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I Wouldn’t Do That If I Was You…

Current Technical Roofing Issues From Field Forensics

Speaker:

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SRI Consultants

Topics

- Cold Roof Designs
- Membrane Issues
  - EPDM
  - TPO
- Induction Welded Plates
- Latent Material Moisture
- Low Rise Adhesive Foams
- Fleece Backed Membranes
- Roof Drains

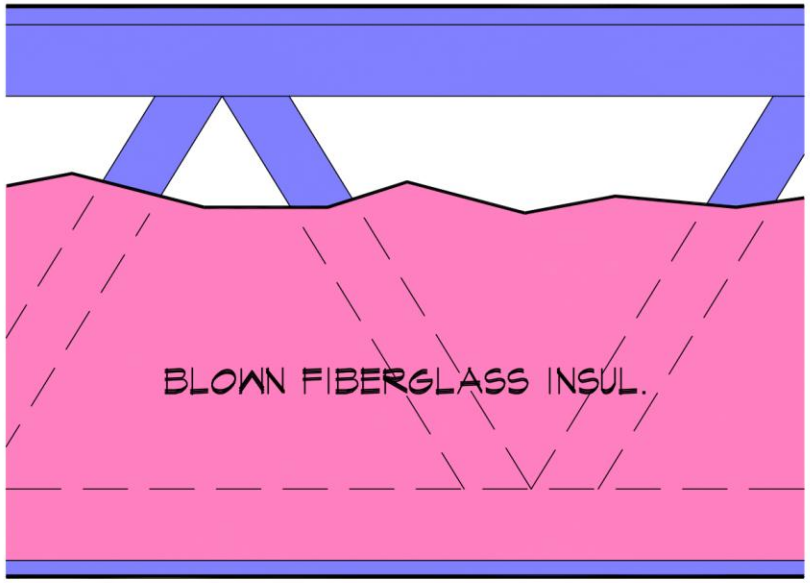
Introduction

- These are issues that are repetitive legal issues or unique (interesting) in low slope roofing.
- Even though specific products or manufacturers may be involved
  - Out of professional curtesy, no names will be used, no specific buildings or locations will be discussed.
  - If you know or think you know what is being discussed, please keep it to yourself (Professional Curtesy)
- This presentation is for avoidance of repeating these mistakes or issues by those here.

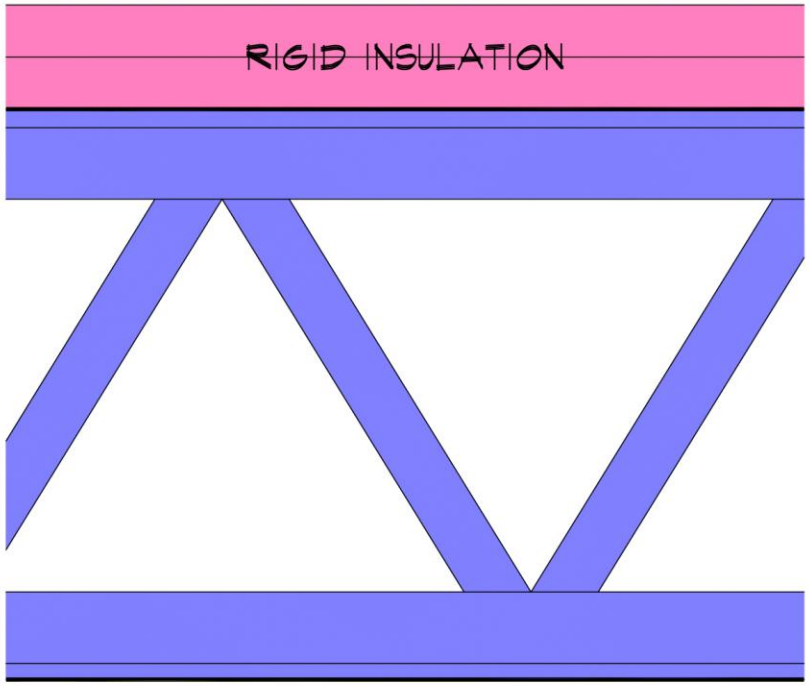
Cold Roof Designs

- This issue continues to be the most repetitive issue in legal and insurance cases
- Very expensive to correct and or remediate
- Almost always a design issue

Cold Roofs, What is it?



COLD ROOF



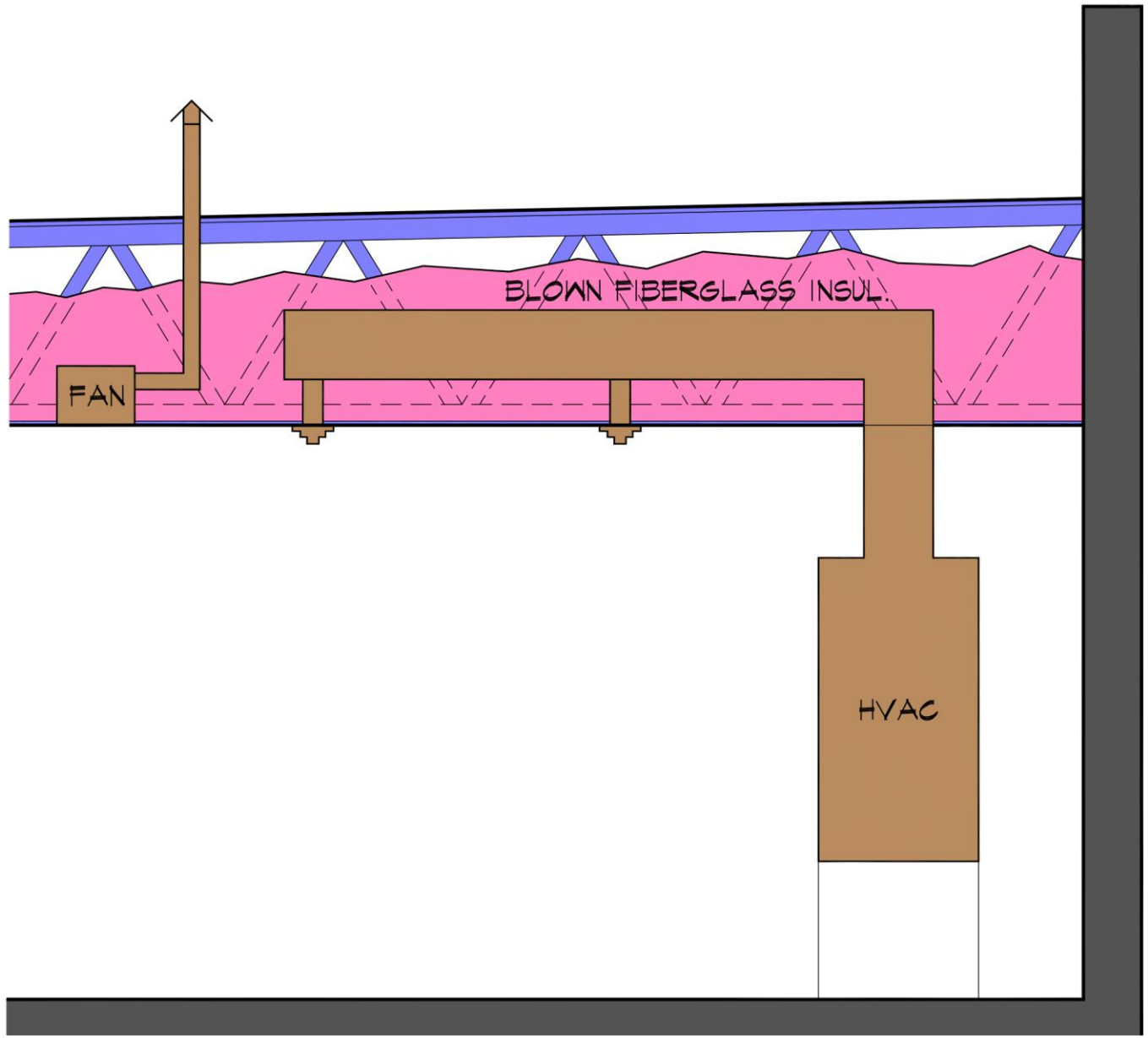
WARM ROOF

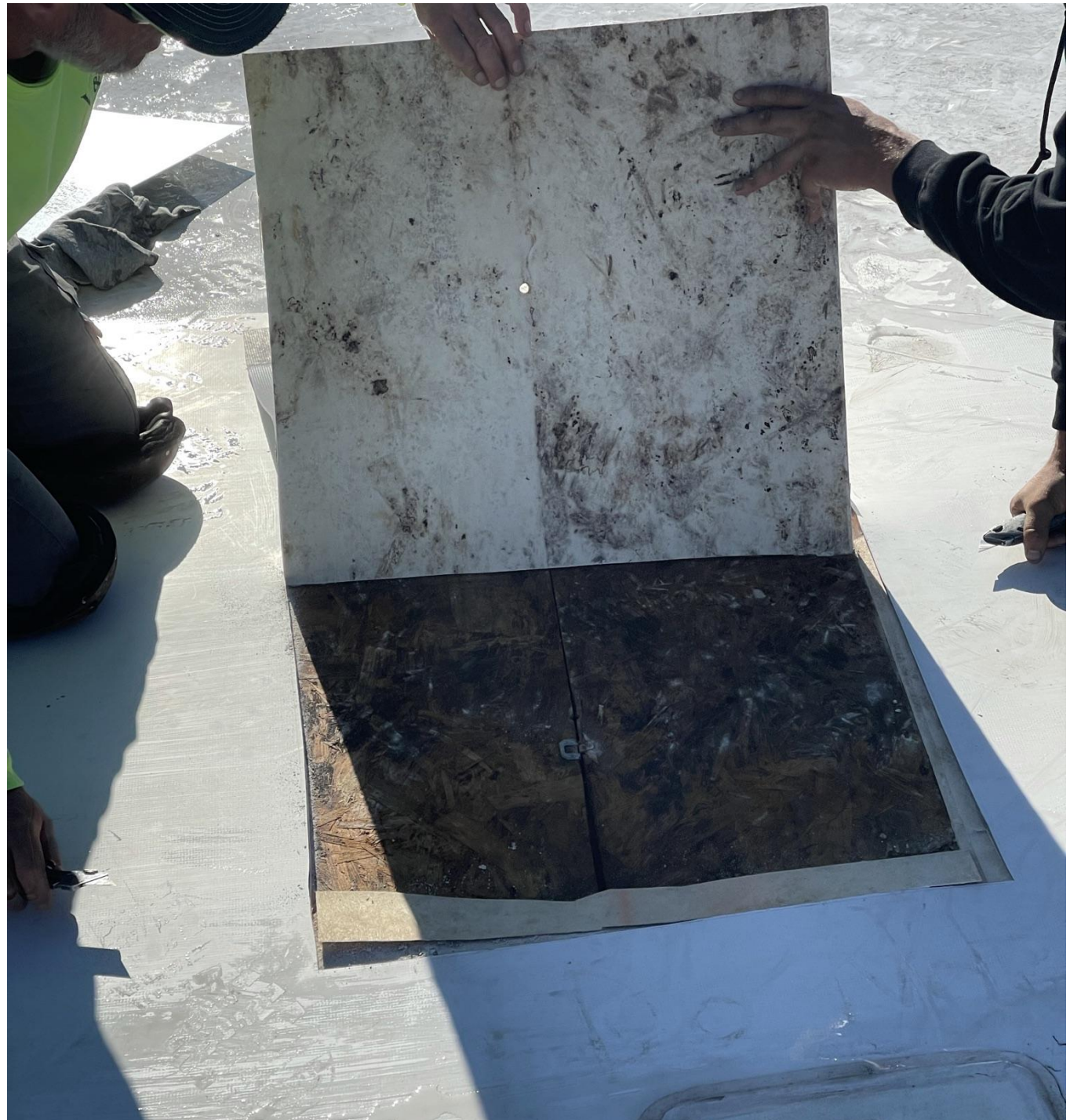
Cold Roofs, What is it?

- Roof design where all or most of the insulation is below the roof deck
  - This is what most steep slope roofs are for residential homes and vented
  - Here they are in a low slope configuration
- Typically, this design was used to meet an exemption in fire code for multifamily to avoid the use of sprinkler system in interstitial space
- R-40 to R-60 of insulation results in this space
  - Incredibly energy efficient!
  - Right?

Cold Roof Designs

- Problem is air leakage
  - Low voltage systems
  - Light fixtures
  - HVAC ductwork
  - Bathroom fans
  - Dryer vents
- All of these leak air to varying degrees
- Roof deck is almost same temperature as exterior
- Typical indoor air can have dew point temperatures in the 40-50°F range
- Deck condensates and moisture-based damage occurs


BLOWN FIBERGLASS INSUL.
FAN
HVAC

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Cold Roof Designs

- Even when everyone agreed what went wrong, roofer was drug along in legal proceedings
- There have been variations of this scenario
- 99.99% ultimately blamed on Designer of Record's choice for cold roof
- Fix?
  - Repair moisture damage
  - Place insulation above roof deck
    - Keep the roof deck warm and not a condensing surface
    - As little at R-5 to R-10 has been anecdotally shown to prevent the decay
    - Experience shows that code required insulation will protect the roof deck even without sealing and ducts or penetrations
- See *Professional Roofing* – Know the Facts, March 2022 for article

Cold Roof Designs

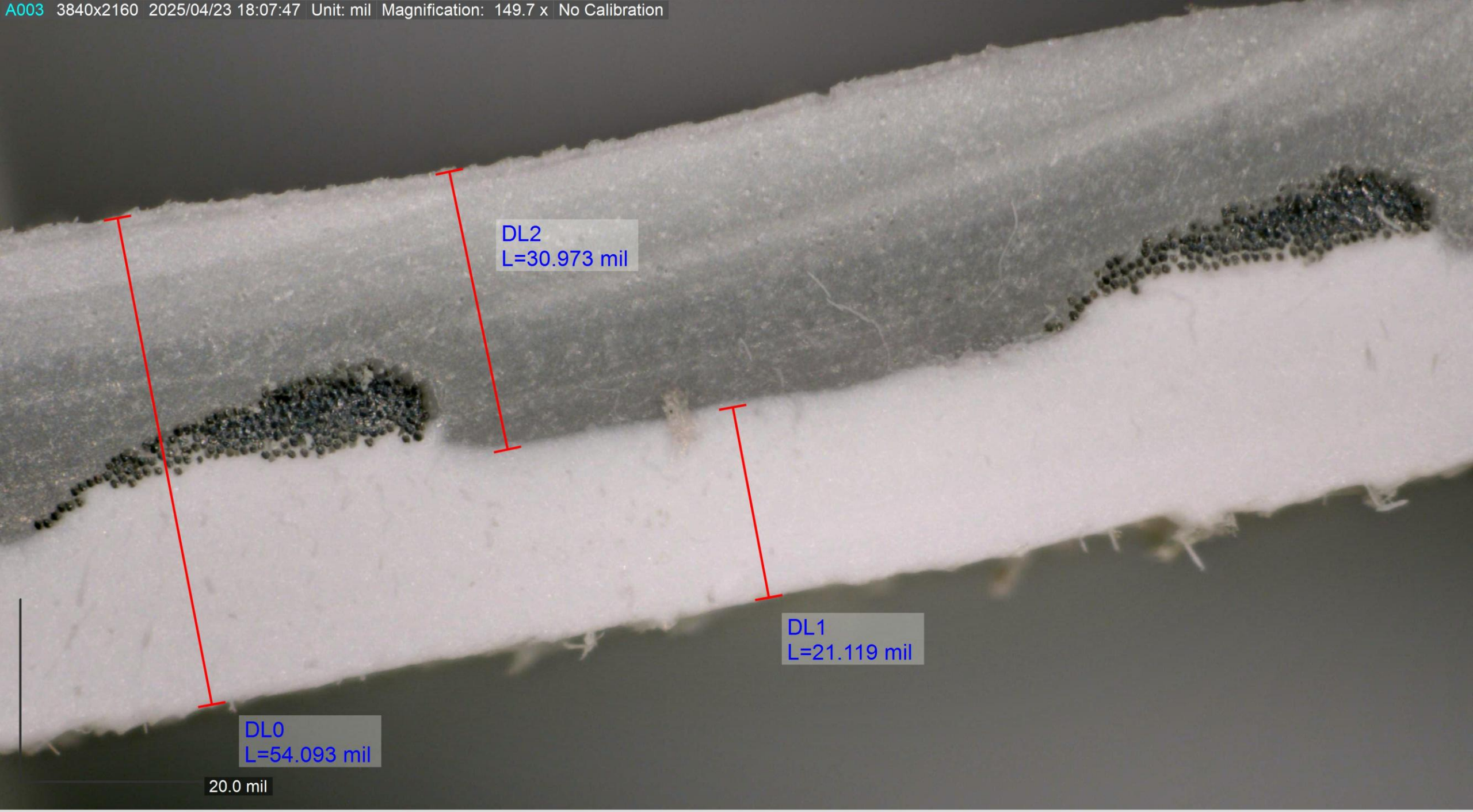
- Ultimate fix…Don’t build them like that!
- Insulation above deck
- **Can I vent it?…Maybe.**
- General rule has been that low slope roof do not lend themselves well for passive venting.
  - Active venting has it own risks
  - Single case in Southern Wisconsin where owner opted to vent.
  - Somewhat unique case where the apartment is a perfect square with venting space (inadvertent) and in a very windy corridor adjacent to interstate.
  - Continuous vents cut into all parapets
  - But it appears to be working (moisture readings and data loggers)

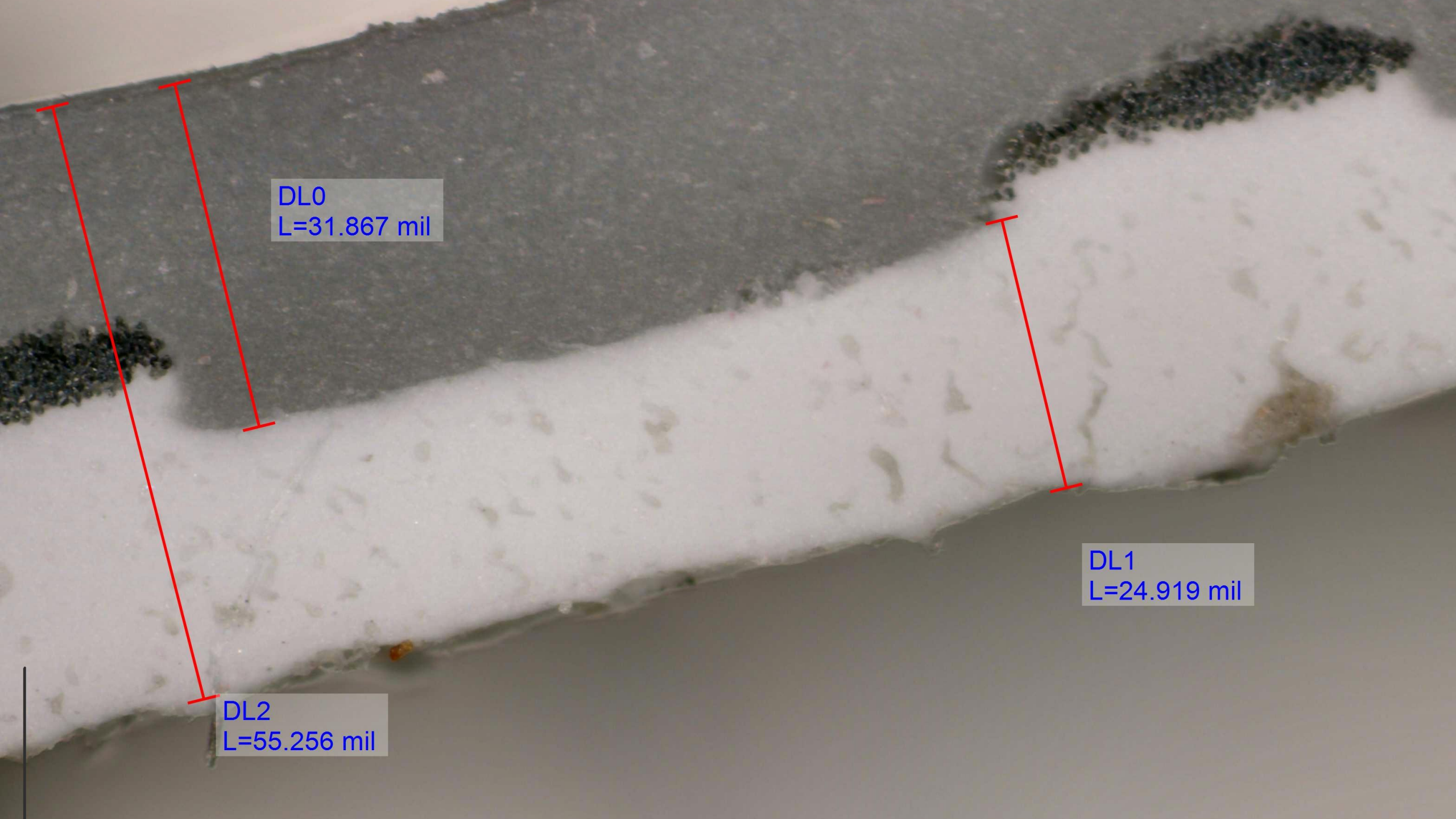
Membrane Issues

- Self Adhering EPDM
  - Shrinkage
  - Believed to be mechanical not formulation
  - End lap slippage
  - Side lap wrinkles -> fish mouths
  - One product, one manufacturer

Membrane Issues

- SA EPDM
  - Corrective action from manufacturer has been to apply cover tape to all laps
  - Appears to be sufficient correction
  - This is typically done for extended warranties, and this tends to quell fears of owners
- TPO
  - Single interesting case
  - East coast contractor had project where the TPO was cratering at laps
  - Small pieces of membrane were “popping off” during welding
  - Remember this is 800-1000°F welding temperatures


A003 3840x2160 2025/04/23 18:07:47 Unit: mil Magnification: 149.7 x No Calibration
DL2
L=30.973 mil
DL1
L=21.119 mil
DL0
L=54.093 mil
20.0 mil


DL0
L=31.867 mil
DL1
L=24.919 mil
DL2
L=55.256 mil

Membrane Issues

- TPO
  - Speculated to be too high moisture content in TPO ingredient
  - Magnesium hydroxide (fire retardant) was speculated to have been received and sent to line with high moisture
  - Hard to prove after the fact
  - Ultimate fix would have been full sheet replacement
  - Owner accepted a coating
- Moral is even with mature product line we can find material or production issues that slip out the door

Induction Welded Plates

- For decades induction welded membranes have been “relatively” trouble free and great performers
- Past several years problems popped up
- Two plates
  - Black = PVC membranes
  - Gold = TPO membranes
- Problem primarily has been with Black / PVC plates

Induction Welded Plates

- Welds made with experienced staff, calibrated weld machines
- Hours to days after install welds would just fail, leaving membrane loose
- Manufacturer technical staff would come to job site to calibrate and demonstrate “how to weld it right”
  - Their welds would fail too
- Issue appears to be a change in plate production
- Very recently TPO plates have reported to have this issue too

Induction Welded Plates

- Additionally, we have seen pictures of fractures in the metal of new plates at fastener opening.
  - Metallurgical or die issue?
- Variation seen in saturated roof systems where black coating on plates will detach from metal plate
  - Membrane left unattached

Induction Welded Plates

- Best advice
  - Photograph and save lot numbers on plate boxes
  - Save test welds for extended period
  - Inform field staff not to ignore issues and just “reweld” again and again

Latent Material Moisture

- Result of heavy vapor retarders combined with thick insulation and coverboard system
- Any free moisture in insulation and coverboard is now stuck between membrane and vapor retarder
- Physically a minor amount of moisture
- But enough to trigger moisture meters
- Open the roof to dry air and moisture leaves in minutes


DELMHORST
27.1

DEWALT

Latent Material Moisture

- Store materials as close to manufacturers instructions as possible
- Understand that a moisture meter is not calibrated to that material (typically)
  - So, use as an indicator but don’t believe the numbers
- Do not store materials over surfaces that can readily emit moisture
  - Grass, gravel, sand
  - Avoid poly tarps tight to ground (greenhouse)

Low Rise Foams

- Discussed at CRCA 2024
- As manufactured and mixed Part A + Part B 1:1 ratio all is well
  - Very strong bond
- Problem has been field mixing and application
  - Temperature
  - Equipment issues (off ratio)
  - Foam ribbon spacings


20
50
10
INCH
1
2
3
4
STAINLESS
5
6
7
8
32
64
16

Low Rise Foams

- Problems
  - Off Ratio foam – equipment issue
  - Ribbon spacing – labor issue
  - Unreacted foam – mixing issue or materials
- Suggestions
  - Invest in foam carts with sensors for pressure (alarms)
    - We used kettles and one worker responsible for kettle, time for this again
  - Clean out old foam in warehouse
  - Asphalt used to be our magic sauce to make roofs work, foam is the secret sauce now, treat it as such.

Fleece Back Membranes

- Absolutely fascinating issue for roof nerds
- Fleece back membranes are typically polyester fleece
- Multiple roofs over light weight insulating concrete that was not vented correctly or at all in Gulf Coast region
  - Elevated moisture under membrane
  - Fleece back TPO
- 4-6 years of age

Fleece Back Membranes

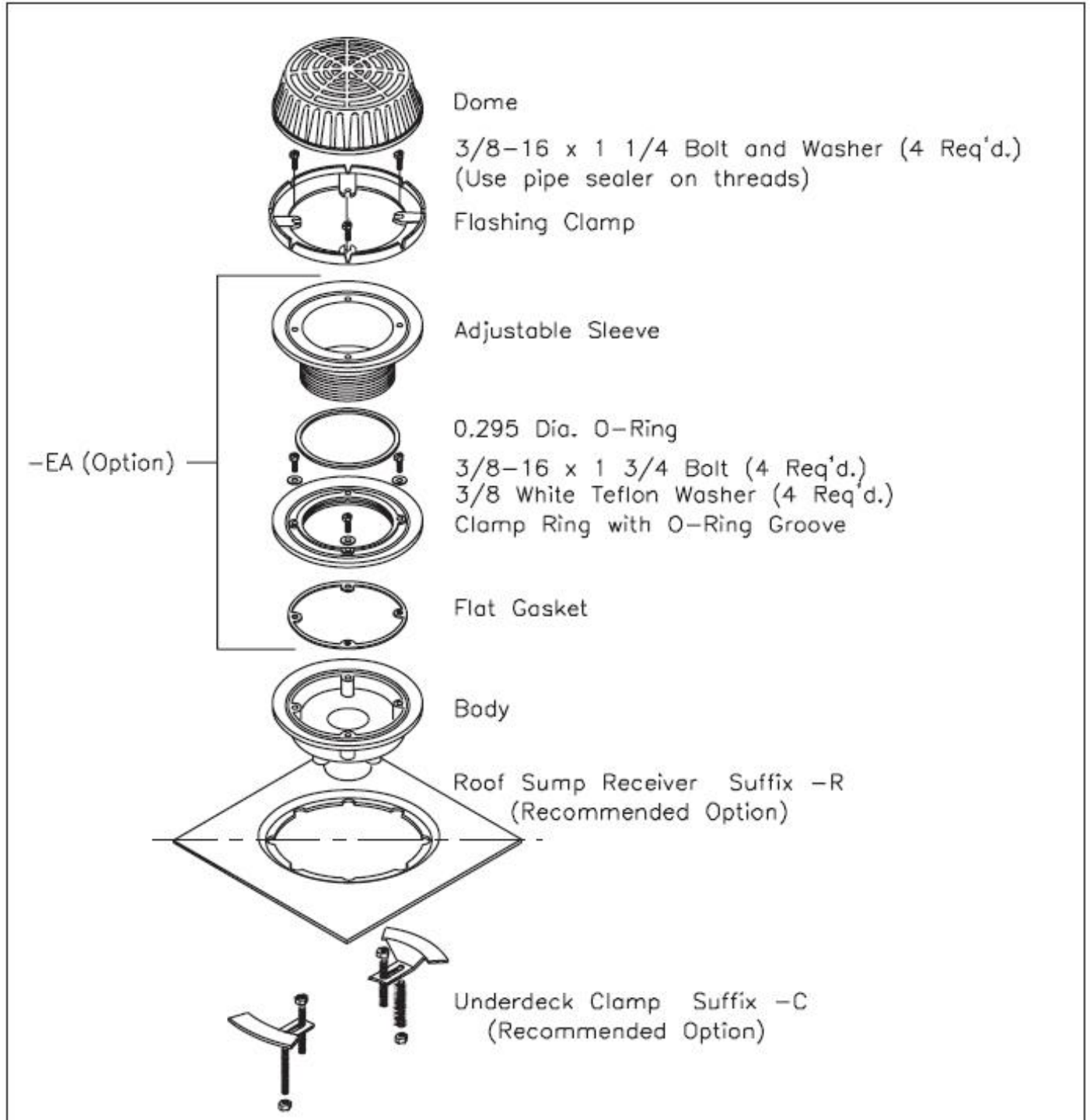
- **Fleece was gone**
- Not damaged, not failing to adhere, not discolored…GONE
- One roof all fleece was gone. Bareback membrane remained
- One roof was spotty with areas that were fine others were bare
  - Varied with moisture
- Alkaline environments (high pH) attack polyester
  - Need the liquid moisture as electrolyte
  - Are there other chemicals at play from concrete?

Fleece Back Membranes

- Sampled Fleece Back PVC
  - Fresh concrete + distilled water
  - Wash water from concrete chute
  - Liquid Drano Max
- Three weeks at 120°F
- Fleece was just beginning to fall apart
  - Particles settling at bottom
  - Bits floating
- So, this reaction appears to takes time months/years not days

Drains

- Adjustable roof drains are not designed for static water pressure!
- **DO NOT** plug these drains
- Pressure will cause water to leak through threads and gaskets in drain assembly into roof
- Over time volume of water in the roof increases
- Roofer gets blamed for “leaking roof”
- When in fact the water is going through the drain assembly


Dome
3/8–16 x 1 1/4 Bolt and Washer (4 Req'd.)
(Use pipe sealer on threads)
Flashing Clamp
Adjustable Sleeve
–EA (Option)
0.295 Dia. O–Ring
3/8–16 x 1 3/4 Bolt (4 Req'd.)
3/8 White Teflon Washer (4 Req'd.)
Clamp Ring with O–Ring Groove
Flat Gasket
Body
Roof Sump Receiver Suffix –R
(Recommended Option)
Underdeck Clamp Suffix –C
(Recommended Option)

Drains

- Multiple cases where the drains were plugged intentionally or by debris (and the general contractor knew)
  - One case plumbing wasn't done, but they wanted the roof installed. So, they plugged primary and secondary drains. Up to 18 inches of water at drains for months
  - Another case debris from construction plugged 8 of 24 drains on roof. General Contractor knew about it for over a year
    - Rain would back up onto roof
    - 1-2 inches of water inside roof system
- Builders risk considered it an "occurrence" each time it rained and claimed the $250,000 deductible applied each time it rained. So, they owed nothing for multimillion dollar losses of the roofs
- Multiple cases of this around the country

Questions?

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