

Enter the Single-Ply

- For hundreds of years, the built up roof had worked because
 - It was kept warm from interior heat (no insulation)
 - It was reinforced with asbestos fibers
 - It had a built in redundancy...each roof was made up of multiple layers of tar soaked felts..a hole in one wouldn't result into an immediate leak.
 - But it was messy to install (mopping melted tar-not pretty) sensitive to trapped moisture between the plies (made bubbles) and took a while to install.

Some Single ply advantages...and disadvantages.

- Clean installation - no sticky tar to clean up...or smell!
- Light weight rolls / insulation
- Rapid installation... only one layer to install!
- Minimal worries about field application - only have to make seams on site!

Single ply – no redundancy

- The single ply's were
 - clean to install (no melted tar)
 - Came in big rolls (minimal joints)
 - And wouldn't melt styrofoam

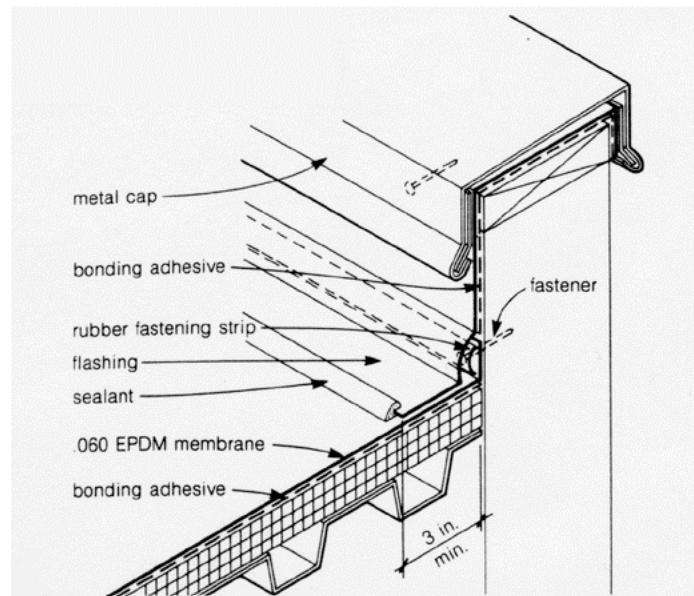


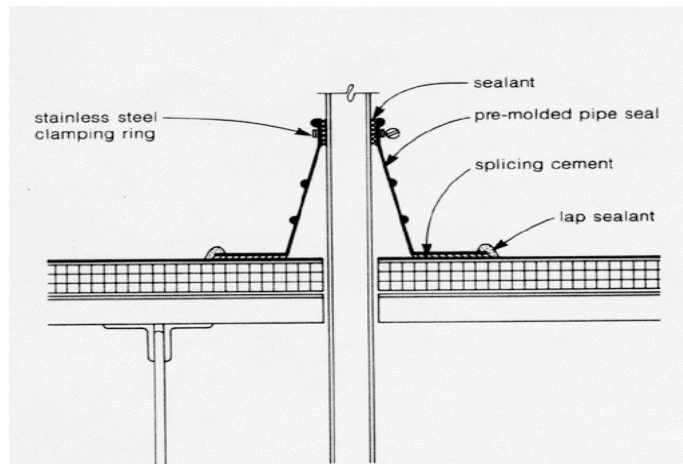
First single ply in the market, PVC

- PVC (polyvinyl chloride) roofs challenged the BUR roofing in the mid '70's.
- PVC sheets 20 feet wide had been commonly used in Europe for many years.
- An early formulation problem (missing isomer) led to premature embrittlement of the pvc sheet....they cracked when exposed to sunlight.
- Reformulation of the pvc and replacement of the installed roofs restored pvc to a viable alternative to the BUR by the mid 1980's

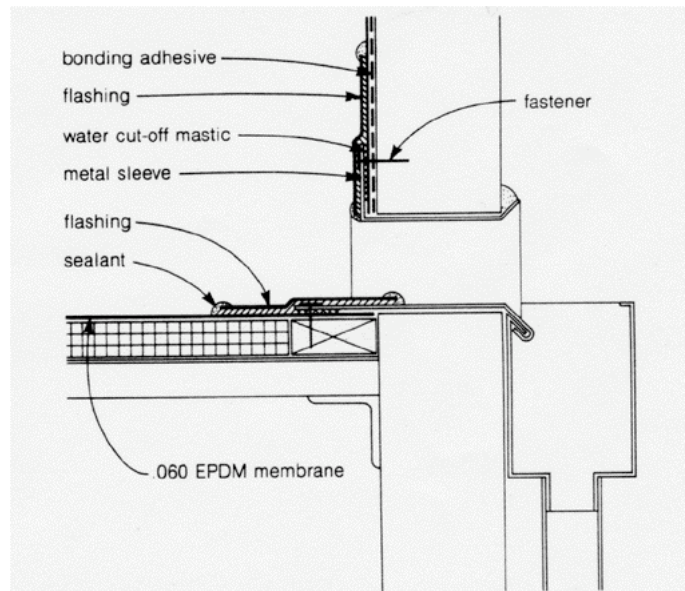
PVC problems meant **EPDM** opportunity

- Word of embrittlement failure spread quickly leaving an opening for another single ply membrane
- **E**thylene **P**ropylene **D**iene **M**onomer (synthetic rubber)





If there is one detail a salesman of EPDM would demonstrate and then say, "now try that with a built-up roof" this is it. The pre-fabricated "booties," made of a material similar to EPDM, are available in sizes to fit most pipes (and can be further adjusted by trimming the cone). They are placed over the pipe, adhered to the deck sheet with splicing cement and held by a clamp and sealant. This flashing is fast to construct.



Typical installation

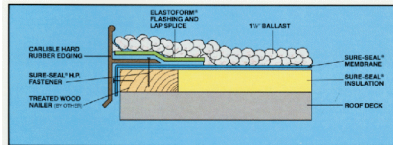
- Loose laid

- Fasten rigid insulation to roof decking
- Unroll the EPDM
- Let it “relax”
- Move it into position
- Make lap joints as required
- Fasten edges mechanically (screws) to parapet or roof edge.
- Cover with ballast (round rocks) to keep sun off, hold the membrane down.

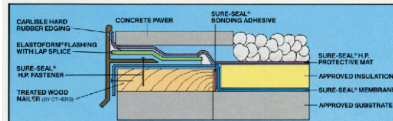


EPDM

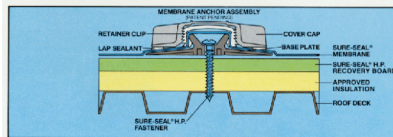
- These synthetic rubber roofs are joined with an adhesive similar to rubber cement.
- Joints have to be overlapped four inches or so, must be cleaned, primed, coated with adhesive, then rolled closed.
- Aligning big sheets to prevent buckled joints (fishmouths) is one of the major installation challenges.



Design B Design B is the least expensive and most popular Castile roofing design. It offers all the advantages of single-ply on flat or nearly flat roofs. The insulation and membrane are loose-laid. The membrane is secured around the perimeter and covered with ballast. For steep-slope roofs or slopes not exceeding two inches per horizontal foot.



Design C This protected membrane assembly consists of Sure-Seal® elastomeric membrane loose-laid on the substrate. The membrane is then secured around the perimeter and overlaid with approved insulation and ballast.



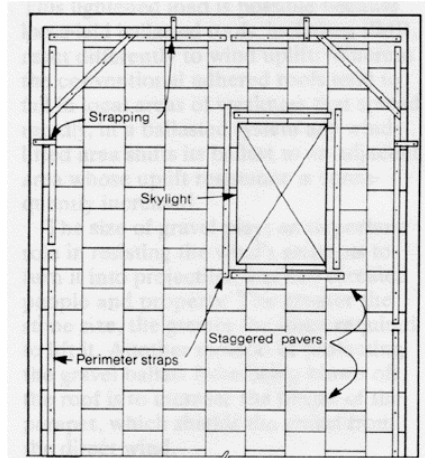


Ballast Migration



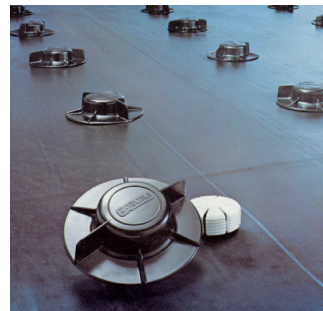
Flying roofs

- Without all the layers of hot tar melting the single ply roofs into one mass, they were prone to wind damage.
- Many of these were installed in the south and Midwest.
- The first major hurricane to hit Houston left most skyscraper windows broken, victims of flying ballast. Many of the roof membranes “inflated” on the tops of the buildings, giving them a ‘domed’ appearance.



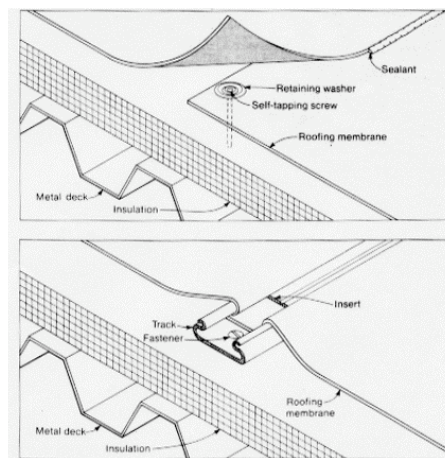
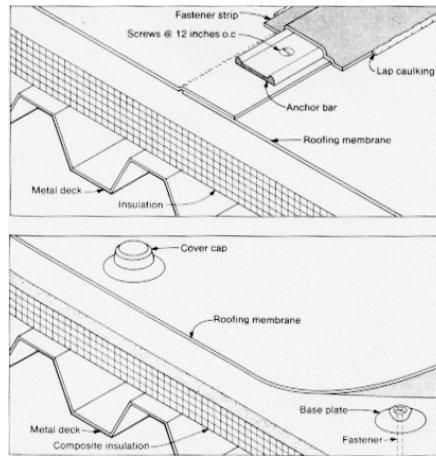
Keep it down

- The insurance companies were not very happy with the flying roofs and broken windows.
- The factory mutual association of insurers conducted research to determine what would be necessary to keep single ply roofs in place in 90 mph winds.

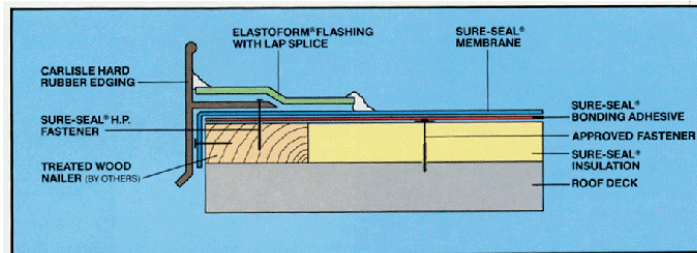


- The resulting I-90 standard, (compliance required for the building owner to get affordable insurance) required the roof and ballast stay in place when exposed to a 90 mph wind.
- Two strategies have emerged for EPDM roofs to meet FM I-90.
 - Mechanically fasten the membrane to the roof deck.
 - Fully adhere the membrane (glue it) to the roof deck
 - ...loose laid (held by rock ballast) is still used in areas where high wind risk is low.

FM I-90



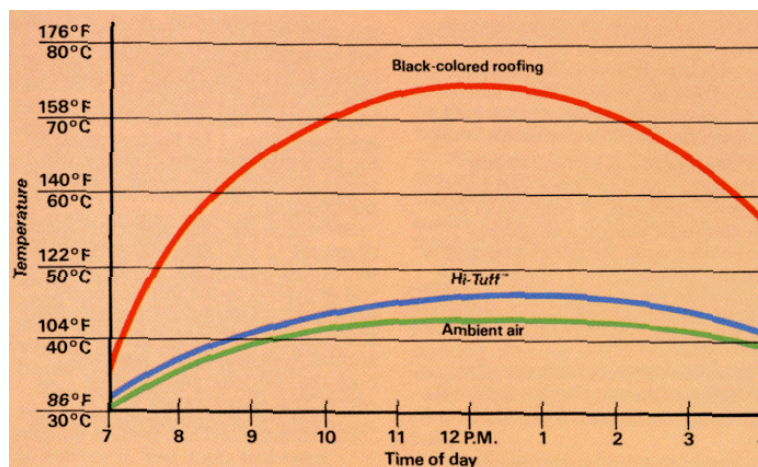
Fully adhered, depends on insulation attachment



Design A

Design A is lightweight. It can be used on odd-shaped and pitched roofs. And it's inexpensive to install. Insulation is attached to the roof deck, then membrane is adhered to the surface. A variation of this is Design E, which features a top coating of Hypalon®/sand. This offers extra flame-retarding capabilities.

Hot stuff, EPDM



White Hi-Tuff roof exposed to sunlight in Phoenix stayed within 6 degrees of ambient air temperature, while a black roof climbed to 56 degrees higher than ambient.

Tasty EPDM

- It turns out, EPDM looks a lot like a whale's skin. In coastal applications, EPDM failure analysis turned up big holes ripped from the membrane. Seagulls were tearing it up, thinking it was tasty blubber!
- EPDM also breaks down when exposed to animal fats (burger king exhaust?) and some highly polluted environments.

