

NOTES FROM THE FIELD
FLAT ROOFS AND
MASONRY IN NEW YORK

PETER MARCIANO

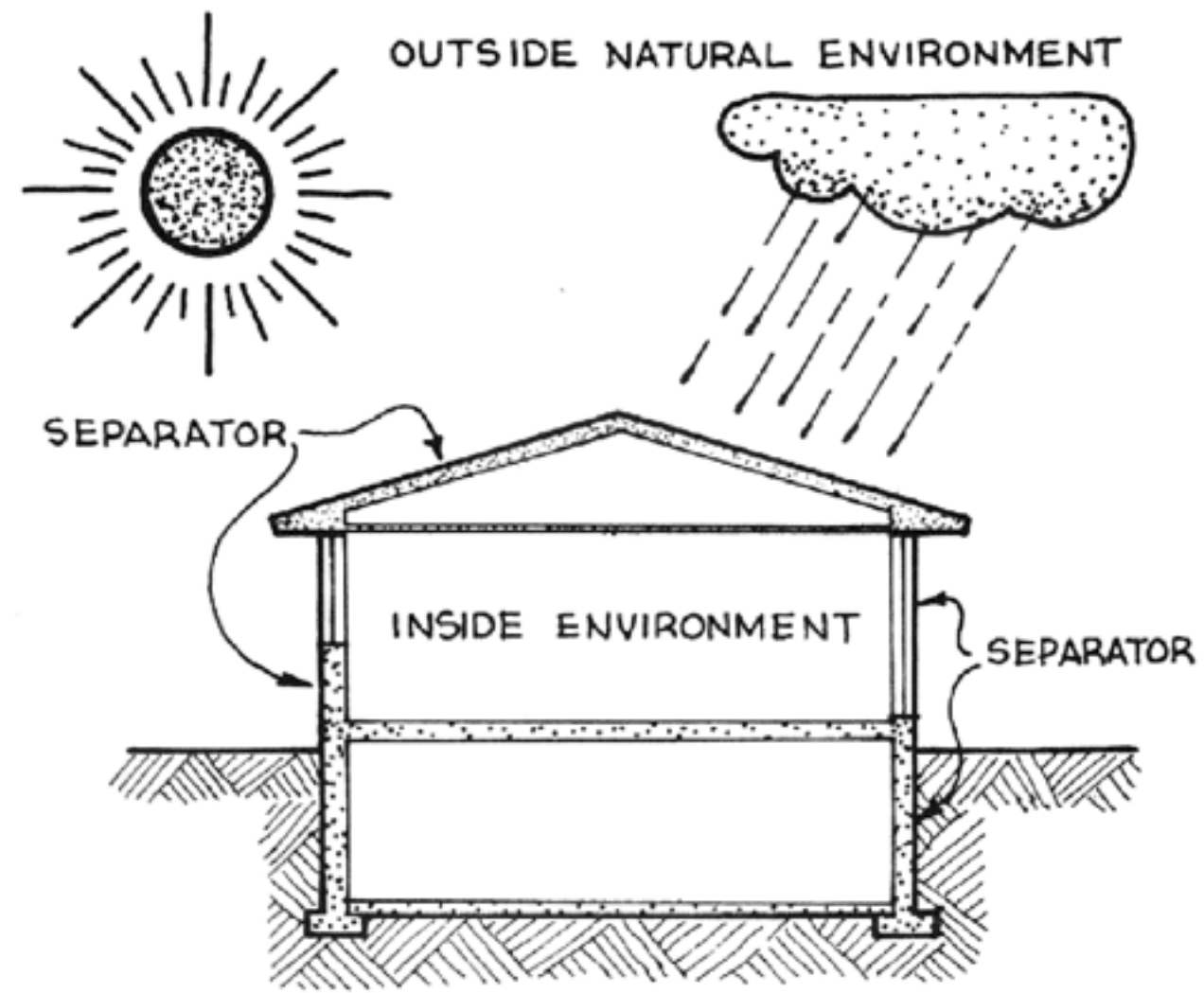


Figure 1-3. Roof with walls are environmental separators.

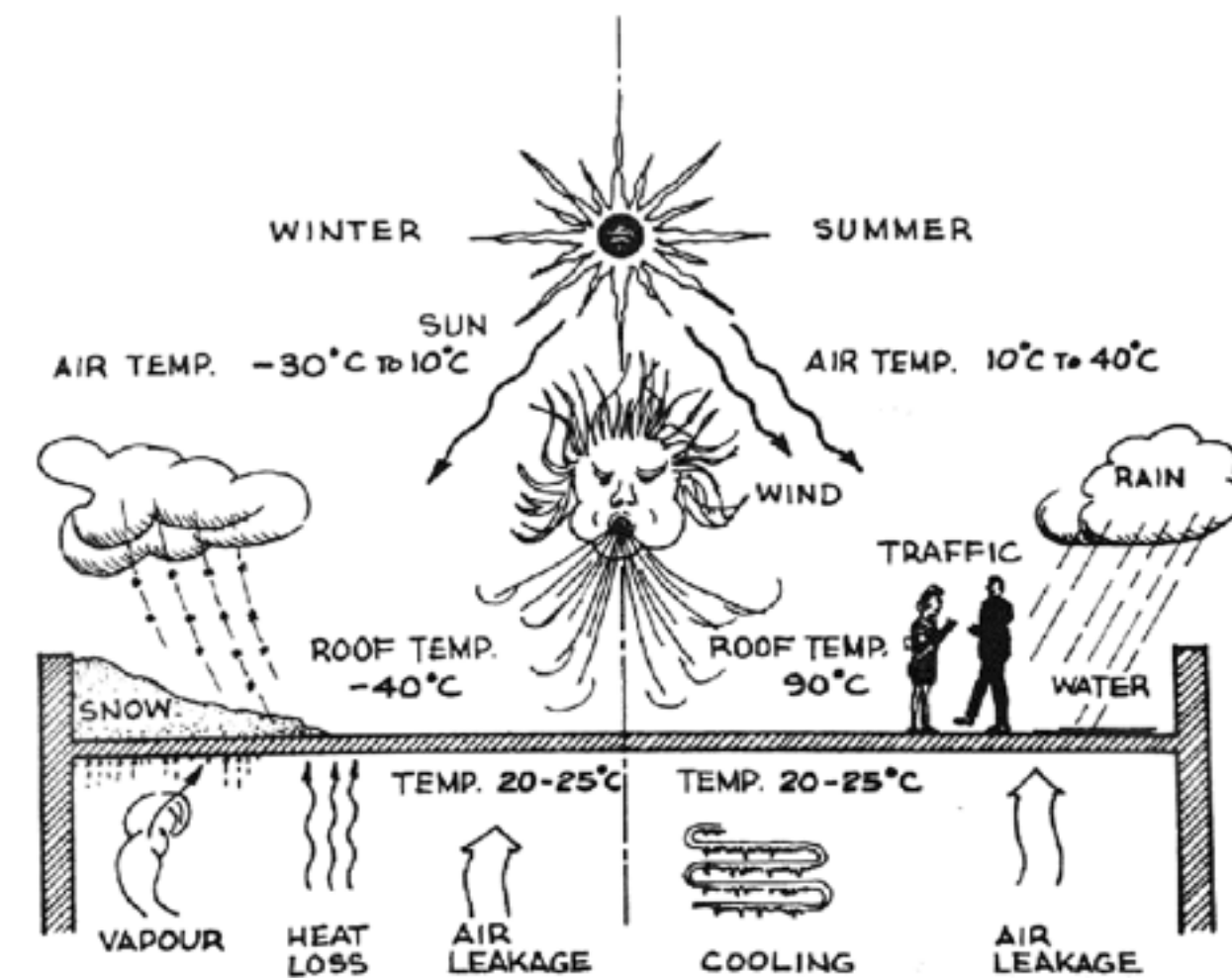


Figure 1-4. Factors of inside and outside environments.

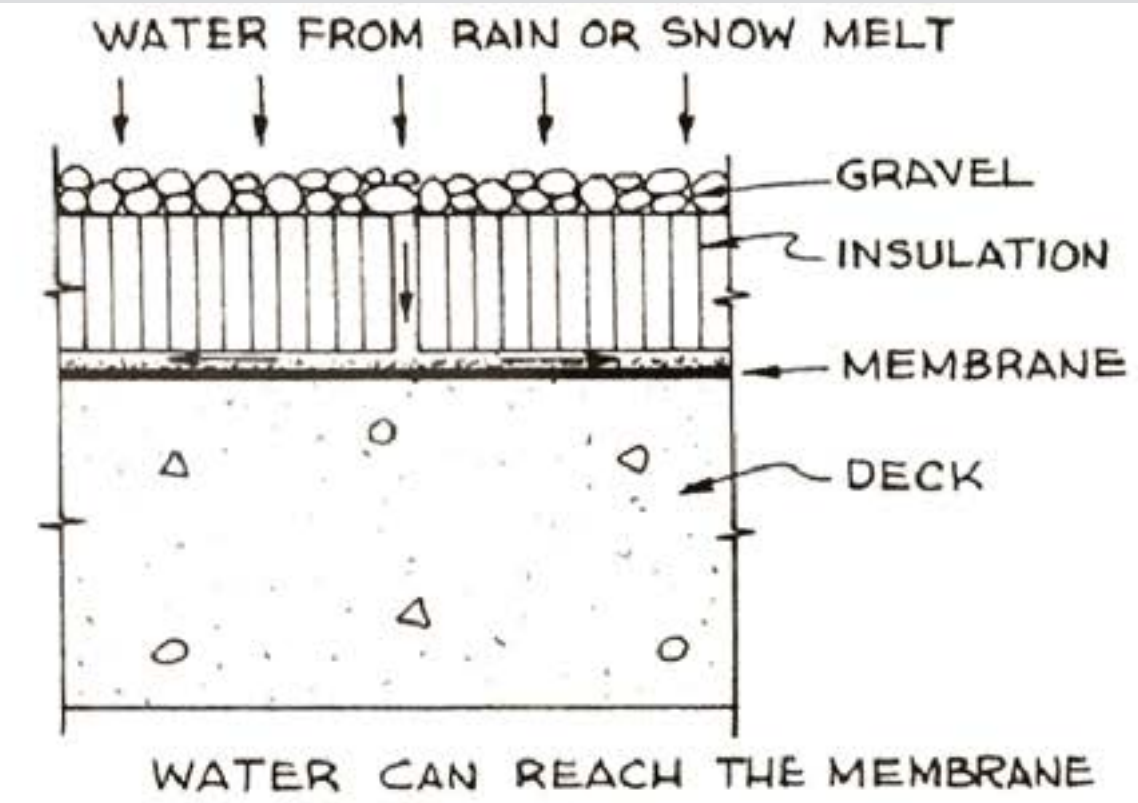


Figure 7-28. Rain or snow melt on protected-membrane roof systems.

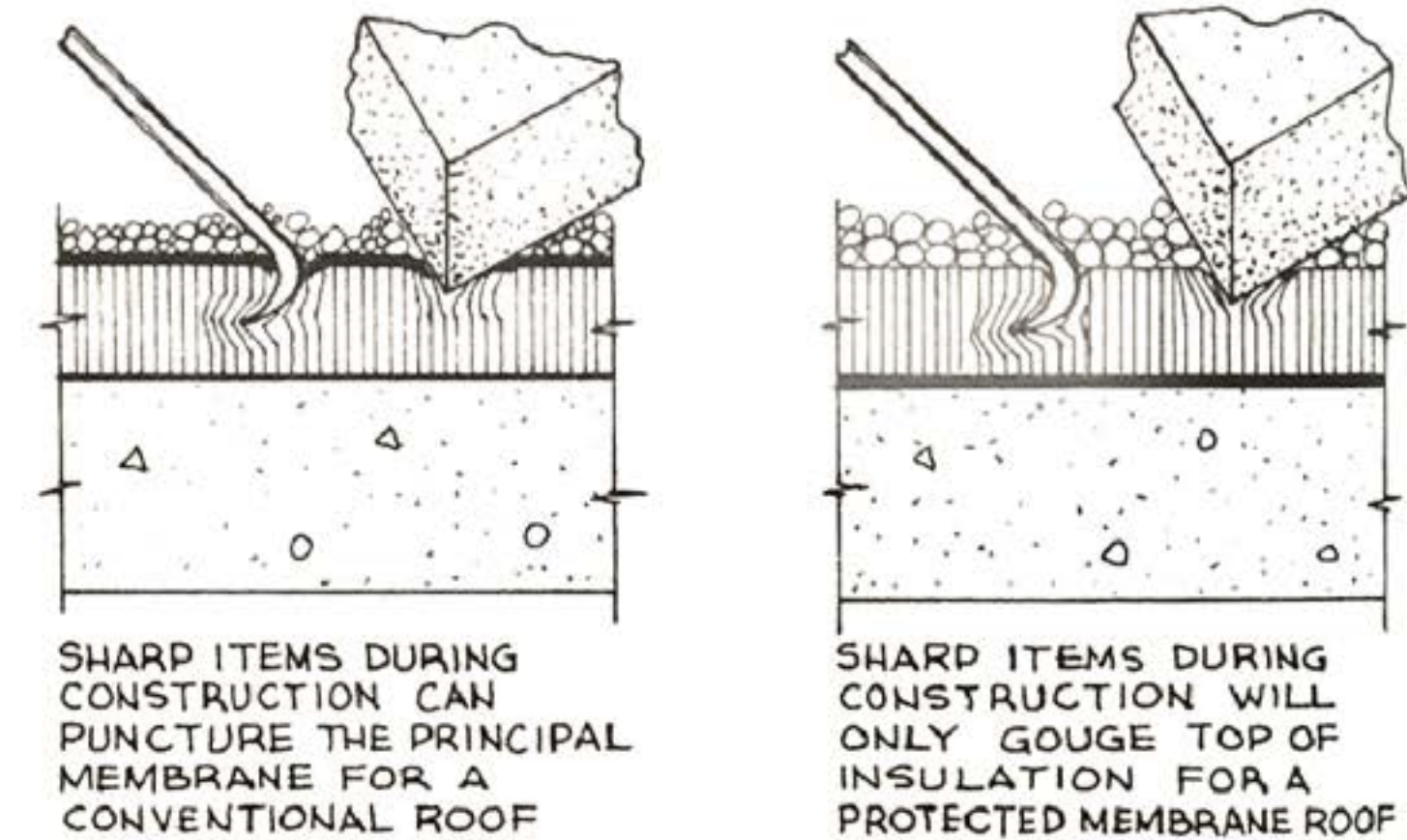


Figure 7-29. Hazards to roofing system during construction.

IT'S ALL IN THE
DETAILS...
and everything is
connected...

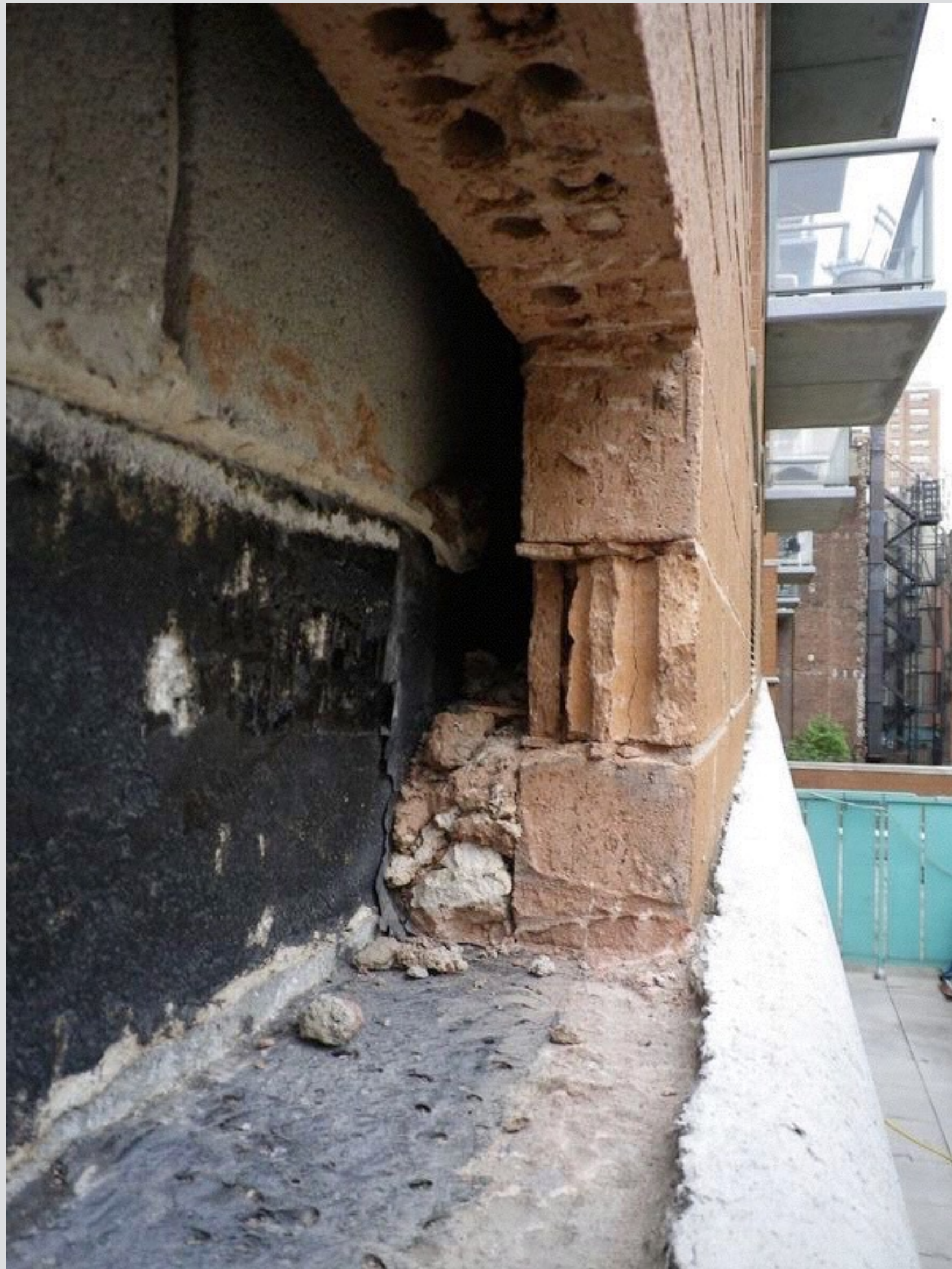
COMPONENTS AND THEIR CONNECTION TO THE
BUILDING ENVELOPE WILL DEFINE THE DURABILITY
AND LONGEVITY OF THE ROOFING SYSTEM

COMMON ISSUES

- PARAPETS, BULKHEADS, BASE FLASHING AND THE ROOF/WALL JUNCTION
- I have seen more roofing failures because of improperly done base flashings, masonry details and walls than I have seen actual membrane failures. Problems will usually show up within the first few years - or sooner!
- COATING FAILURES. When they don't work, why do we keep trying?
- Accessories, skylights, roof drains, penetrations
- Railing systems / cladding solutions.



Our buildings will drain, it's up to us if they drain to the outside or drain to the inside.



Rebar laid in slab will almost always miss the center of CMU's.
Air barrier? What's an air barrier?



Eastern façade slab / wall repaired after hurricane Irene in 2011. Heavy storms reveal our building problems.



Liquid applied membrane up wall, out on to deck and down the face of exposed slab



East façade below parapet wall, repaired after hurricane Irene in 2011.



Looks OK? It "lasted" 15 years



Water rotted out wood deck. Leak is not due to the membrane. Parapets and coping are to blame.



Useless base flashing. No waterproofing at coping. Even minimal masonry mass with porous coping stones lets in a lot of water.



Coating Failure?

Coatings are not a solution when there is something else wrong in the assembly.

Elastomeric - vapor open paint won't let water in *or* out! Note what's left of the first, white colored cement coating on the brick. This wall has been doing this since it was built in 1994





3"XPS on walls, 6" XPS on deck, Elevator service calls eliminated. XXXX



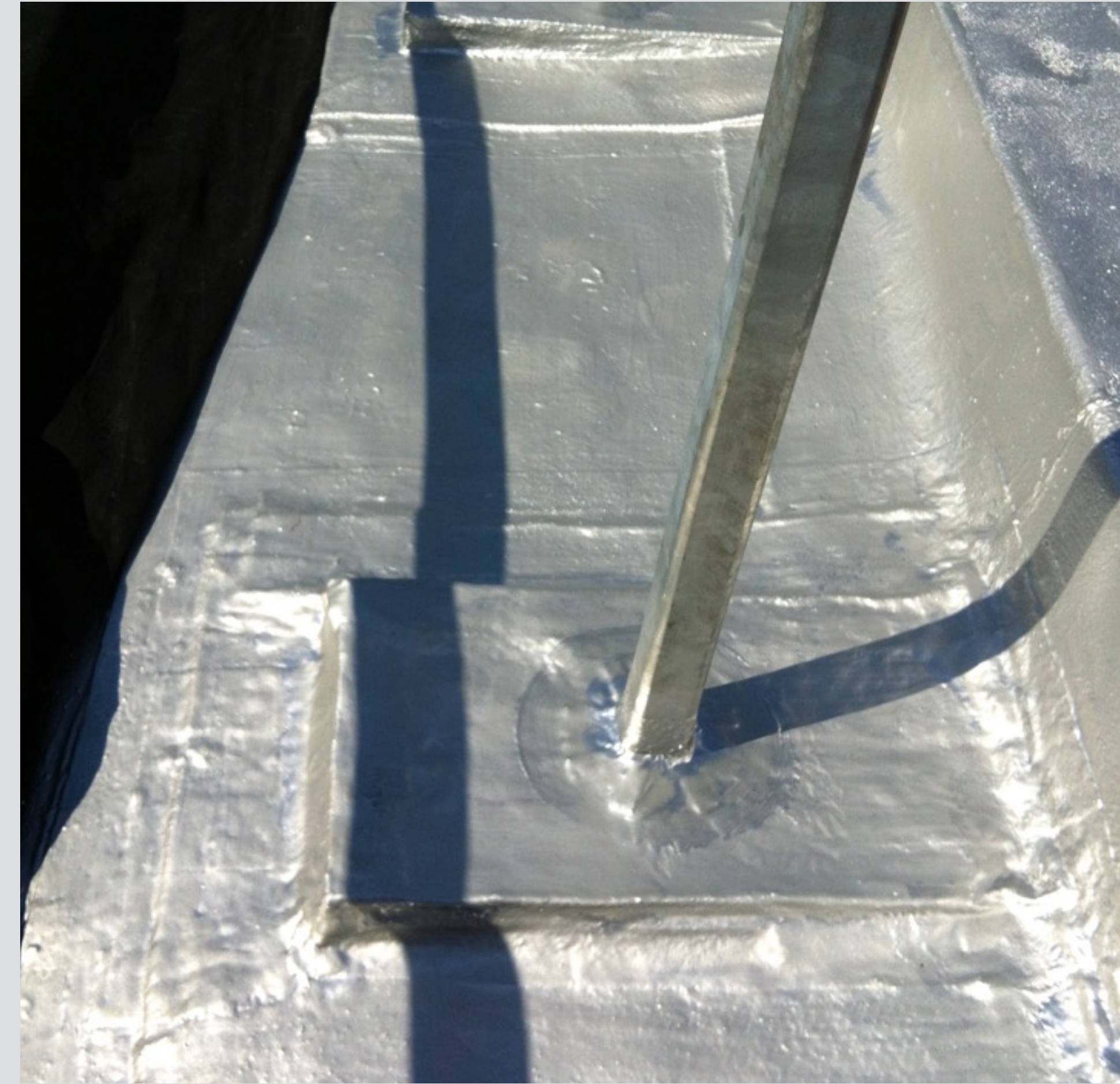
If you don't design the walls for drainage to work with the roof system - don't worry - someone else will.



We treat railings as an afterthought



One large connection point. No outriggers. No pitch pockets.



Two coats of cold liquid applied membrane over post base and entire roof before drainage mat and insulation is applied.





New and rebuilt masonry. Peel and stick. Aluminum cap, core drilled posts.
All steel was prefabricated and then sent to galvanizer and bolted together on site.





NYC standard galvanized skylights. They leak air and water and over ventilate. They are used everywhere.



NYC standard versus Velux with integral insulated aluminum clad curb. Custom sizes. Accurate ventilation.



We still have access to all types of roof drains

A FEW DESIGN CONSIDERATIONS

- Evaluate the existing conditions and structure as well as possible.
- Best reasonable practice approach - envelope / wall / roof / connections. Masonry and system components accessories. Use the right roof for the structure and part of the country you are in.
- Get insulation into the job. What type of insulation? Always in multiple staggered layers.
- Consult with, and question, the manufacturer. Bring him into the job early on.
- Use products and materials familiar to the contractors. New products are flooding the market and everyone has the “next best new system”. Do not be the guinea pig.
- Consider how the roof may be used, or more importantly, abused. This may help determine insulation type and membrane type.
- Budget and cash flow. Design a complete system. If that’s not possible, then phase in sections over time.
- Know your contractor and check their past jobs. Hire someone experienced in the type of roof system you are using



Evaluate the existing structure

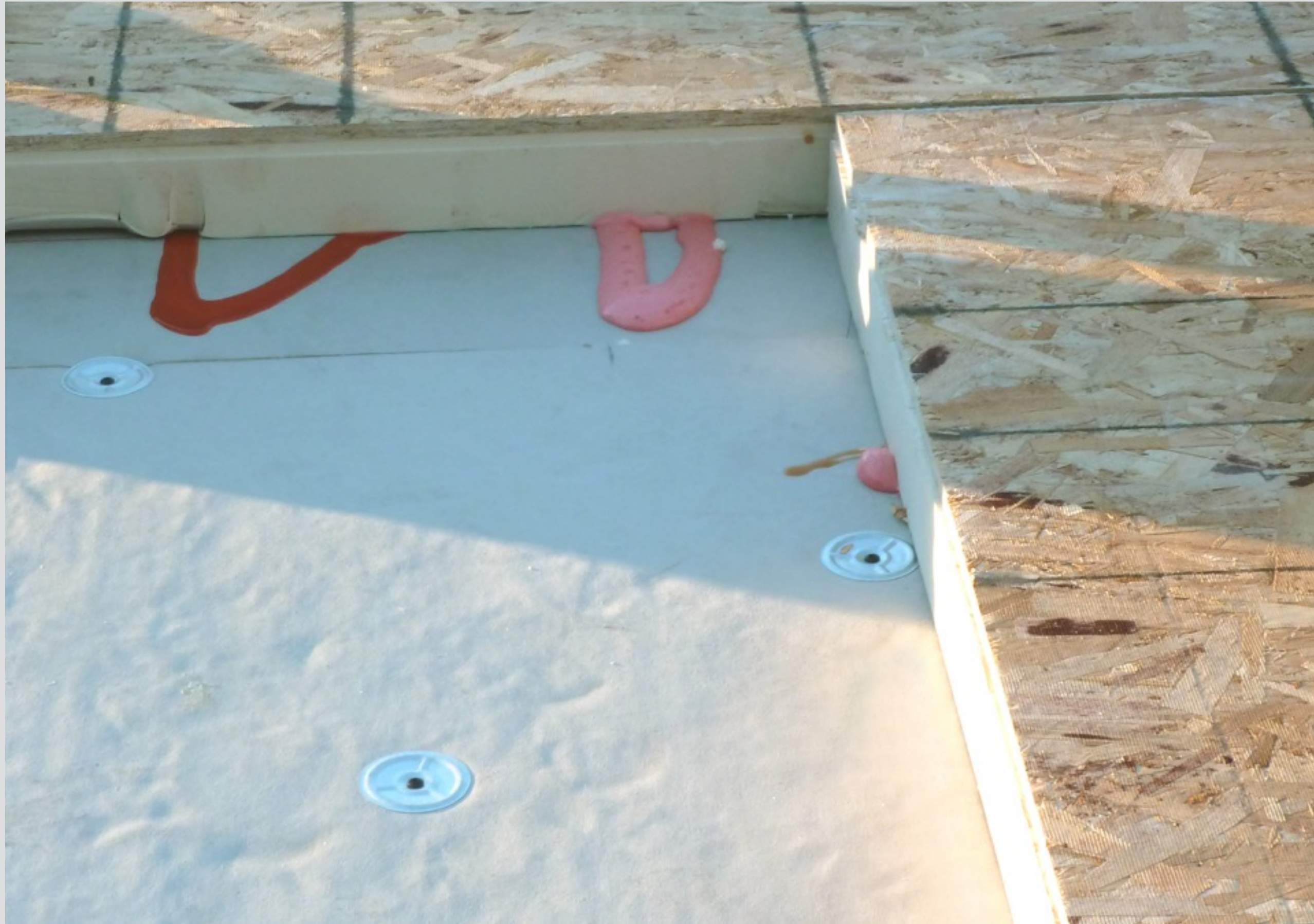
Cored brick and hollow CMU laid up in mass wall fashion with no drainage plane this cheap single ply roof is outlasting the wall system.



Lintel condition, no possibility of drainage to the outside. Every window was like this, most still are.



Get insulation into the job, as much insulation as the as the owner will allow.



Polyiso, XPS, Rockwool - type really does not matter, but use the right insulation for the building type.
Always install in multiple layers, and look for expansion and contraction issues.
Adding insulation to an existing roof deck increases deck height and lowers guard rail height.

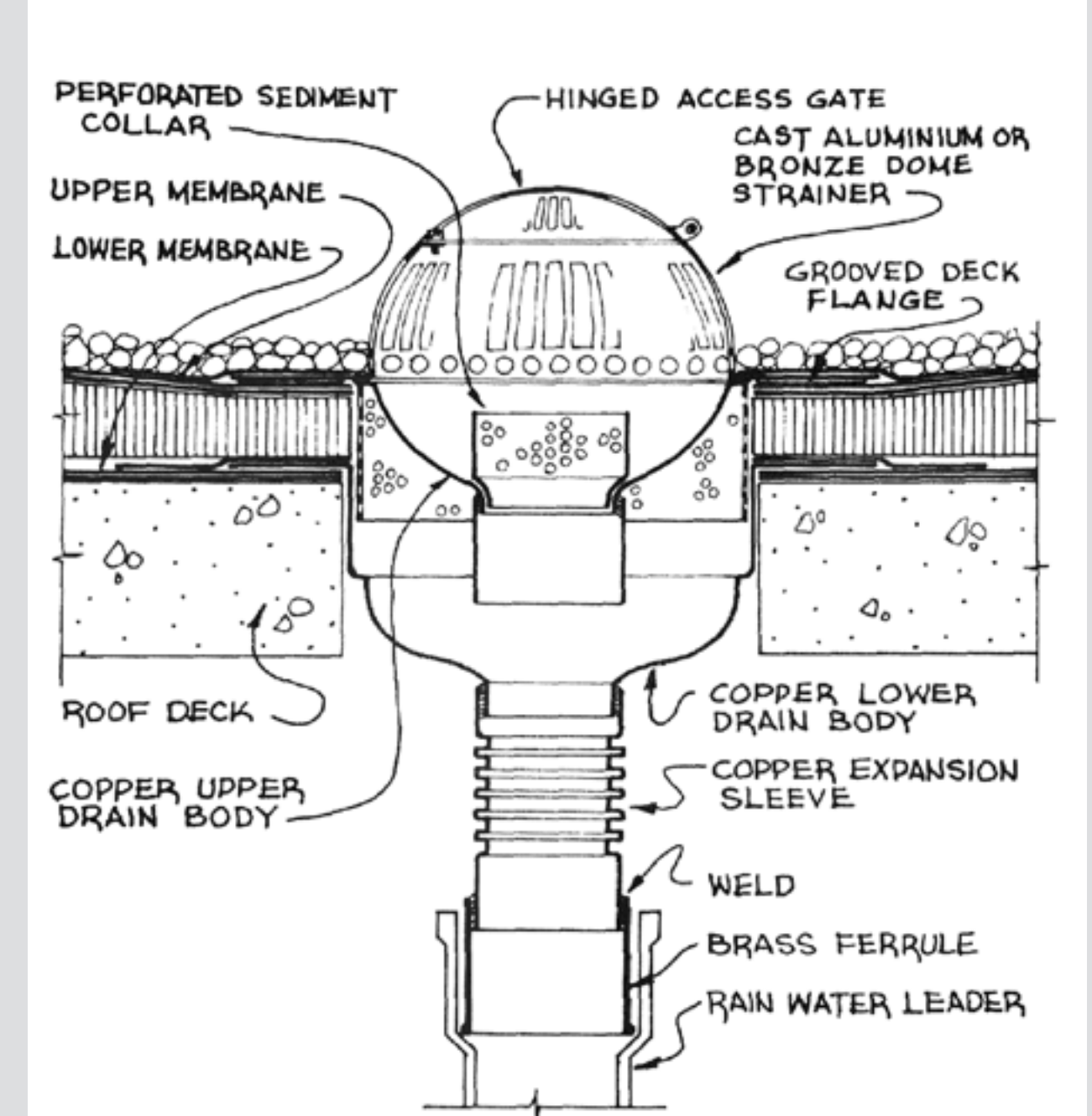


Figure 7-15. Two-part copper drain for drainage at both membranes of a double membrane roof system.

1970's

These assemblies have been around for a long time.

Double vapor barrier roof. Polyiso over adhered water barrier with roof membrane on top. The potential exists for water getting trapped within this assembly. This handles air really well but more importantly it allows it to become watertight in a day.

COLD LIQUID APPLIED ROOFING SYSTEMS

LIQUID APPLIED SYSTEMS

COLD LIQUID APPLIED HAS BECOME MORE MAINSTREAM. Used in wall systems, as air barriers, on decks etc.

EXCELS AS A COATING SYSTEM FOR EXISTING OR NEW ROOFS

MOST MANUFACTURERS OFFER A LIQUID APPLIED COMPONENT AS PART OF THEIR ROOFING SYSTEMS

LIQUID APPLIED IS AN EXCELLENT SOLUTION FOR COMPLICATED FLASHING DETAILS OR COMPLEX GEOMETRY (no more “origami” with sheet materials)

LEARNING CURVE

THE ODOR OF THE UNCURED PRODUCT IS OVERWHELMING AND TOXIC. Maybe we will use acrylic products more

FUMES WILL ENTER AN OCCUPIED BUILDING AND ALARM THE OCCUPANTS

APPLICATION OVER WET OR GREEN CONCRETE CAN LEAD TO MAJOR FAILURES

INCONSISTENT APPLICATION - HOW DO YOU DETERMINE APPLICATION THICKNESS? Mil gauge, grid deck, spec additional coats.



Always fully reinforce any liquid applied system. As much as I want to believe that unreinforced direct cold applied paint on roofs will work, we are just not there yet.



How do you ensure application thickness? Roof pitch $\frac{1}{16}$ - $\frac{1}{8}$ per foot

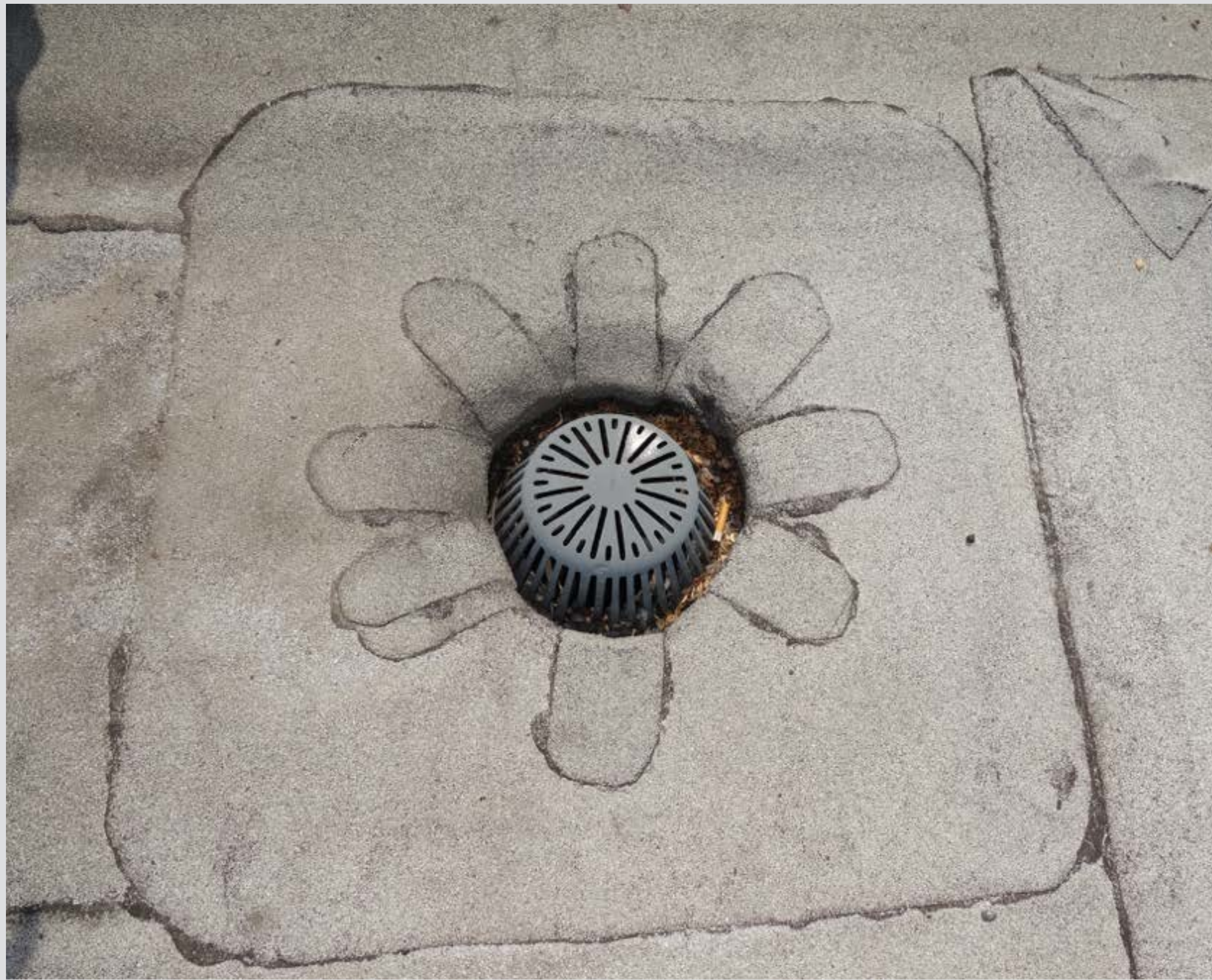


Seamless... *after* multiple coats





Liquid applied systems make seamless curbs possible. No more “bitumen origami” at the detail areas.



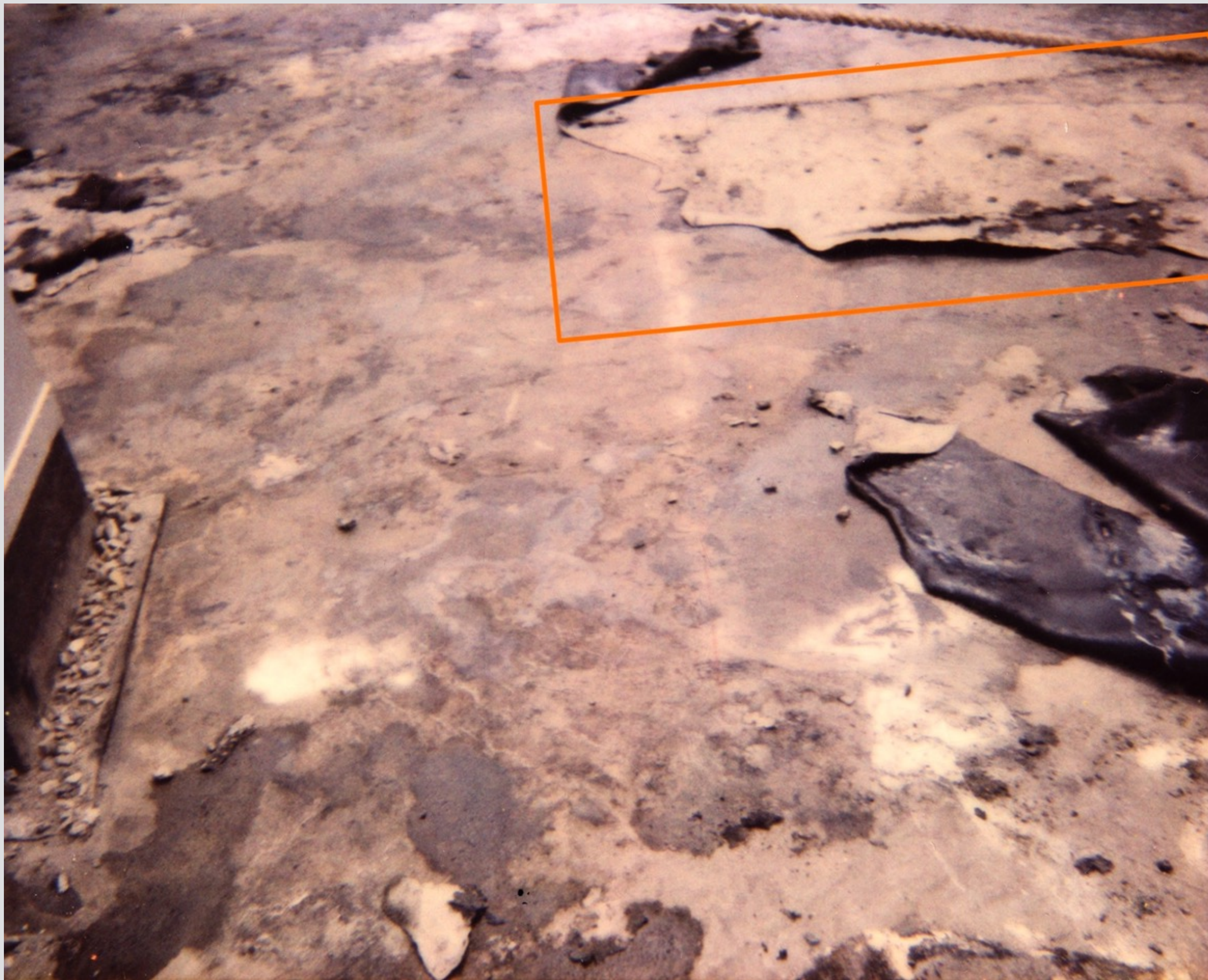
Cutting and patching membrane to get it into clamping ring at critical point of system



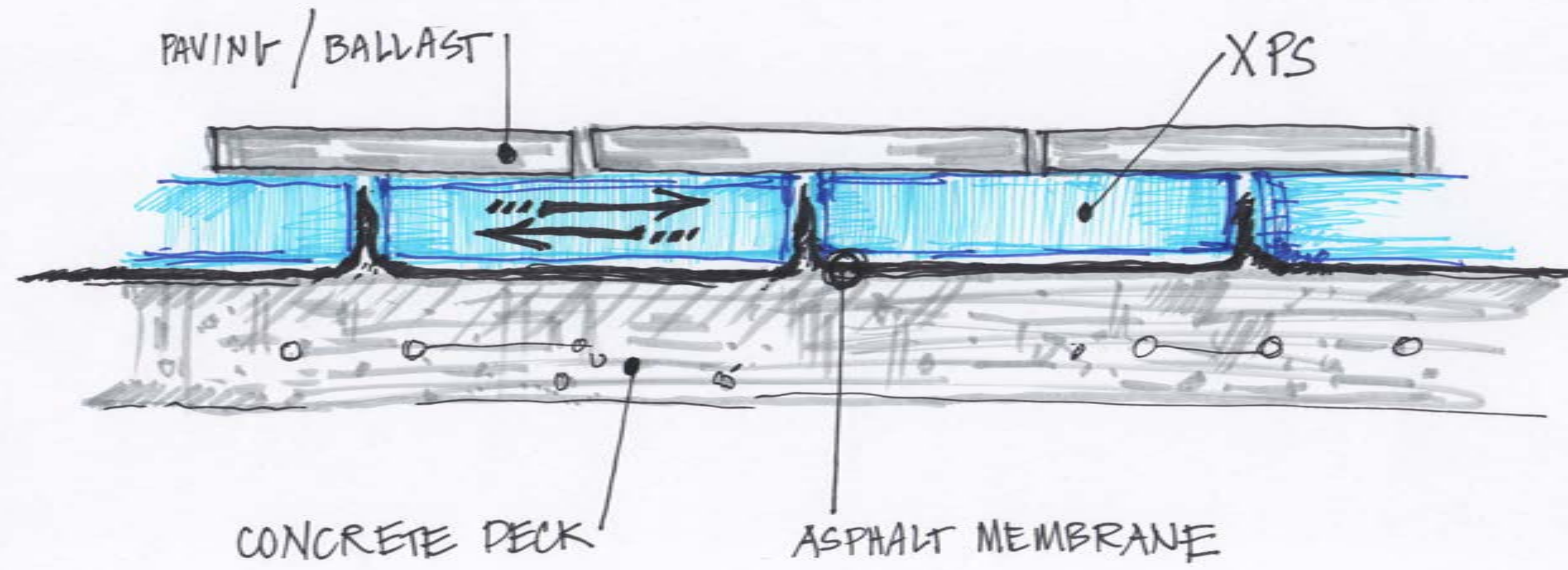
Brand new roof in 2007. Exposed membrane over 6" XPS, coating was applied in 2008. This photograph was taken on July 2, 2015

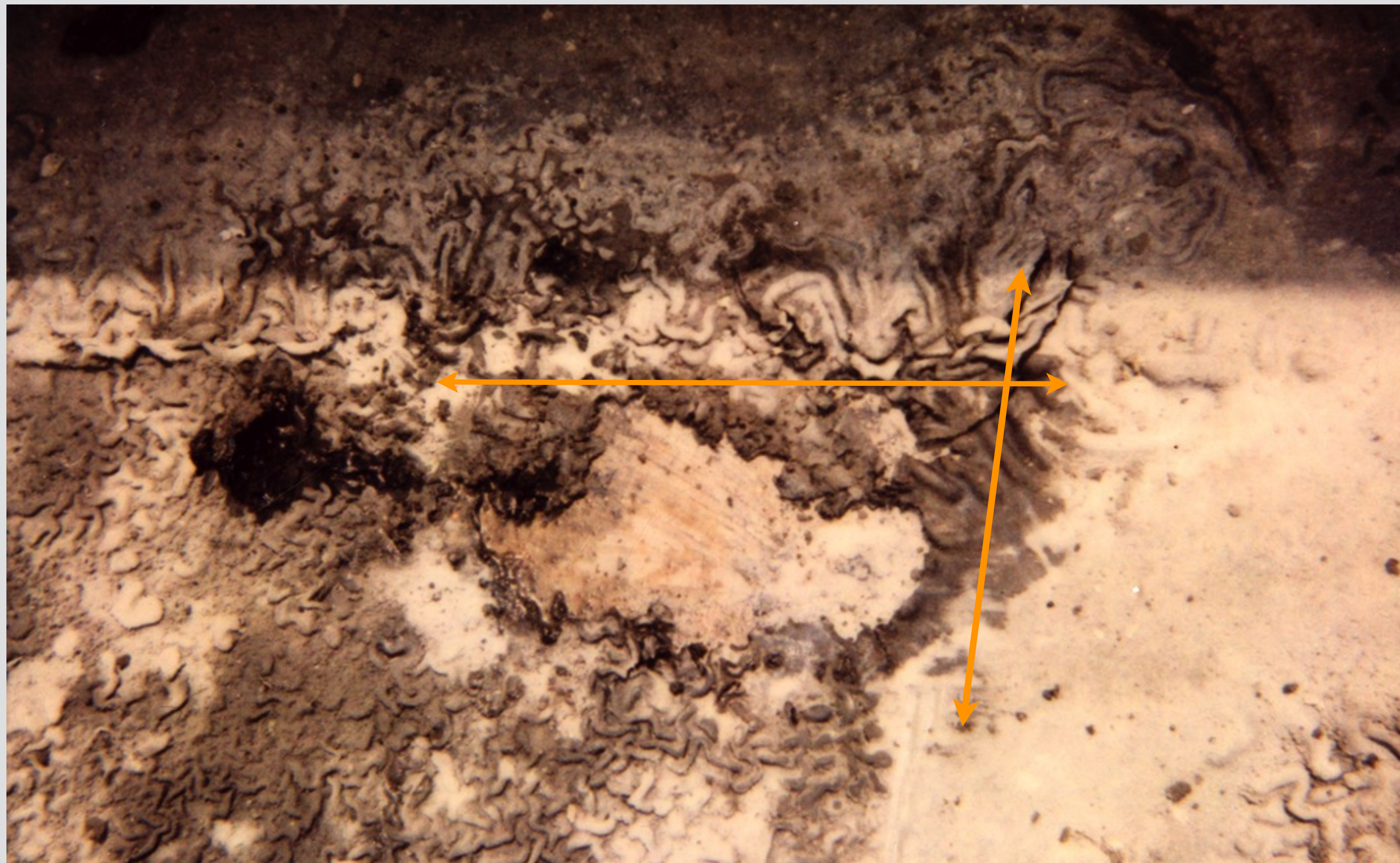
IRMA FAILURE

Inverted or insulated roof membrane assembly. PRM expansion, drainage mat, slip sheet, unreinforced liquid applied.



As bad as this looks, there was not a lot of water damage inside. Good concrete, decent pitch to drain and primer kept a lot of water out.





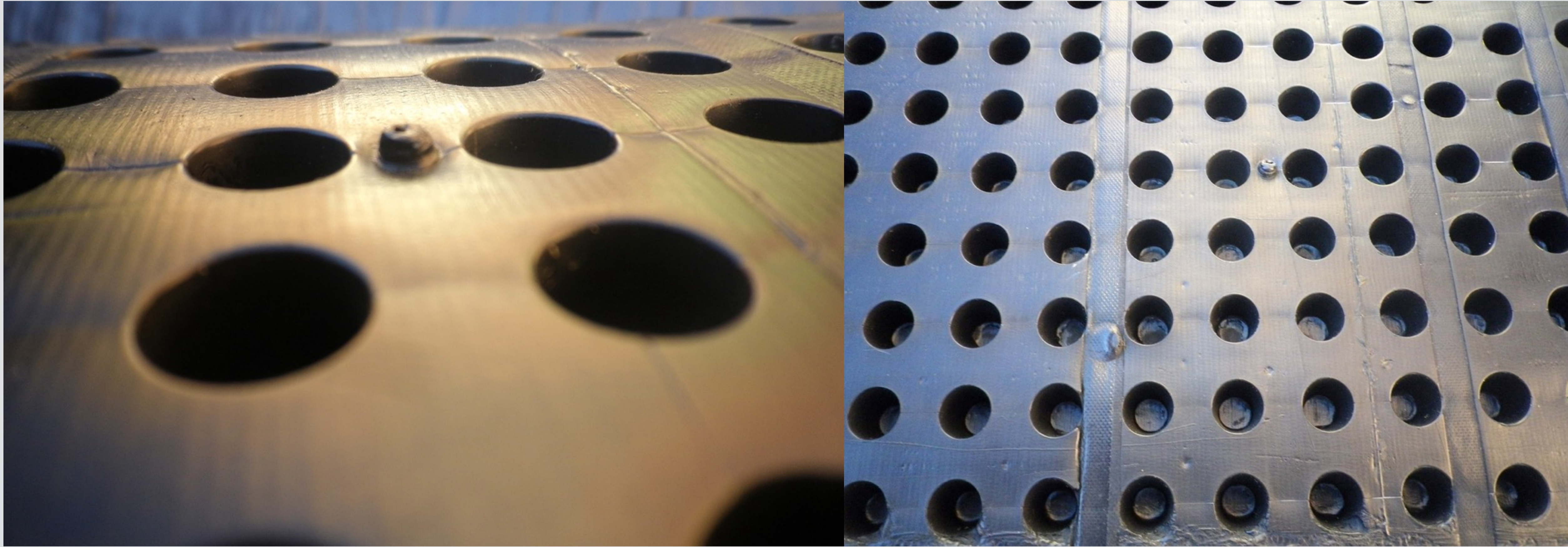
This was the “perfect storm” that had to have two or three other things going on in order to fail like this:

- * No drainage mat or slip sheet. Insulation applied directly on top of membrane.
- * Unreinforced hot asphalt - no felts, fabric or fibers.
- * Likely a highly elastic, rubberized, modified hot asphalt.



2016,,,

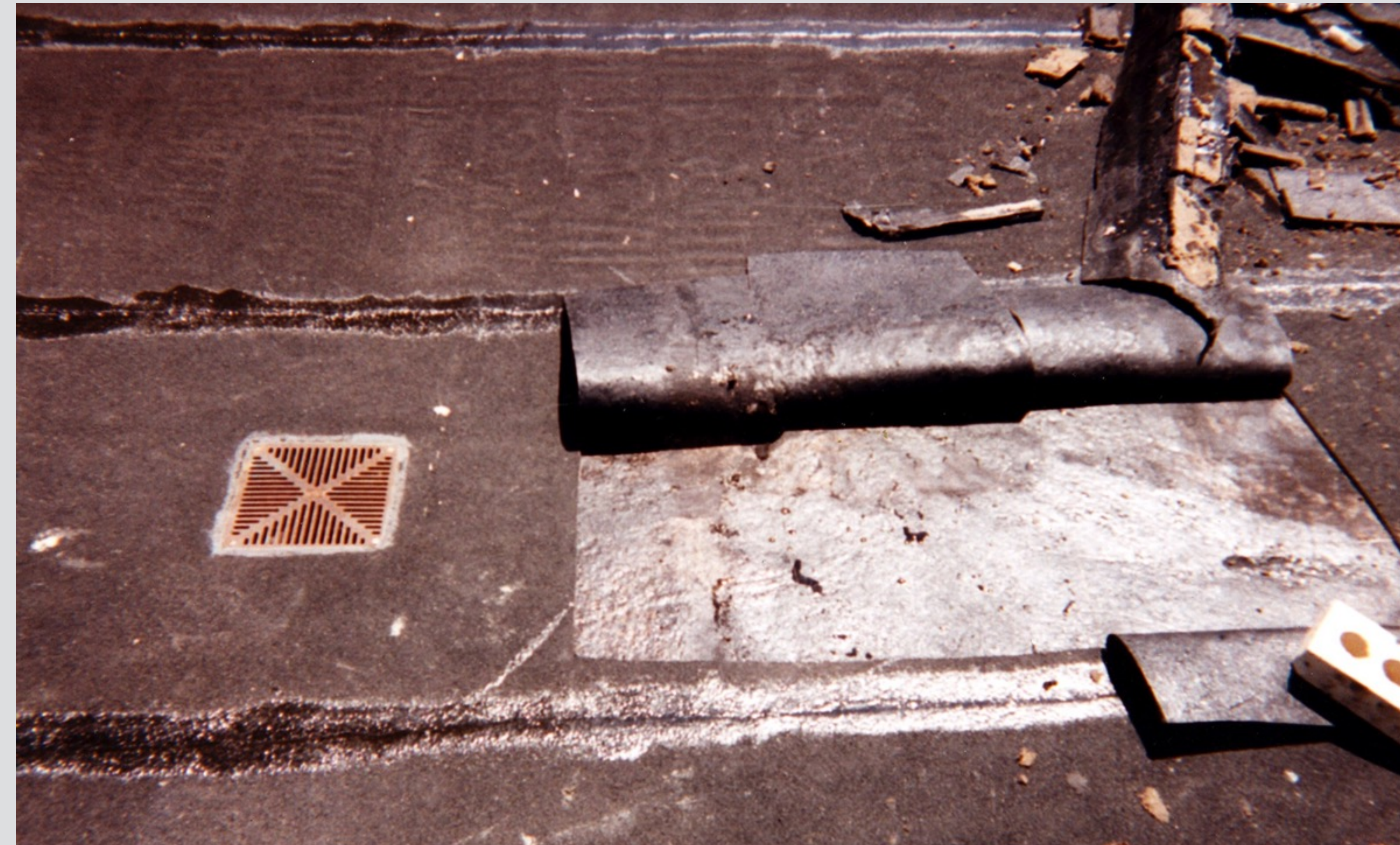
Fully reinforced liquid applied roof 1998. Removed this section in August 2014 to see how it was holding up. It looks good after 17 years, but can we get another 20/25 years out of it?



Drainage mat. Re-purposed subsoil product. Different types/usage. Was this used on roofs in the 1980's?



Different types and different thicknesses of drainage mat for different purposes



1996 - complete failure of membrane on concrete deck within 4 months. Component failure of roof drain and cap flashings. Roofing problems will almost always show themselves very early on.

Protected roof membrane - insulation on top

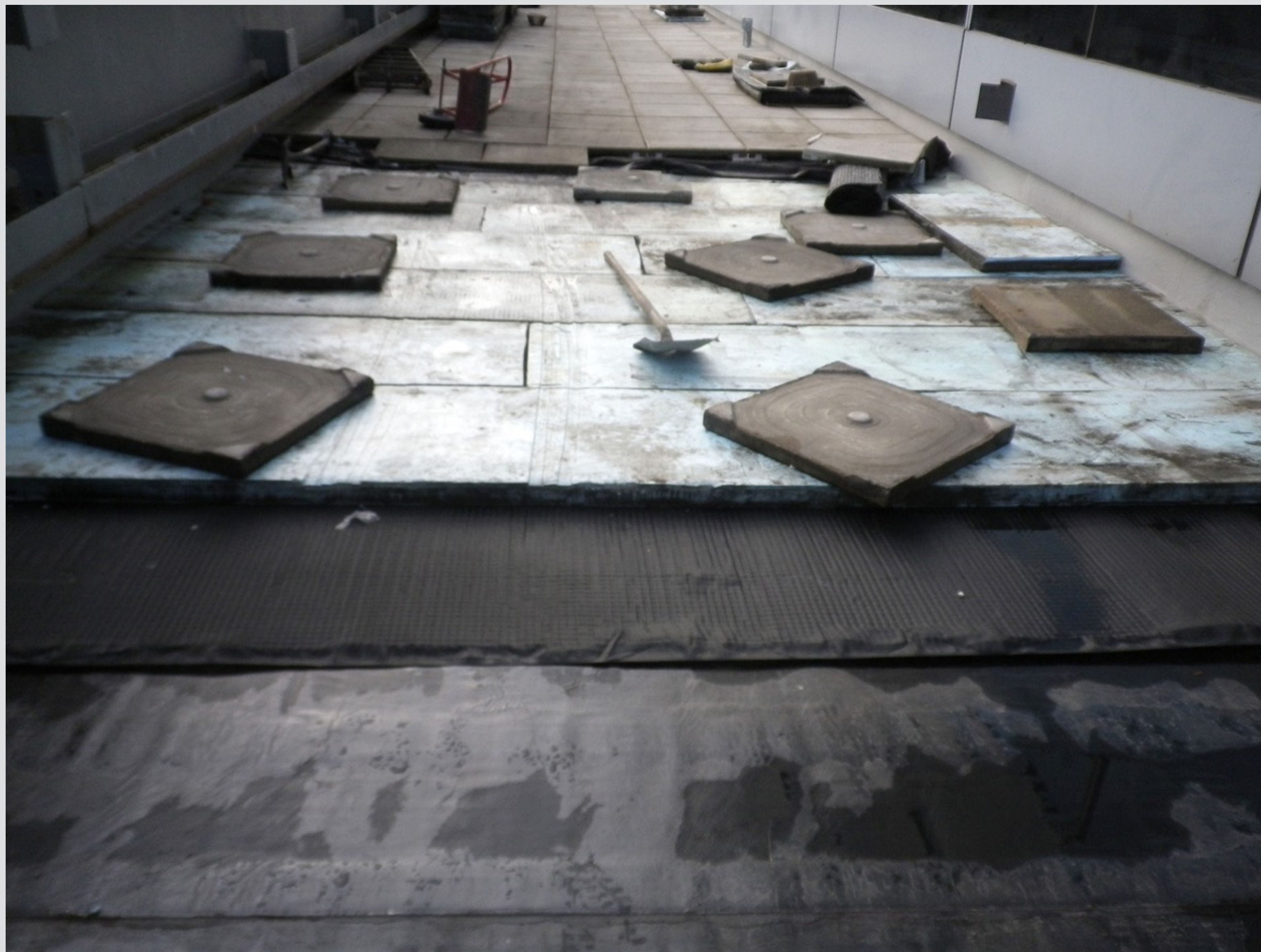
- The perfect roof? Probably.
- Protects membrane and the structure.
- Not easily accessed to repair or inspect but no one does this anyway.
- Design for highest durability and longevity.
- Myth: “ It’s impossible to find a leak....”
- Possibly the best selection for a 50-70-100 year roof ?

Exposed roof membrane - insulation below

- More susceptible to damage.
- Design around vapor / water traps.
- Possibility of excessive membrane expansion.
- Accessible, maintainable and repairable.
- Myth : “ Its easy to find a leak...”
- Easy to extend its life expectancy well beyond the warranty period by coating every 5-10 years. Easy to have a real maintenance program. Could this system make it to 70 years?

IRMA ROOF

Inverted / insulated roof membrane assembly. PRM : the perfect roof?



IRMA replacement usually allows reuse of insulation and ballast for the new roof.
Missed opportunity., Owner could have added another layer of XPS



Cut-in base flashing. Face sealed. No possibility to drain out.



Find the high point and hope that it pitches to drain.
Tapered insulation won't work in an IRMA.



Extending the life of IRMA membranes by applying coating systems. We are headed there.



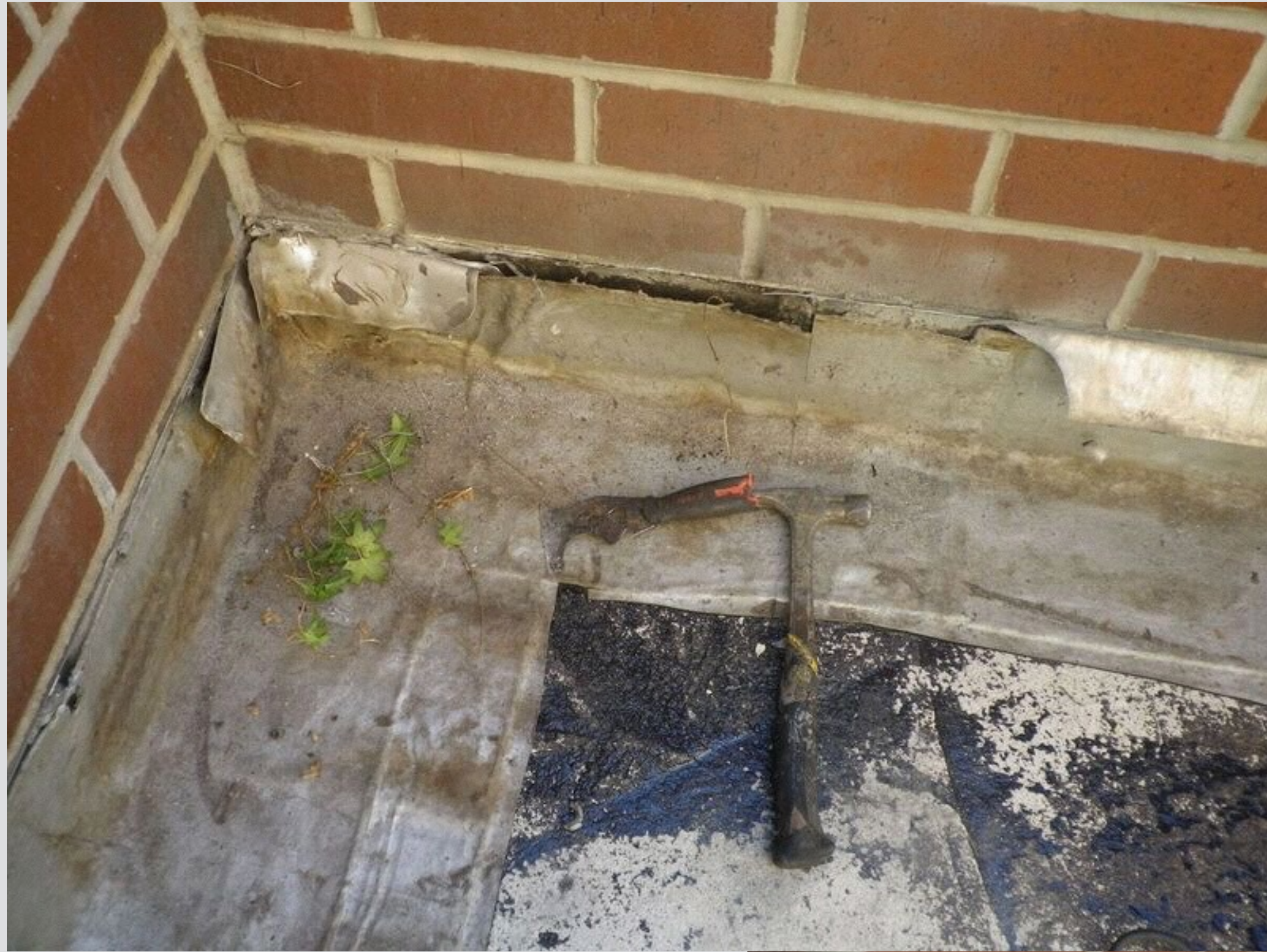




Always change the roof drains.....only in a few instances is this not necessary



IRMA system. Stages from deck to pavers. Drainage below? No problem.



Cut out / bypass metal base flashing



Clad the walls where you can usually on the inside of parapets and bulkheads

WOOD DECK

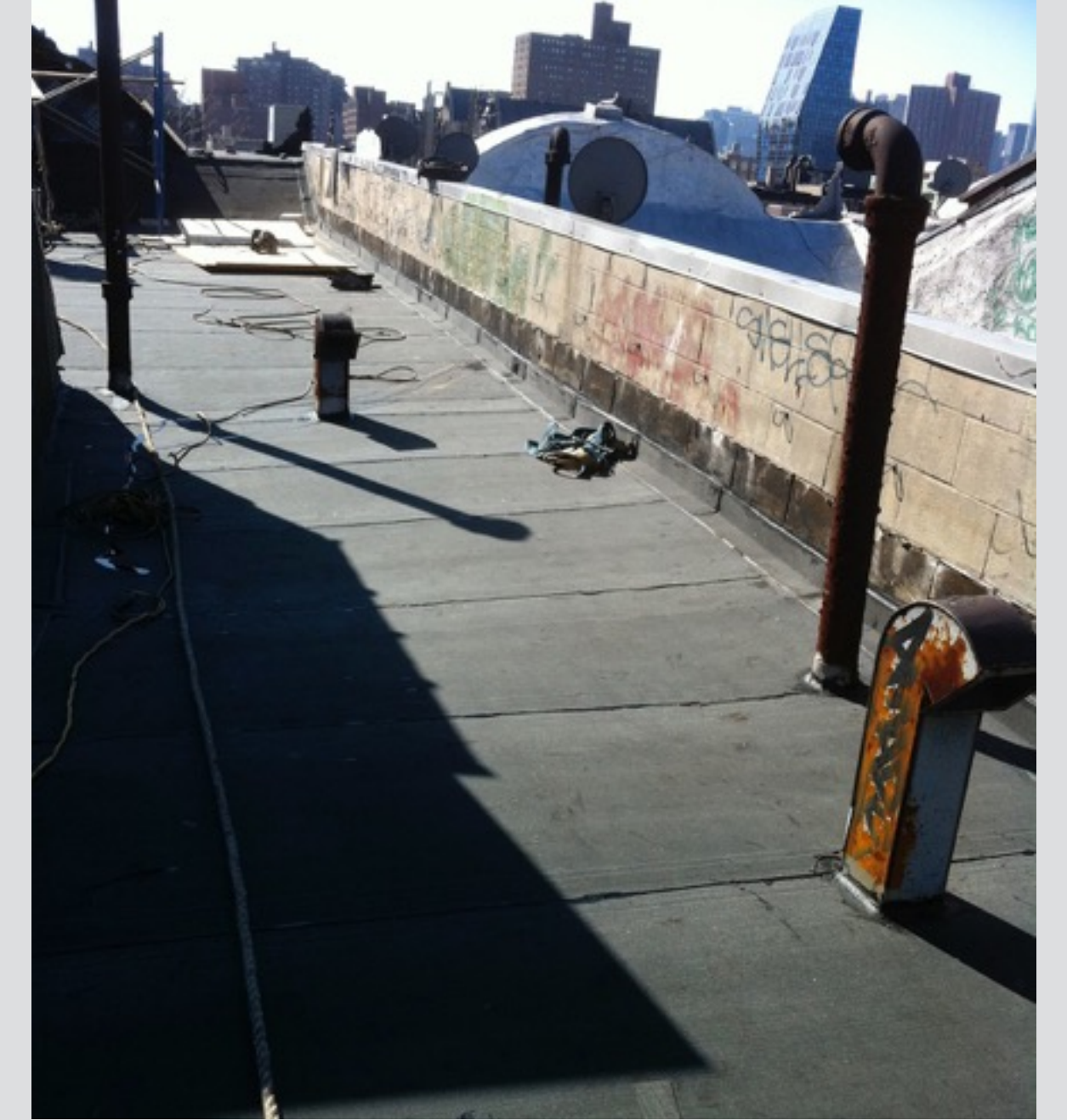
Exposed membrane insulation, cladding
vapor barrier, insulation, cladding.



2012 condition of 1995 CMU parapets. Graffiti is the water barrier.



Rear of cornice covered with flashing cement



2 layers of 3" Polyiso on the roof deck. The insulation is connected to the mechanical system, but in this case does it actually help?





The liquid applied component of an asphalt roof allows us to waterproof the cornice details easily.



Oversized gutter with raised outer edge will prevent overflow down rear façade



Peel and stick under counter flashing with drip edge under gutter



1996 hollow CMU parapet replaced original solid brick parapet



Save the CMU wall. Keep it dry.



Keep it warm.



2012 : CMU parapets clad in insulation and aluminum should never need to be repaired.



Increase parapet or guard rail height where required for code compliance. Lawyers, especially in this room, know how to use tape measures.



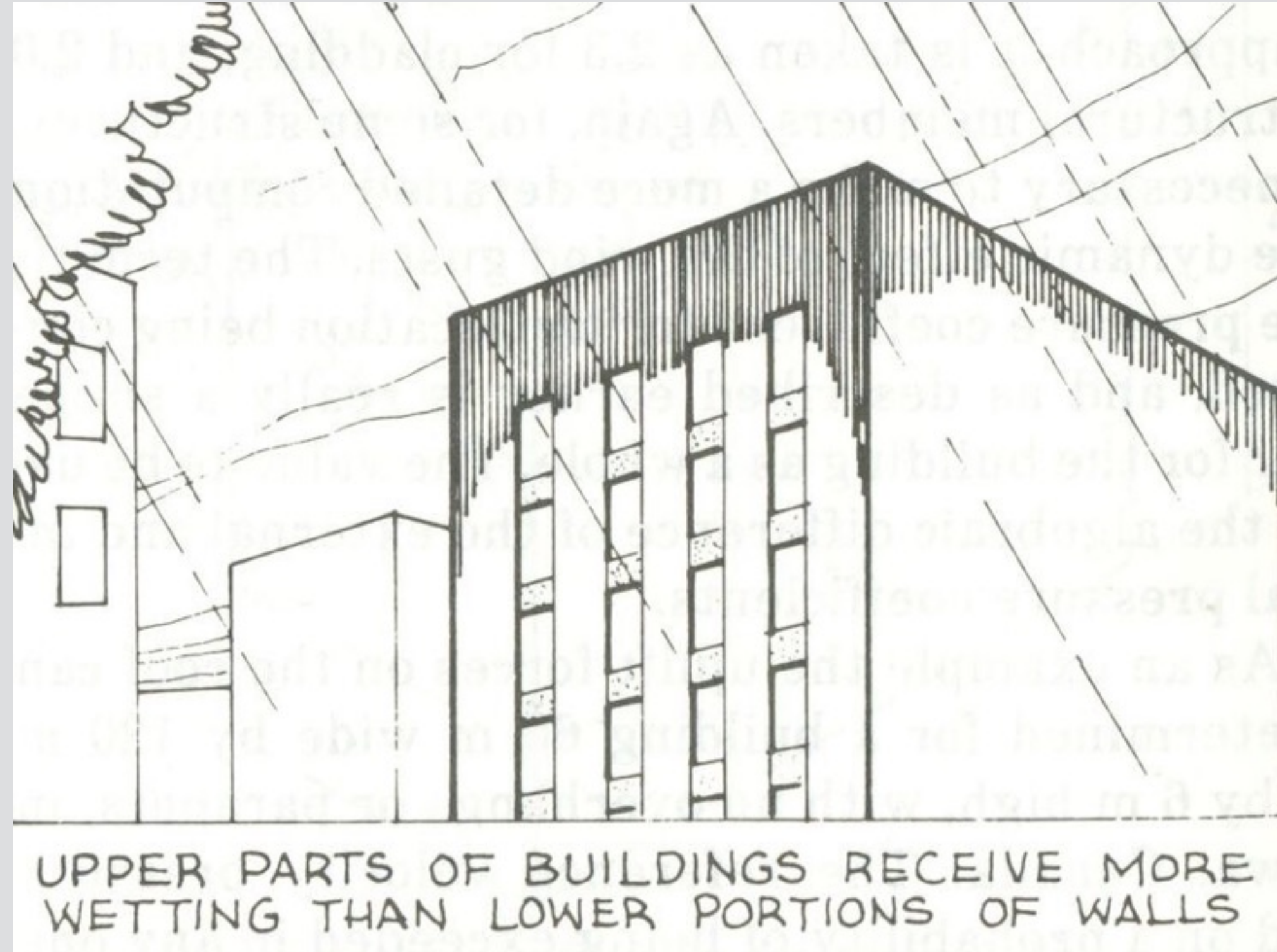




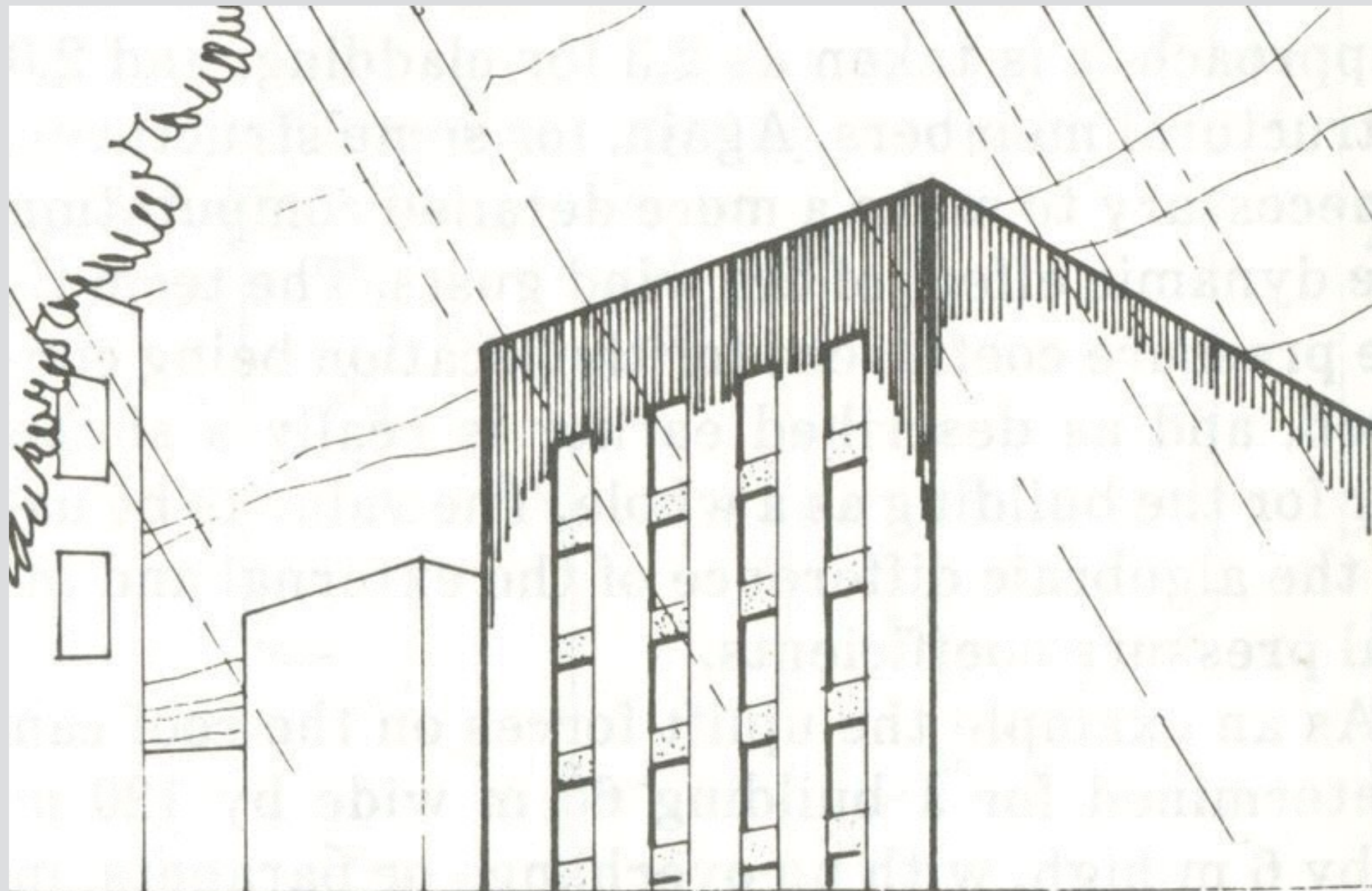
In the 1970's and 80's we did a lot of dumb things to our cornices and façades. We tore them off the buildings and ensured a lifetime of headaches and expense for ownership..... *but that was then*



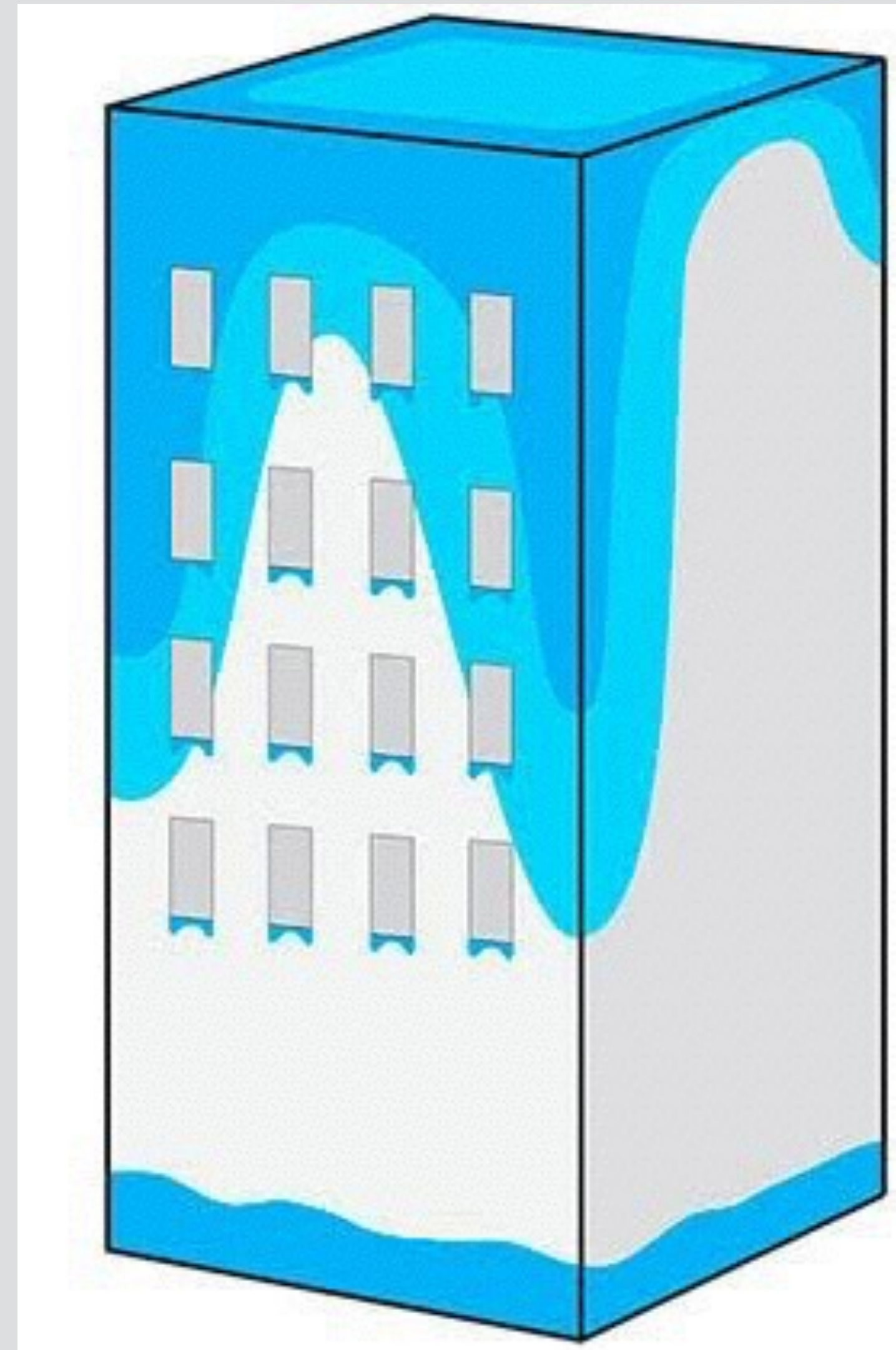
And this is now... What's changed? Where's the cornice? Problems show up immediately in new work. In 2016 we are still taking the part of our façade that has to handle the most water load and we make it worse.



Baker 1980



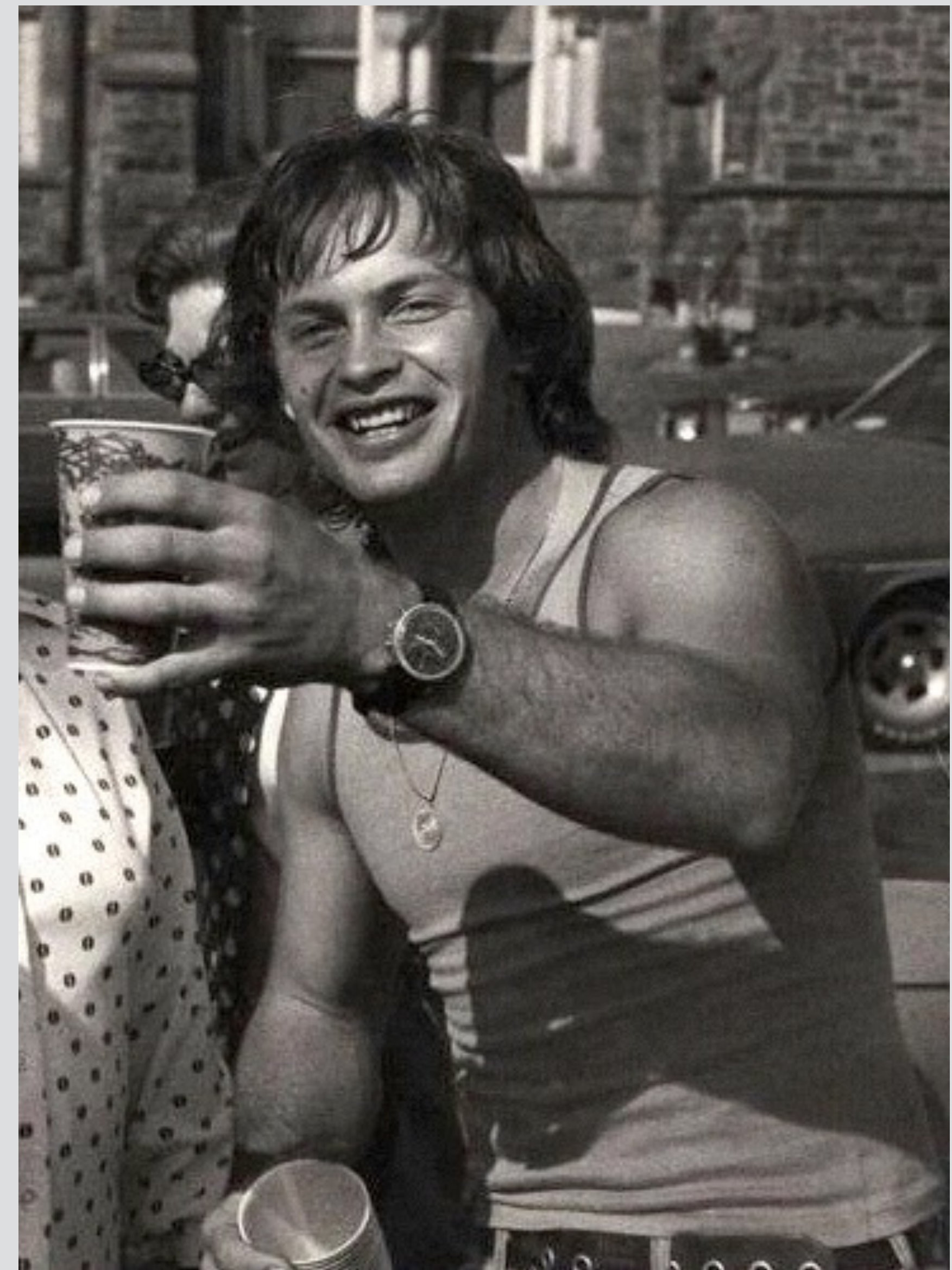
UPPER PARTS OF BUILDINGS RECEIVE MORE WETTING THAN LOWER PORTIONS OF WALLS



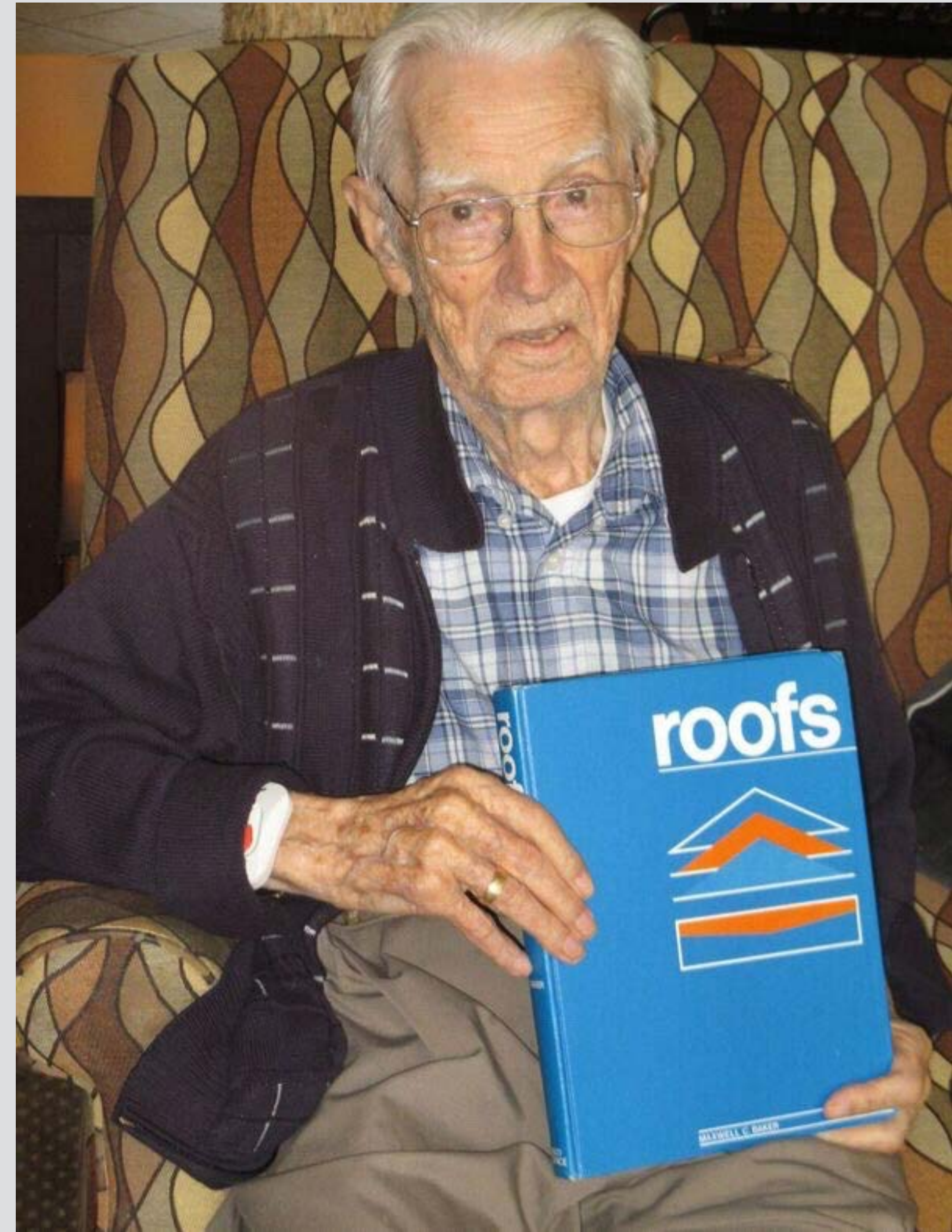
Lstiburek / BSC



The bad, the ugly and the good ?
We have the perfect roof and the perfect wall, but what about our cornices and parapets?

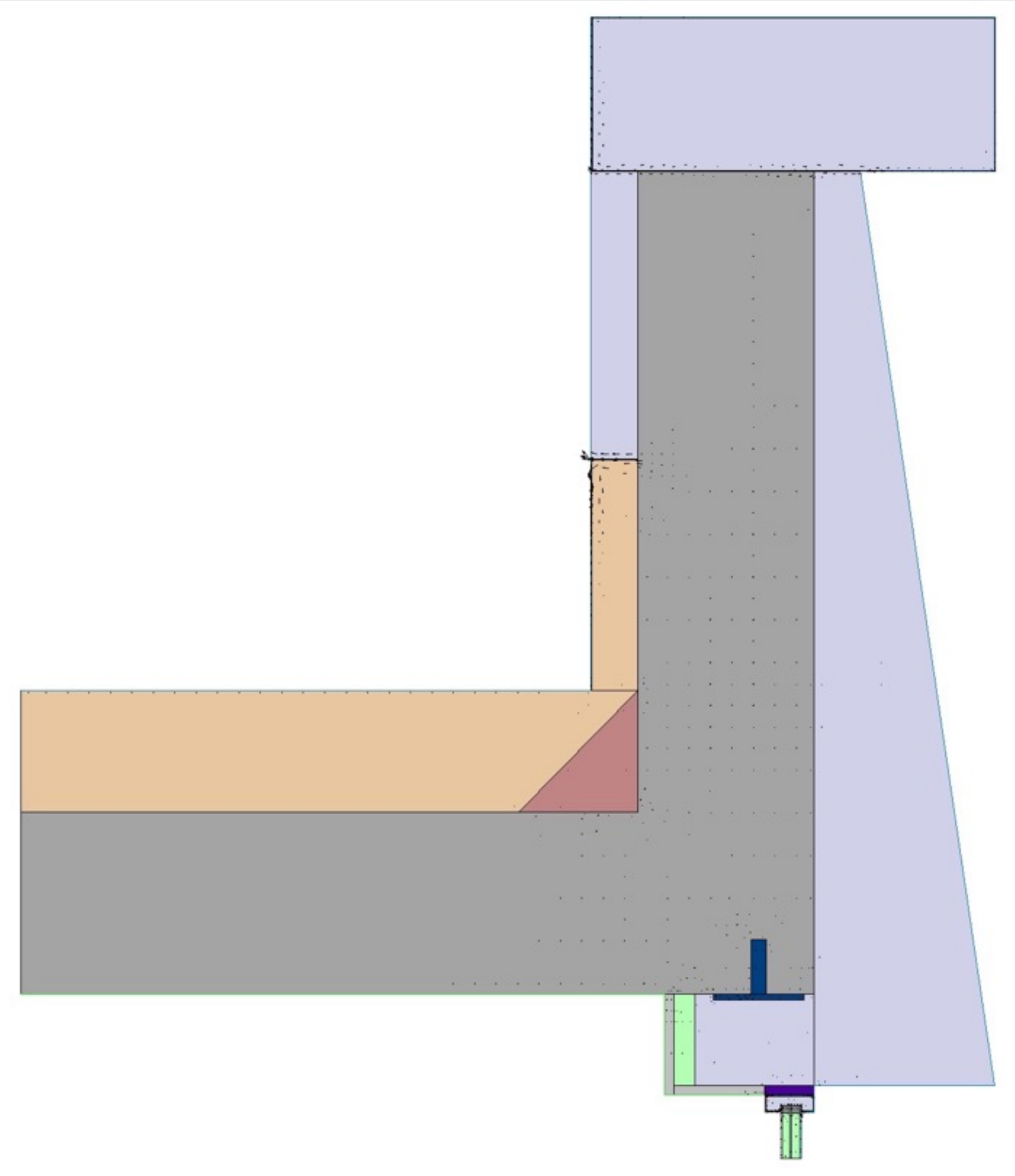


WHO ELSE ?



Lstiburek, along with Baker, have been figuring out our parapet problems across a generation. Very little of what they understand has shown up in the field.









Thank you...

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