PINPOINT WEBINAR

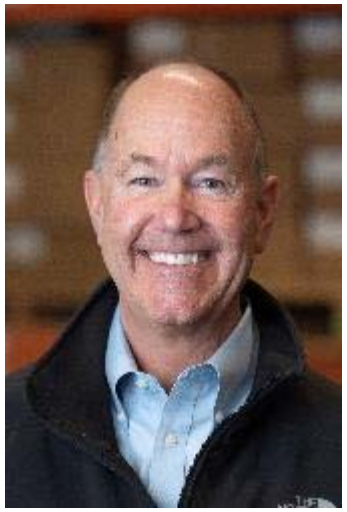
February 24, 2021

Thanks for joining us a few minutes early.

We will start promptly at 2 p.m.!

IMPORTANCE OF SNOW RETENTION ON ROOFS

… a conversation with
Rocky Mountain Snow Guard's
Lars Walberg



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Agenda

2:00 | Start Program and Webinar Housekeeping Items

Debbie Hathorne, CRA Executive Director

2:02 | CRA Announcements & Speaker Intro

Debbie Hathorne, CRA Executive Director

2:05| What is Snow Retention

Lars Walberg, Rocky Mountain Snow Guards

3:15 | Q & A

Webinar Courtesies:

- Thank you for being on-time.
- All attendees are muted
- **Use the Q&A at the bottom your screen to send your questions to Debbie.** She will relay them to the speaker(s).
- We will not use the raise hand function, please use Q & A.
- Links and other information will be sent in Chat box if applicable. Otherwise, the chat function is limited and we ask you to use Q&A.
- Due to the number of participants, we may not get to all the questions, but we will try.
- Please participate in our interactive polling through-out the presentation.
- Final note, in order to earn CIU credit, you will be required to answer a final poll question at the end of today's presentation.

What is Snow Retention?

- Snow Retention is rooftop systems that help keep snow and ice from avalanching off the roof.

Why Install Snow Retention?

1. Prevent damage to rooftop penetrations.
2. Prevent damage to the roof itself.
3. Prevent damage to things below roof eaves.
4. Prevent injury or death.

Reason #1

- Prevent damage to Rooftop penetrations.

Reason #2

- Prevent Damage to the Roof Itself.

Reason #2 Continued

Prevent Damage to the Roof Itself:

Reason #3

- Prevent Damage to Things Below Roof Eaves

Reason #4

Prevent Injury or Death:

Reason #4 Continued

Prevent Injury or Death:

Crested Butte 'roof avalanches' lead to one death, multiple injuries

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THE DANGERS OF FALLING SNOW AND ICE

As the weather gets colder in New England, many people are already carrying out winterization measures to protect their homes and businesses. Road salt has been purchased, shovels dug out of garages, and tires swapped out. With all this attention paid—and rightfully paid—to the hazards of traveling on foot or by car through a winter wonderland. However, paying attention to snow on the ground should not come at the expense of preparing for snow on roofs and eaves, which poses an entirely different set of risks to guests, neighbors, customers, and all pedestrians.

While slip-and-fall, or slip-and-crash, accidents immediately come to mind as common winter hazards, falling ice and snow from roofs can also cause serious injury to the unsuspecting traveler. Serious head, neck and back injuries, including severe concussions, can result from a snowpack sliding off a steep roof and onto an unlucky passerby. Along with the possibility of a concussion and neck injuries, if the passerby is knocked off his or her feet there might also be the typical injuries of a slip-and-fall accident.

If such a sliding snowpack is heavy enough, or includes a hefty chunk of ice, it may very well knock the person unconscious or cause deep lacerations. Even a small amount of falling snow and ice from a sign, building ledge, or scaffolding can cause serious bodily damage and long term injury.

Seminar Question # 1

- Snow sliding off a roof is dangerous because it is heavy. ***So, just how heavy is snow on a roof?***
- On average, there is 1.125 gallons of water in a cubic foot of snow (1/12 of the volume of snow is water)
- A gallon of water weighs 8.35 lbs.
- 12” of snow weighs 9.39 lbs per square foot.
- ***So, a 12” layer of new snow on a single roof area 25’ wide x 20’ eave to peak (5 Squares) weighs:_____***

Seminar Question #1 Answer

- 12” of ***average*** snow on a single roof area 25’ wide x 20’ eave to peak is: ***4,695*** lbs.
- 6” is ***2,347*** lbs
- 3” is ***1,173*** lbs
- Heavy snow may weigh up to ***double*** that of average snow.
- Old compressed snow can weigh up to ***7x*** that of average snow.

A Brief Study of the Physics of Why Snow Slides on Roofs

Roof Avalanche

The science behind snow slides

When snow blankets a roof surface, a frictional, temperature sensitive, adhesive bond is created between the snow particles and the roof surface. An additional weak bond is created at the ridge of the roof that connects the snow on either side of the ridge. The vertical weight of the snow translates to vector forces known as drag or gravity loads.

Initially, while the snow and the roof surface are both cold, the bond between the snow and the roof surface is adequate to resist the drag load of the snowpack. Eventually, internal heat sources and the suns UV rays, penetrate the translucent snowpack and begin to warm the roof surface below.

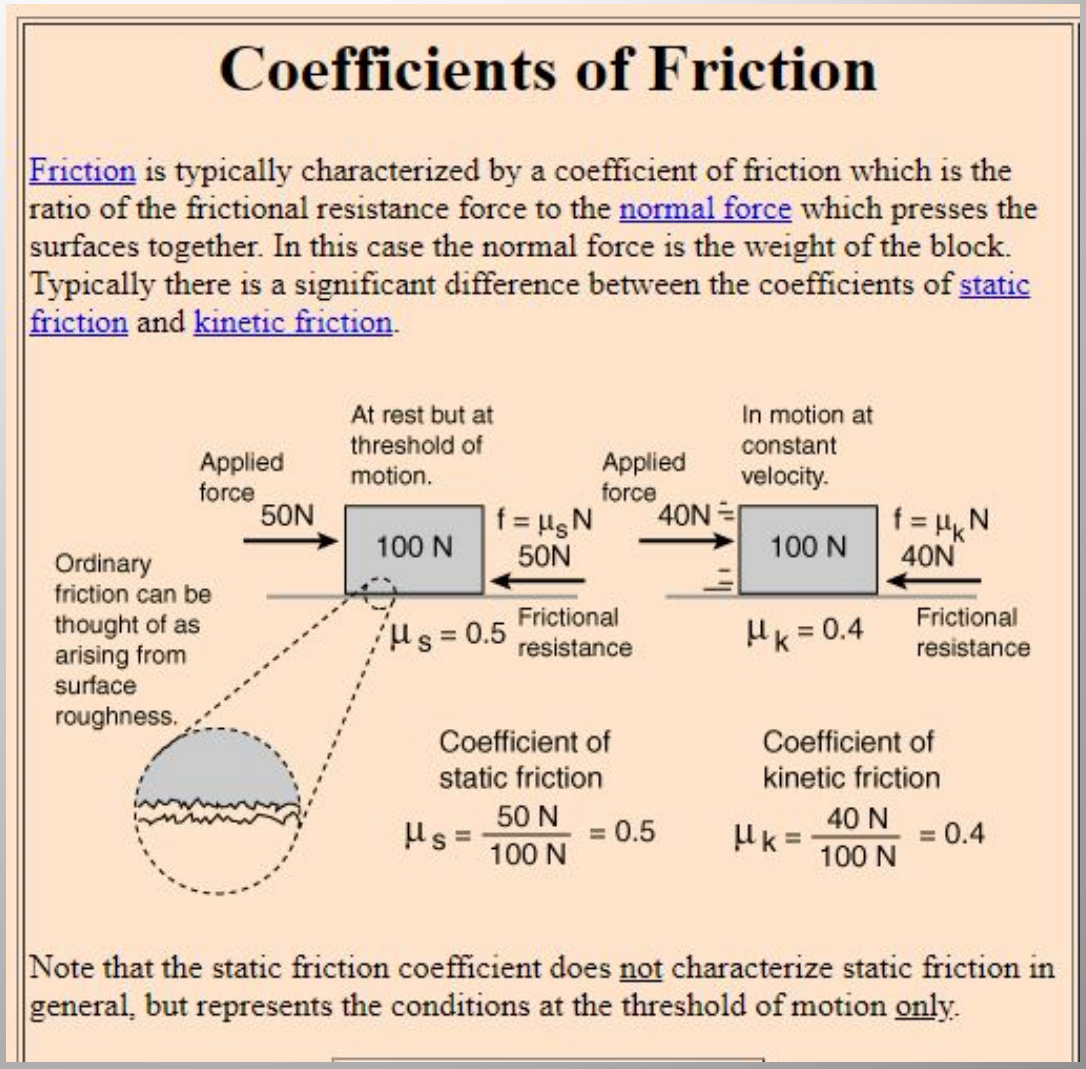
The snow particles at the surface of the roof turn to meltwater altering the frictional coefficient of the bond between the snowpack and the roof surface. In time, the drag load becomes greater than the combined bond at the roof surface and the cohesive bond at the ridge and the snowpack releases in what is known as an avalanche.

The Coefficient of Friction of snow on the roof changes over time.

Snow on a roof starts out with a coefficient of static friction as the snow bonds to the roof surface. As the snow melts, water forms on the surface of the roof and eventually the static coefficient of friction changes to a coefficient of kinetic friction and the snow slab starts to move.

Different roofing products have dramatically different coefficients of static friction and different coefficients of kinetic friction.

Accumulation of water on a roof surface changes the coefficient of static friction. The reduction in friction is greatest on smooth, non-absorptive roof surfaces like metal and polymer.



Roofs with High Friction

Asphalt Shingles

Textured Concrete Tiles

Roofs with High Friction (con’t)

- Granule Coated Steel

Roofs with Medium Friction

Wood Shakes and Shingles

Smooth Concrete and Clay Tile

Roofs with Little Friction

Natural Slate

Metal Panels

Roofs with Very Little Friction

Smooth Metal Shingles

Synthetic Shingles

Roofs with Very Little Friction (con't)

PVC, TPO, EPDM

Seminar Question #2

- Should you consider adding snow retention on a ***synthetic*** shingle roofing project in Denver with a pitch of:
- 12/12?
- 8/12?
- 6/12?
- 4/12?

Seminar Question #2 Answer

- YES.

- Synthetic shingle roofs are so slippery that snow slides even on a 4/12 pitch and those can be even more dangerous because snow will get deeper before the load overtakes the friction at the surface.

Sloped Roofing Product mix has changed over time

- The last 25 years have seen significant growth in slippery roofing product sales:
  - US Sheet metal roofing market grew to 1 Billion in product sales in 2019.
  - US synthetic shingle sales have grown to 350,000 squares/year in 2019. (0 squares in 1990).
  - Sloped roofing applications of PVC and TPO type single ply membranes have grown dramatically with the addition of color to the membranes.

There are 3 Basic Types of Rooftop Snow Retention:

1. Snow Guards
2. Snow Fences and
3. Snow Bars

Snow Guards Snow Fences or Snow Bars?

Snow Guards:

- Unitized parts installed in a pattern
- Usually less expensive option than snow fences
- Very effective in Soldier Row Pattern on exceptionally slippery roofs like synthetic and metal shingles
- Also known as Snow Clips, Snow Dogs, Snow Birds, Snow Jacks and a bunch of other names.

Snow Guards, Snow Fences or Snow Bars?

Snow Fences:

Round or square tubes suspended above the roof surface on brackets.

Most expensive system but more effective in holding snow on steep pitches and heavy snow loads.

Usually requires fastening into solid structural members or into solid wood blocking.

Snow Guards Snow Fences or Snow Bars?

Snow Bars:

- A single bar, usually rectangular suspended above the roof surface on a clamp or bracket.
- Usually installed on metal panel roofs and single ply roofs.
- Often less expensive than snow guards or snow fences on metal panel roofs
- Very effective.

Effective Snow Retention is a Combination of Good Product AND Good System Design

Calculating Snow Guard Quantities and the Spacing of Snow Fence and Bar Brackets

- Reputable snow retention manufacturers base their design calculations on standards set by the American Society of Civil Engineers
- Density of and placement of snow retention systems is determined by the snow load per unit of roof area which is determined by these factors:
  - Roof Slope
  - Roofing Product
  - Roof Snow Load (usually a factor of ground snow load)
  - Drift Snow Loads
  - Potential Exposure (over walks, driveways, decks, etc.)

A Word about Snow Loads

- Ground Snow Loads (GSL) in most parts of the northern US are between 25 and 35 PSF.
- Pueblo to Ft. Collins GSL's range from 30 to 50 PSF.
- Colorado mountain GSL's range from 65 PSF to 250 PSF.
- Roof Snow Loads are in very general terms, 70% of GSL.
- Ground and roof snow loads design requirements are usually written into building codes but not always.
- These loads are what reputable snow retention manufacturer's must design their systems to handle.
- While it sometimes seems like manufacturers are designing systems with too many snow guards, it's because they're designing for worst case scenarios and not for average snows.
- An average snow (not too dry, not too wet) weighs 9.4 lbs./cubic foot. A system designed for a 40 PSF snow load (West Denver area) is being designed for snow 51" deep.
- Town of Vail ***Roof Snow Load*** design requirement is 70 PSF.

But - It’s not ONLY about load

- Snow retention layouts are designed for snow load but meeting snow load requirements doesn’t mean that the snow retention system will keep the snow on the roof.

- For example, based on SNOW LOAD ALONE, 2 to 5 Snow Guards per square will meet load requirements on a 4/12 pitch roof of synthetic shingles with a 40 PSF Ground Snow Load.

- But experience has shown that 2 snow guards spaced 5’ apart at the eave aren’t nearly enough to hold snow on a roof that’s 10’wide and 10’ from the eave to peak. Reputable snow retention manufacturers will specify between 8 and 12 snow guards for that roof area.

Snow Retention Attachment Options: ***(Many Snow Retention Products are Stronger Than The Attachment)***

Attachment of Snow Retention to the Roof

- **Attachment with Fasteners**:
  - Nails allowed for attachment of snow guards on a new roof. Not used for snow guards attached to an existing roof.
  - Screws with gasket seals are often used to attach snow guards to existing roofs.
  - Lag Bolts and Lag Screws are used to install snow fence brackets. Much of the time, this type of attachment must go through the roof deck and into the roof support structure or into solid wood blocking.

Attachment of Snow Retention to the Roof

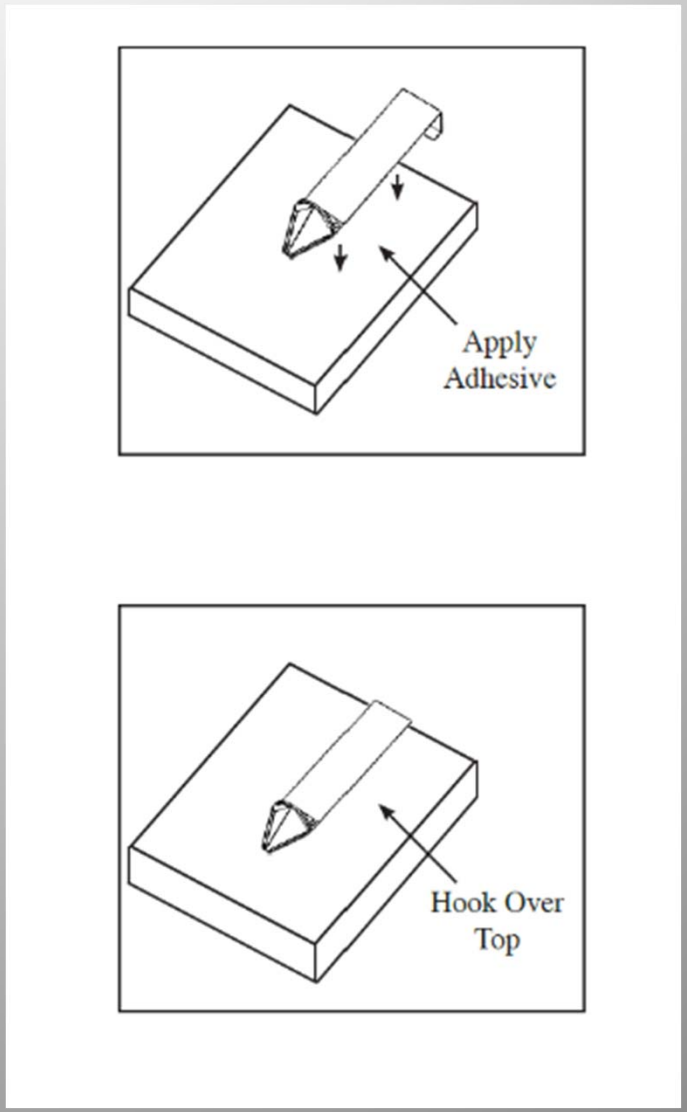
- **Attachment with Clamps:**
  - Clamp attachment to seams of Standing Seam roofs is used with Bar and Fence Systems. Proper clamps must be used and recommended torque must be achieved when tightening clamps to realize advertised load ratings.

Attachment of Snow Retention to the Roof

- **Attachment with Adhesive:**
  - Some manufacturers allow attachment of snow guards to metal roofs with adhesives and tapes. Adhesive installation instructions must be closely followed to achieve advertised load ratings.

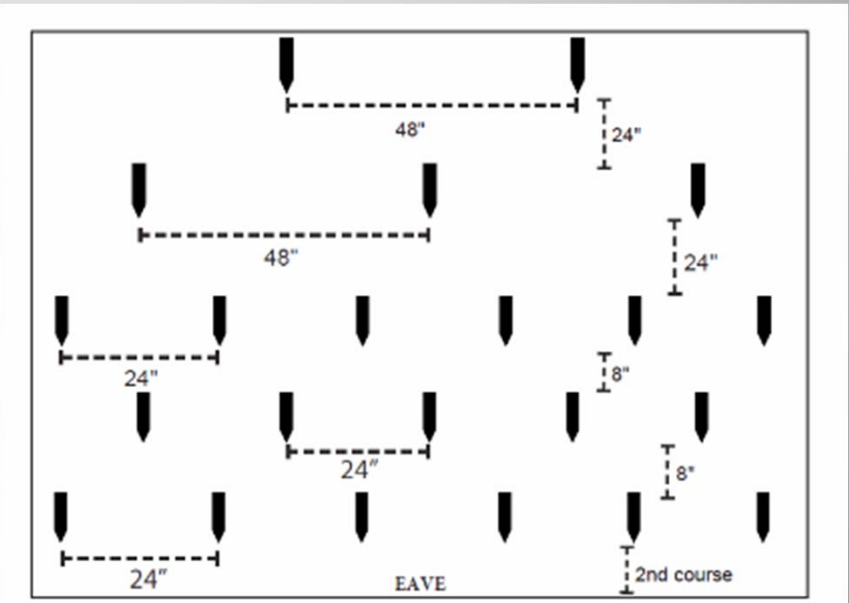
Attachment of Snow Retention to the Roof

- **Hook or Barbed Strap Attachment:**
  - This is a type of attachment that works well with tile and natural slate roofs.
  - It is recommended that a small dab of sealant / adhesive be used as well to keep the snow guards from moving side to side.



Snow Guard Layouts: Traditional “Spread” Pattern for Shingle Applications

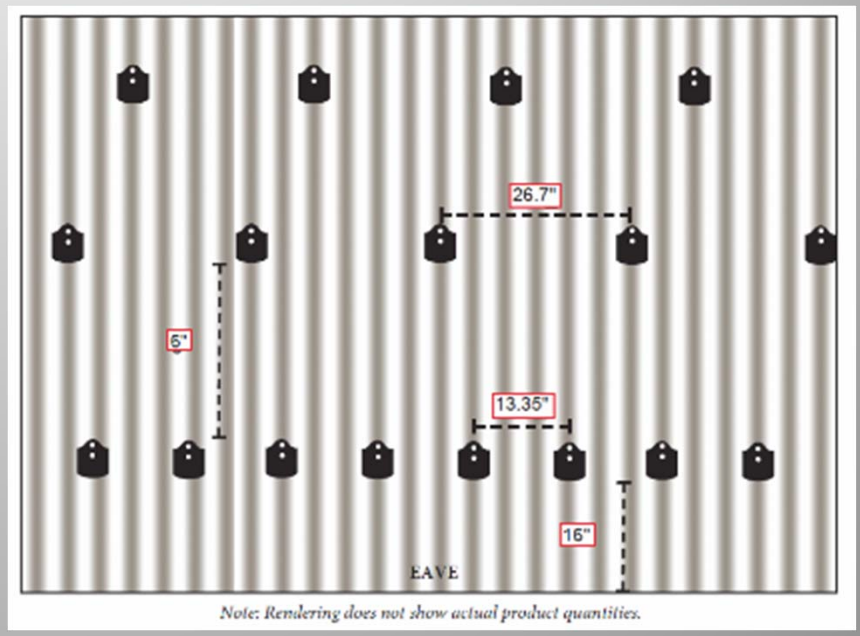
- This pattern features a relatively dense 3 row pattern at the eave with a broader pattern that extends to 10’ or so from the peak of the roof. This pattern is effective with older – poorly insulated roofs where the snow melts off the upper portions of the roof before sliding off. It is also used on less slippery roofs, lower slope roofs and roofs in low snow load areas.



Note: Rendering does not show actual product quantities.

Snow Guard Layouts: Traditional “Spread” Pattern with “Solder Row at the Eave

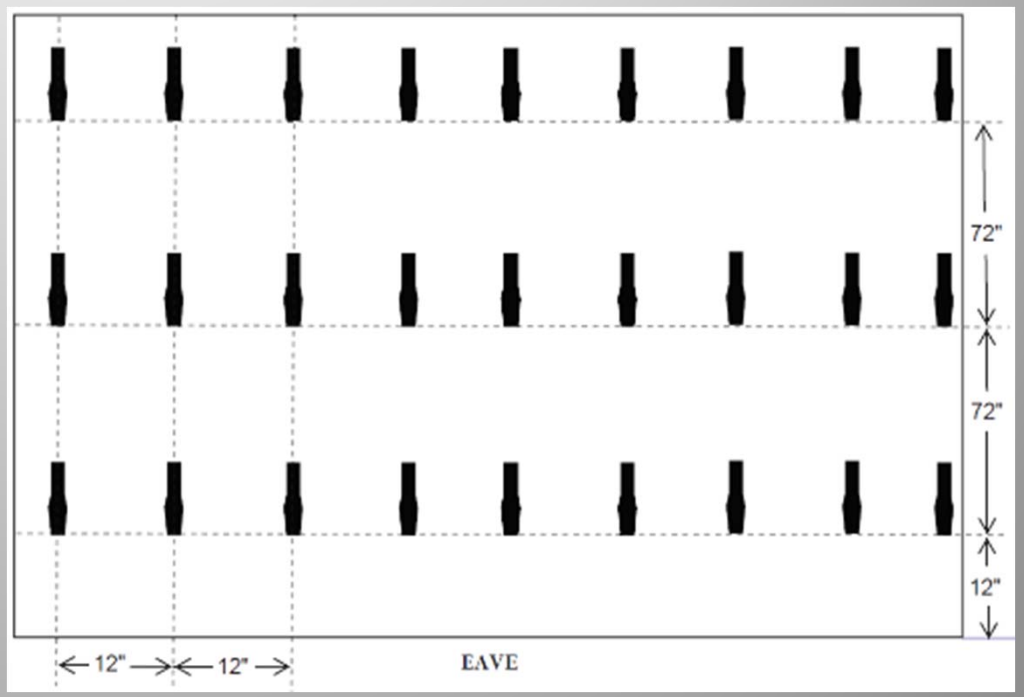
- This pattern features a single “soldier row of snow guards at the eave with a broader “spread” pattern that extends to 10’ or so from the peak of the roof. This pattern is effective with older – poorly insulated roofs where the snow melts off the upper portions of the roof before sliding off. It is also used on less slippery roofs, lower slope roofs and roofs in low snow load areas.



Note: Rendering does not show actual product quantities.

Snow Guard Layouts: Multiple Soldier Row Pattern

- This pattern features multiple soldier rows of snow guards starting at the eave and extending at regular intervals to the peak of the roof. This pattern is effective with newer structures that are well insulated with slippery roof coverings. It is also a more pleasing pattern that is simpler and faster to install than a traditional spread pattern.



Seminar Question #3

- A pattern of snow guards is intended to break up avalanching snow as it slides off the roof into smaller, less damaging pieces.

- Yes
- No

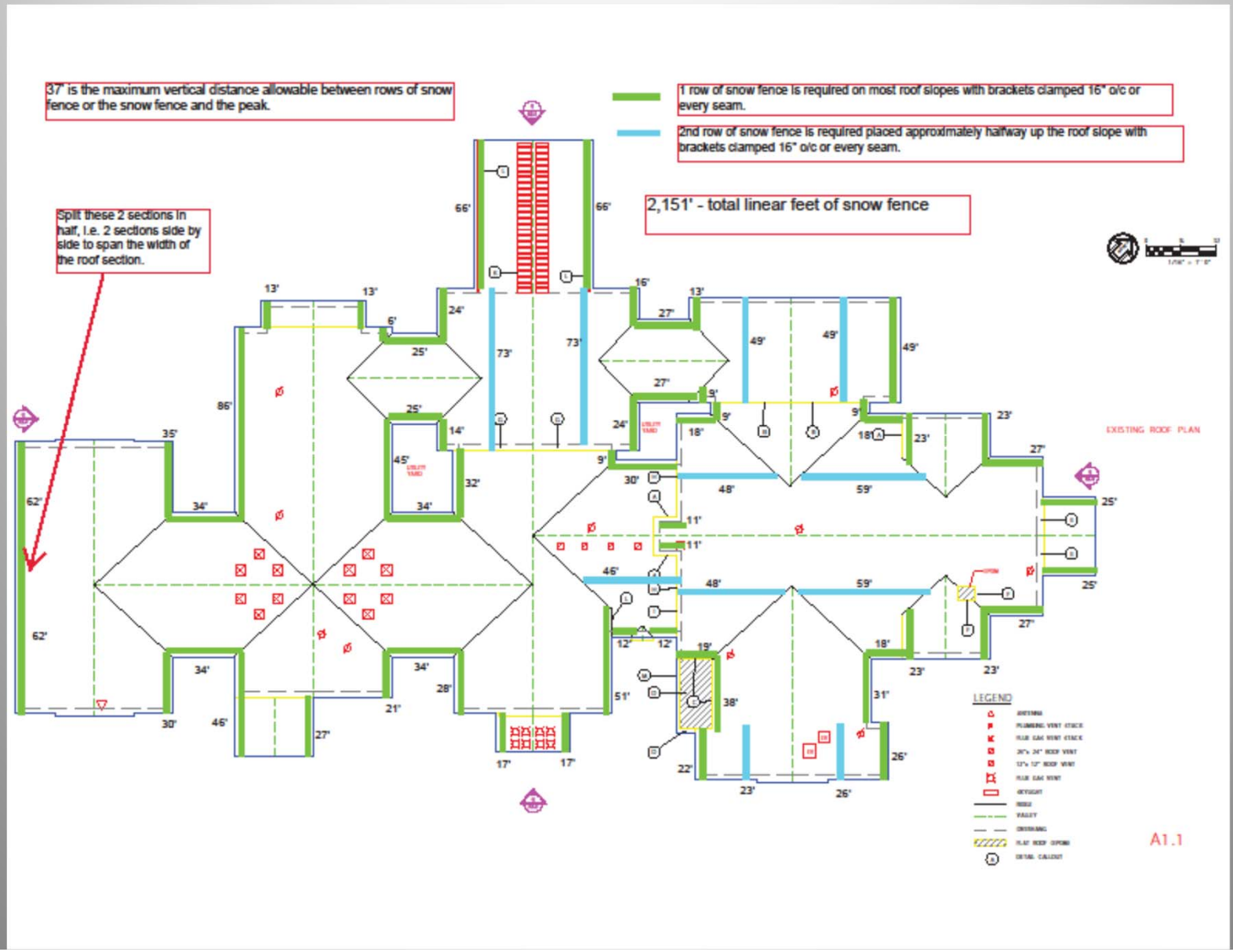
Seminar Question #3 Answer

- NO.

An avalanche of snow will overtake snow guards and may fall to the ground in large, heavy damaging quantities, damaging the snow guards on the way down the roof.

Snow Guards should be installed in a pattern that is intended to keep snow on the roof until it comes off the roof as meltwater.

Single and Multiple Snow Fence or Snow Bar Patterns

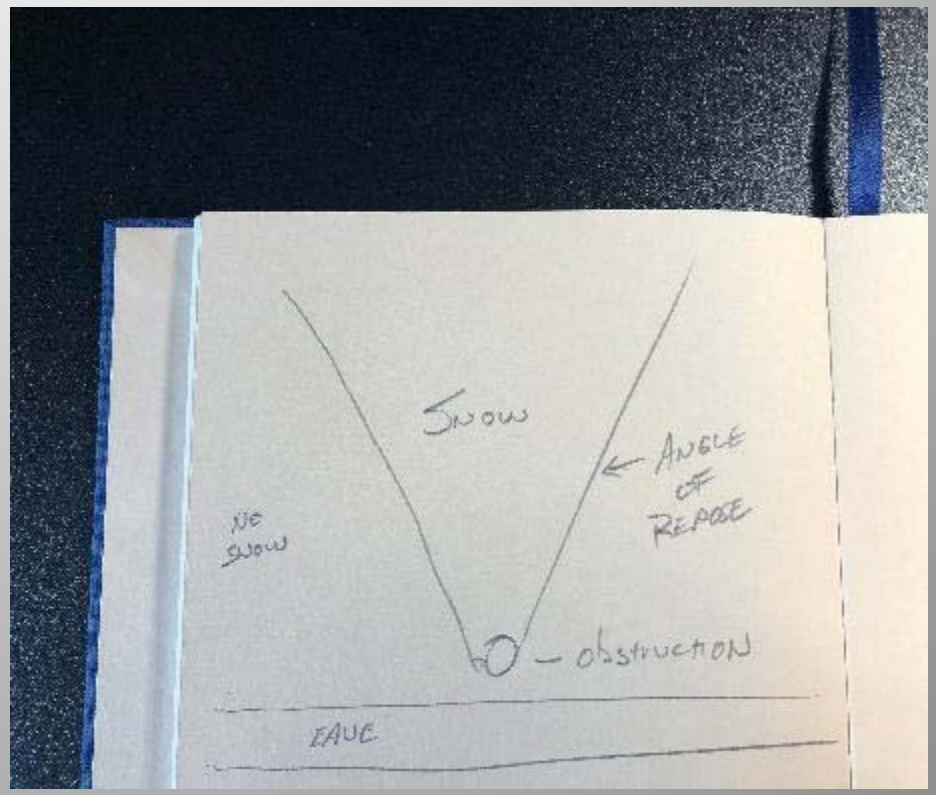


Seminar Question #4

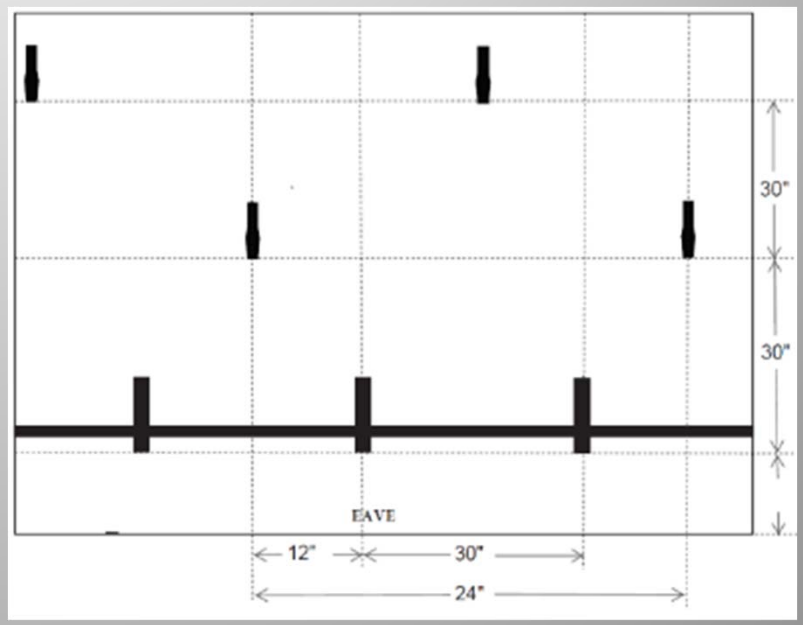
- Is it OK to put snow retention just over a doorway and not across the entire eave?

Seminar Question #4 Answer

- It is not recommended to put snow retention across part of an eave. Snow retention should extend across the entire eave.
  - The angle of repose of snow on a roof means there is a greater load on the ends of a partial eave snow retention pattern.
  - Snow sliding off of adjacent areas will pull a snow blanket over partial eave snow retention.



Hybrid Snow Retention Patterns
Snow Fence at the Eave with Spread Pattern of Snow Guards Above



Common Styles of Asphalt Shingle, Metal and Synthetic Shingle Snow Guards

Asphalt Shingle, Metal and Synthetic Shingle Snow Guards Installed

Corrugated Steel Roof Snow Guards

Corrugated Roof Snow Guards in a Traditional Spread Pattern

Bolt Down Snow Fence

Hybrid Bolt Down Snow Fence and Snow Guard System

Concealed Fastener Snow Fence

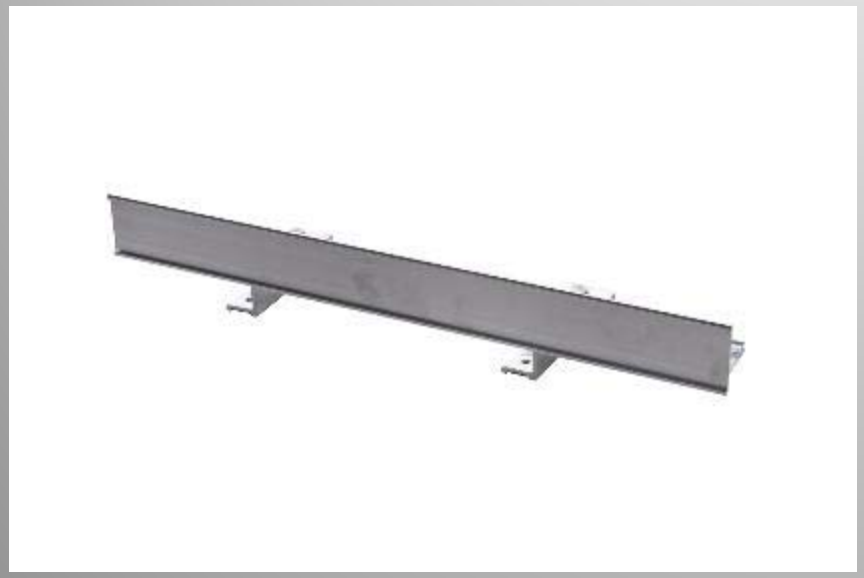
Multiple Rows of Concealed Fastener Snow Fence Installed

2 and 3 Pipe Clamp-To-Seam Snow Fence

Clamp to Seam Snow Fences Installed

Clamp to Seam Snow Fence Installed

Snow Bar System for Exposed Fastener Metal Roofs and Single Ply Membrane System



Concealed Fastener Snow Fence on Single Ply Roof

Seminar Question #5

- Does snow retention cause ice dams?

Seminar Question #5 Answer

- Generally, adding snow retention to a roof will not cause or alleviate ice dams.
- Ice dams are caused by snow melt reaching a cooler part of the roof over the eave that re-freezes.

A Word about Solar Panels and Snow Retention

- Snow slides on solar panels.
- Solar panel companies do not like snow retention because snow on panels reduces electricity production.
- Several snow retention manufacturers offer solar panel snow retention products. Some attach to the panel racking and some are attached to the roof below the solar panels. Snow retention systems that attach to panels have roof pitch and snow load limits. Systems that attach below the panels can be installed in any situation as long as there is enough room below the panels to accommodate snow fence bracket installation. 12” of exposed eave below the panels is the minimum required.

Questions . . .

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Final comments:

- Thank you Lars!
- Presentation slides are available at:

  https://www.coloradoroofing.org/member/education
- A survey will be sent after the seminar, please take the time to respond. Your feedback helps us plan future webinars and seminars.
- Thank you for staying on the webinar the full time. **Please answer this final poll question to earn your CIUs.** Then, you are free to hop off and end your session.

Thank You for attending!