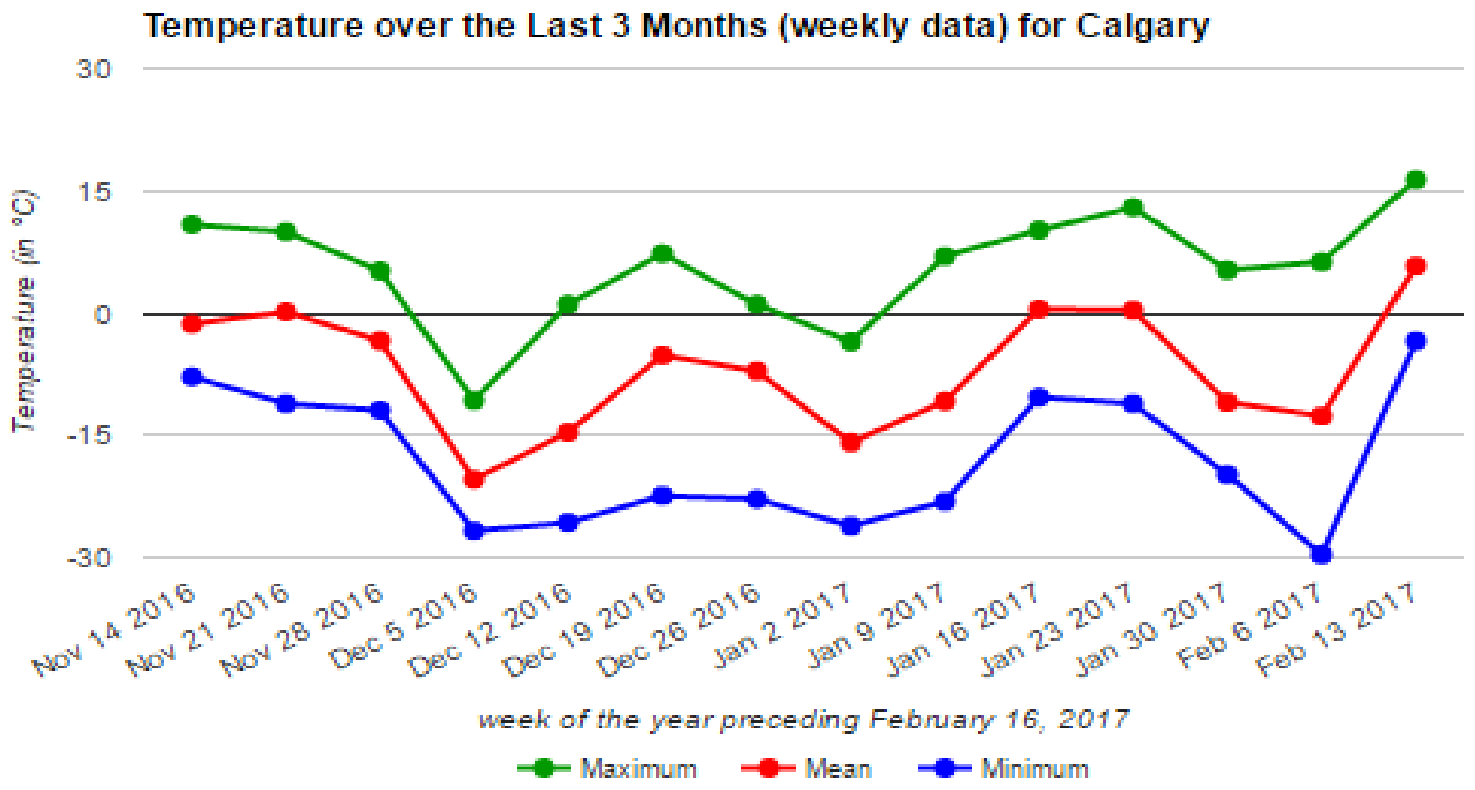
- Vented
  - Best for simple designs
  - Still may need guidance on amounts, type and location of vents
  - Still need to regulate interior humidity and ensure proper air/vapour barrier

CODE

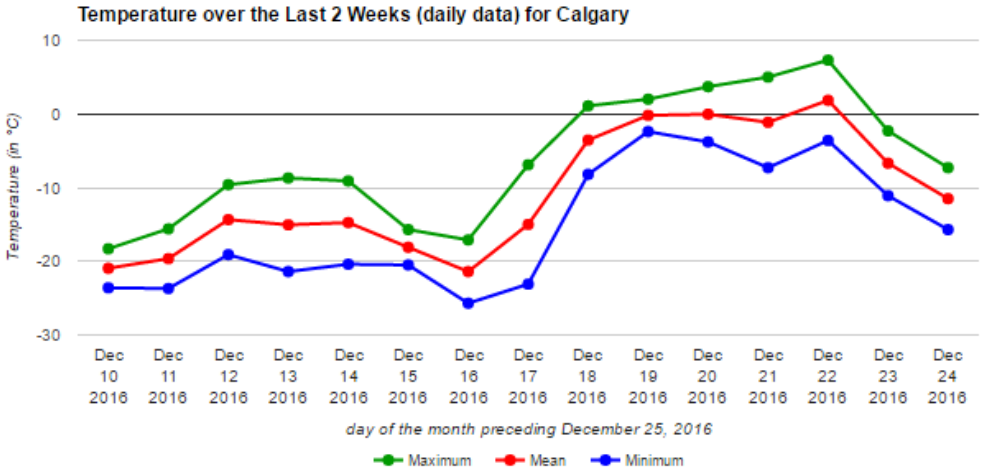
- Unvented
  - Technically allowed, but many AHJ require professional review
  - Allowed in IRC
  - Hopefully allowed in 2020 NBC

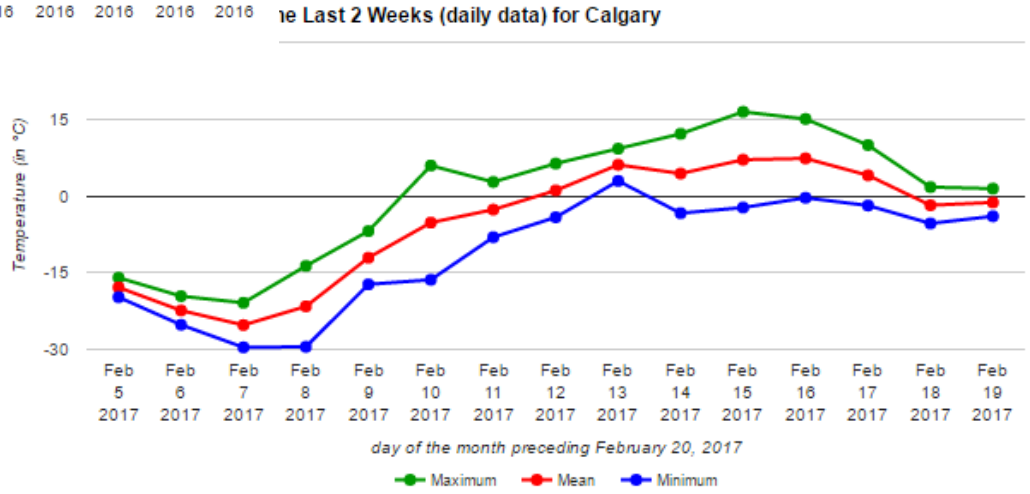
THEORY

THEORY


Temperature over the Last 3 Months (weekly data) for Calgary
30
15
0
-15
-30
Temperature (in °C)
Nov 14 2016
Nov 21 2016
Nov 28 2016
Dec 5 2016
Dec 12 2016
Dec 19 2016
Dec 26 2016
Jan 2 2017
Jan 9 2017
Jan 16 2017
Jan 23 2017
Jan 30 2017
Feb 6 2017
Feb 13 2017
week of the year preceding February 16, 2017
Maximum
Mean
Minimum

THEORY


Temperature over the Last 2 Weeks (daily data) for Calgary
Temperature (in °C)
10
0
-10
-20
-30
Dec 10 2016
Dec 11 2016
Dec 12 2016
Dec 13 2016
Dec 14 2016
Dec 15 2016
Dec 16 2016
Dec 17 2016
Dec 18 2016
Dec 19 2016
Dec 20 2016
Dec 21 2016
Dec 22 2016
Dec 23 2016
Dec 24 2016
day of the month preceding December 25, 2016
Maximum
Mean
Minimum


ıe Last 2 Weeks (daily data) for Calgary
Temperature (in °C)
15
0
-15
-30
Feb 5 2017
Feb 6 2017
Feb 7 2017
Feb 8 2017
Feb 9 2017
Feb 10 2017
Feb 11 2017
Feb 12 2017
Feb 13 2017
Feb 14 2017
Feb 15 2017
Feb 16 2017
Feb 17 2017
Feb 18 2017
Feb 19 2017
day of the month preceding February 20, 2017
Maximum
Mean
Minimum

THEORY

- 1940s buildings did not have vapour barriers
- To prevent condensation
  - Humidity control
  - Air/vapour control
  - **Ventilation**
- Helps drying if assembly gets wet
- Some belief it will help shingle life

THEORY

- Complications now-vented
  - Building complex, mixing roof types
  - More flat roof (increased density)
  - Wind driven rain (increased heights)
  - Roof assemblies vary
  - Fire Code
  - Buildings tighter
  - Previous assumptions don’t apply
  - No good design guidelines

THEORY

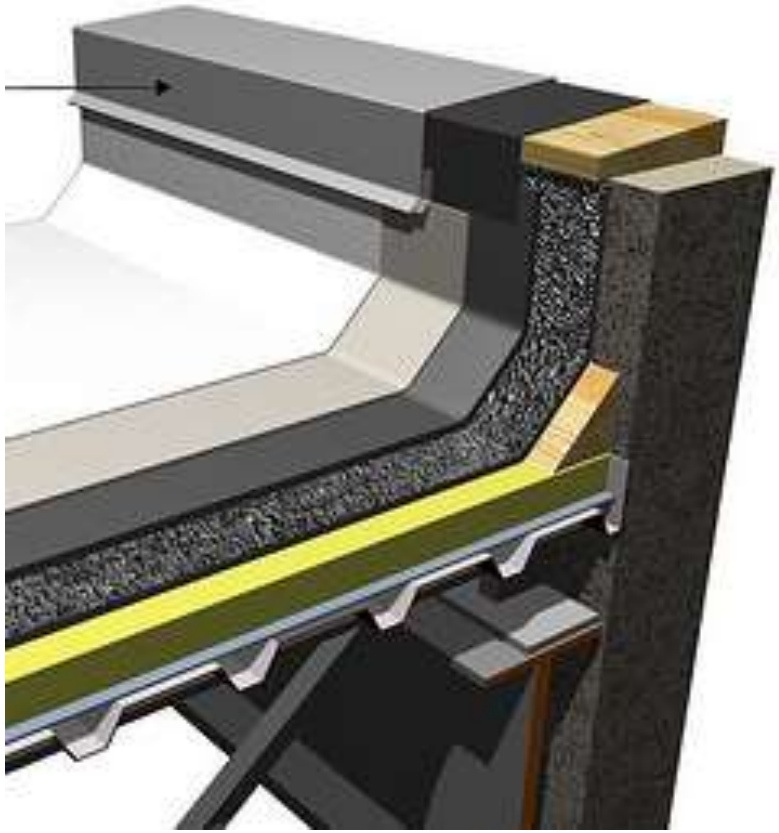
- Unvented basics
  - Done for years (cathedral, vaulted, flat)
  - Reduce chance of condensation
  - Depending on project, several ways
  - Spray foam, hybrid (foam/batt), cellulose/osb (passive)

*Building science.com

EXAMPLES

EXAMPLES

- Flat Roof-Commercial
  - Pros
    - easy installation
    - slope
  - Cons
    - Expensive
    - Can get high
    - Wall vapour barrier tie-in



EXAMPLES

- Builders and designers don’t consider ventilation at beginning
- Just add more vents
- Add a power vent
- Ventilation often an afterthought

EXAMPLES

- Vented with baffles

EXAMPLES

- When to consider unvented
  - Decks over living
  - Don’t have 63mm min free airflow
  - Blocked ventilation paths
  - Complex roofs
  - Flat roofs

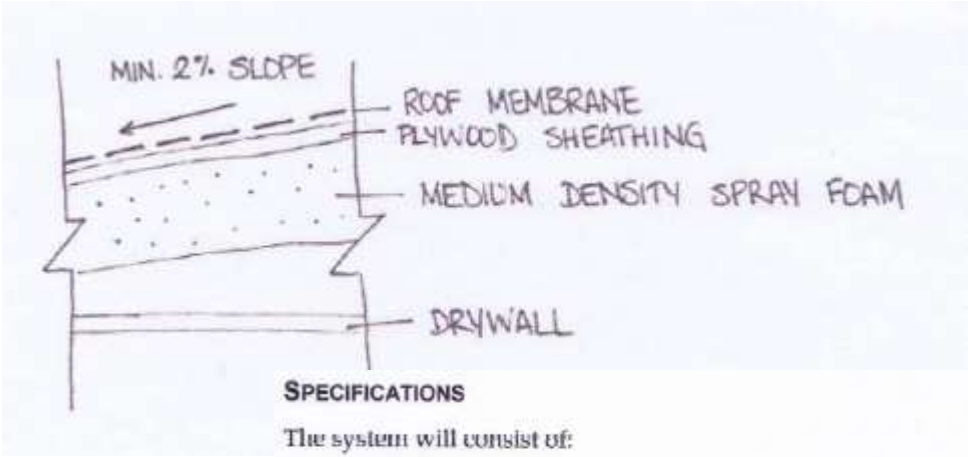
EXAMPLES

- Can do unvented for standard roofs

EXAMPLES

- Completed over 230 unvented roof projects since November 2014
- Each project unique requires
  - Assembly
  - Specifications
  - Initial stamp
  - City of Calgary – site review
- Roof/deck installation not part of unvented design

EXAMPLES

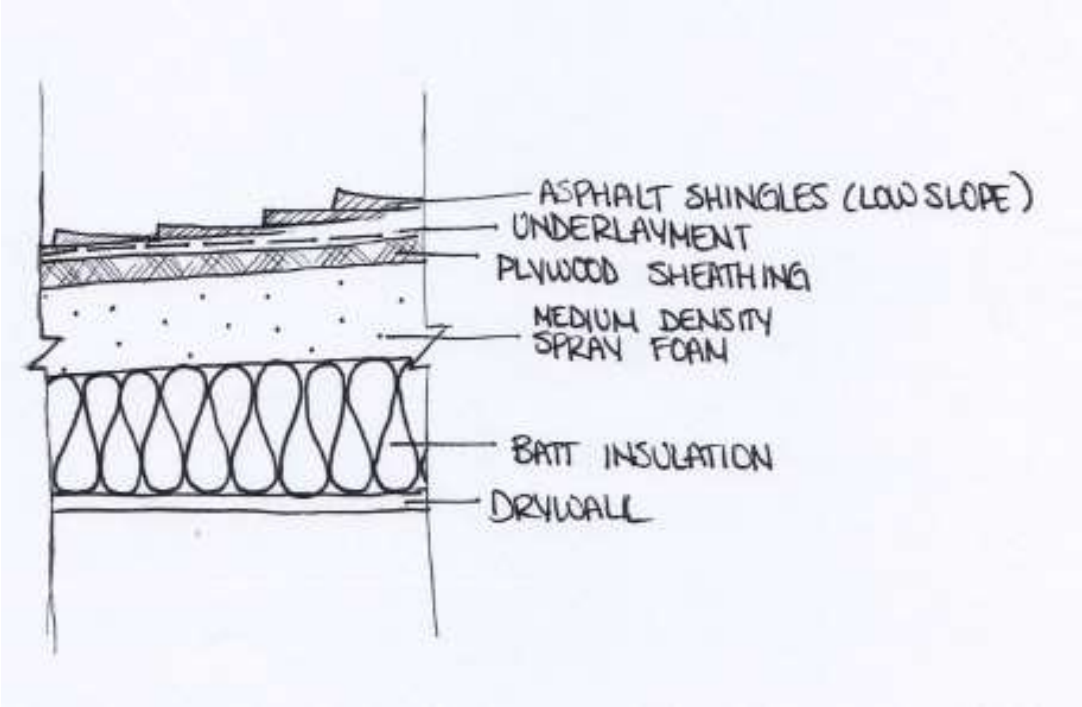


SPECIFICATIONS

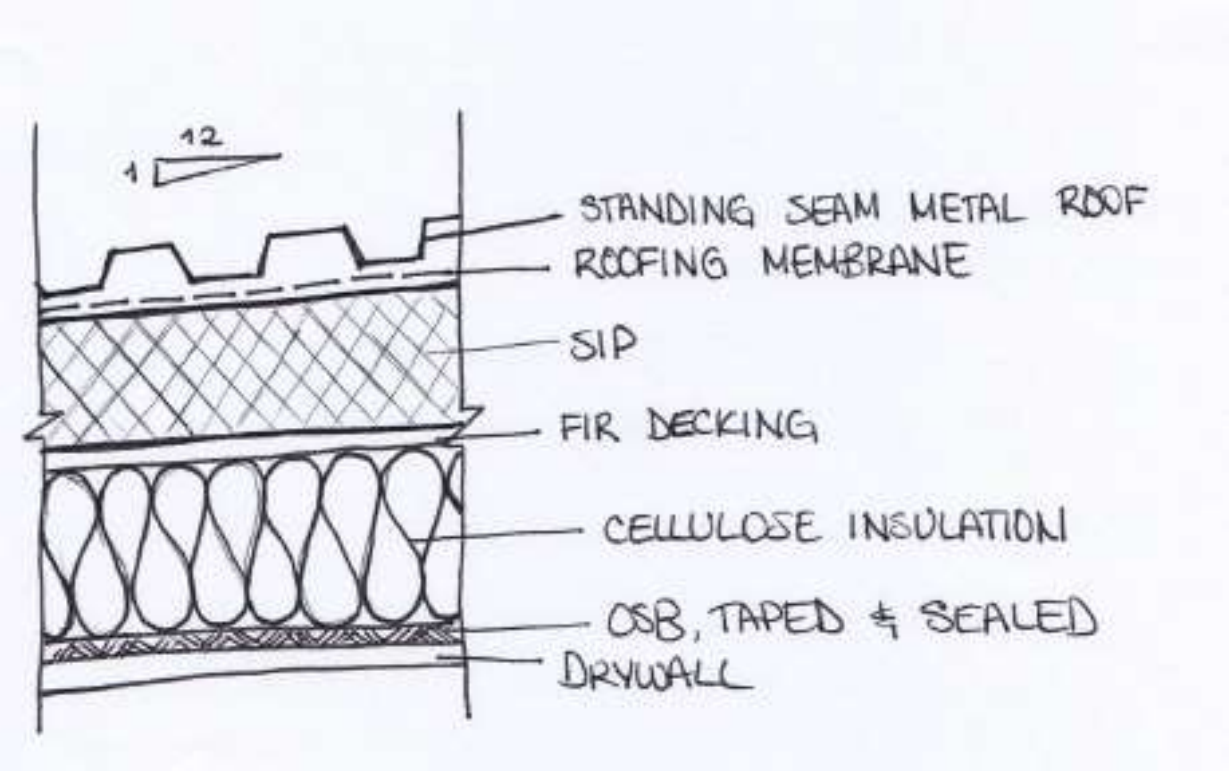
The system will consist of:

- Roofing membrane
  - Finished decking above membrane at 2nd storey deck
- Plywood sheathing*
- Min. 2% slope
- Roof framework
- Min. 150mm (6 in.) of medium density spray foam (Foamsulate-ECO ® product, CCMC No. 13527-L.), sprayed to the underside of the sheathing to act as a vapour barrier
  - An equivalent product may be substituted but min. average RSI-6 (R-34) value must be achieved
- Drywall and interior finish

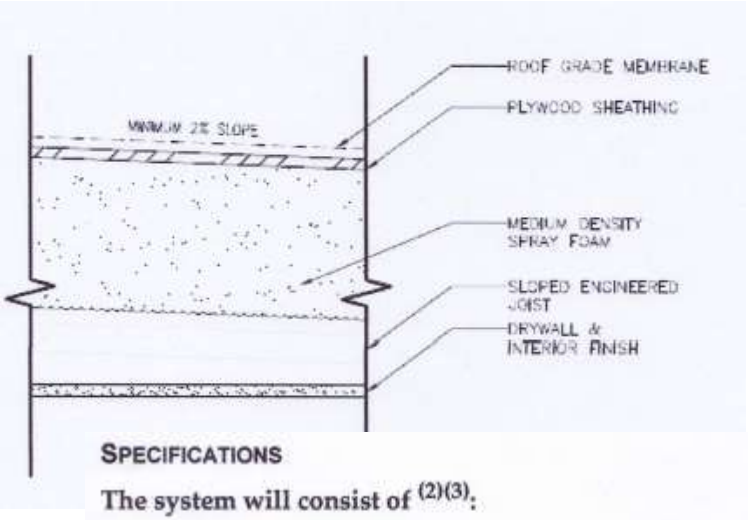
EXAMPLES


ASPHALT SHINGLES (LOW SLOPE)
UNDERLAYMENT
PLYWOOD SHEATHING
MEDIUM DENSITY SPRAY FOAM
BATT INSULATION
DRYWALL

EXAMPLES


12
1
STANDING SEAM METAL ROOF
ROOFING MEMBRANE
SIP
FIR DECKING
CELLULOSE INSULATION
OSB, TAPED & SEALED
DRYWALL

EXAMPLES



9.36 SPECIFICATIONS [4]

Framing Type:	I joist (12" O.C.)
Framing Factor:	89.5% insulation, 10.5% framing
Intended RSI_{EFF}:	5.02

SPECIFICATIONS

The system will consist of [2][3]**:**

- Roof grade vinyl membrane
- Plywood sheathing*
  - Ensure min. 2% slope away from the house/towards scuppers, gutters, or drains
- Roof framing
- Average min. 167 mm (6.57") of medium density spray foam (Icynene MD-C 200 v2, CCMC No. 13593-L), sprayed to the underside of the sheathing to act as a vapour barrier
  - An equivalent CCMC approved spray foam product may be substituted, RSI 5.76 must be met to achieve assembly RSI 5.02
  - Omit additional polyethylene layer
- Drywall and interior finish

EXAMPLES

- Unvented Decks
  - Need drainage
    - Where to?
  - Concrete expensive to remove
  - What is it covering?
  - Roof detailing
  - Flat roof with activity on top = HIGH RISK
  - Protected vs unprotected membrane

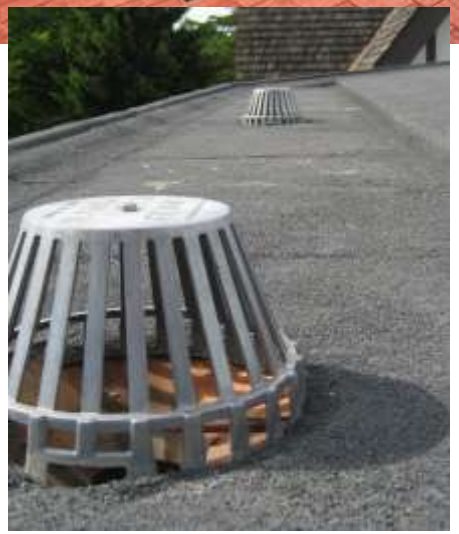
QUALITY CONTROL

QUALITY CONTROL

- DESIGN
  - Commercial, vented, unvented, combo
- Review drawings early on for venting issues
  - Closed soffits
  - Skylights
  - Structure – beams, low trusses
  - Flat roofs
  - Penetrations
  - Vent locations
- Realize unvented is an option

QUALITY CONTROL

- High risk factors
  - Deck over living
  - Internal drains
  - Penetrations
  - Solar panels
  - Maintenance-access
  - Concrete toppings
  - Interior lights/penetrations
  - Plumbing lines
  - Bathrooms – humidity sources



QUALITY CONTROL

- During construction
- Any changes in design
  - Pre-review
  - Photos
  - Material changes
  - Inspector/other trade changes
    - Ok to question
    - Request Code Section clarification

QUALITY CONTROL

- Actual install of spray foam
- Framing issues – block installation
- Use of low density
- Steel
  - Extra insulation required?
- Tie ins
  - Air barrier continuity
- Actual spray foam

QUALITY CONTROL

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QUALITY CONTROL

- Spray foam
  - CAN/ULC S705.2
  - CCMC Listing
  - Form – product/thickness
  - Applicator check
    - Temperatures
    - Density
    - Prepare logs
  - Correct long term thermal resistance (LLTR)
  - Check quotes carefully

QUALITY CONTROL

QUALITY CONTROL

- If vented and using poly, need to ensure done well

QUALITY CONTROL

- OCCUPANCY
  - Flat roofs
    - Let owners know need to maintain
  - Vented – owners shouldn't be putting holes in v.b.
  - Leakage
    - Investigate properly
    - Leakage may take longer with unvented

QUALITY CONTROL

- Various venting and unvented design strategies
- Depends on design, location, and budget
- More complex designs require careful review

QUESTIONS

- Questions

THANK YOU

If you have any further questions please contact us.

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