



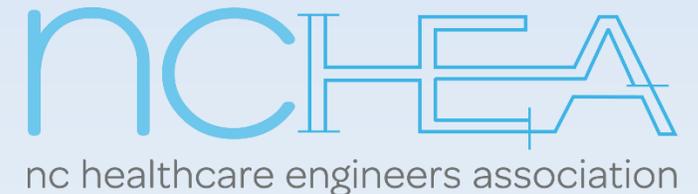
**Presents:**

## *Low Slope Quality Roofing*

**Ignorance Is Not Bliss: How Roofing Decisions are  
Costing Money, Quality and Patient Satisfaction**

Presented to:

North Carolina HealthCare Engineers  
Association



***Unbiased Representation: We Work For You!***



- Unbiased Representation - We Work For You
- Founded in 1994
- Minority-Woman Owned, Veteran Managed
- 14 local employees: New York and Florida Representation
- Roof and Building Asset Management
  - ▣ Healthcare, Commercial and Industrial Sectors

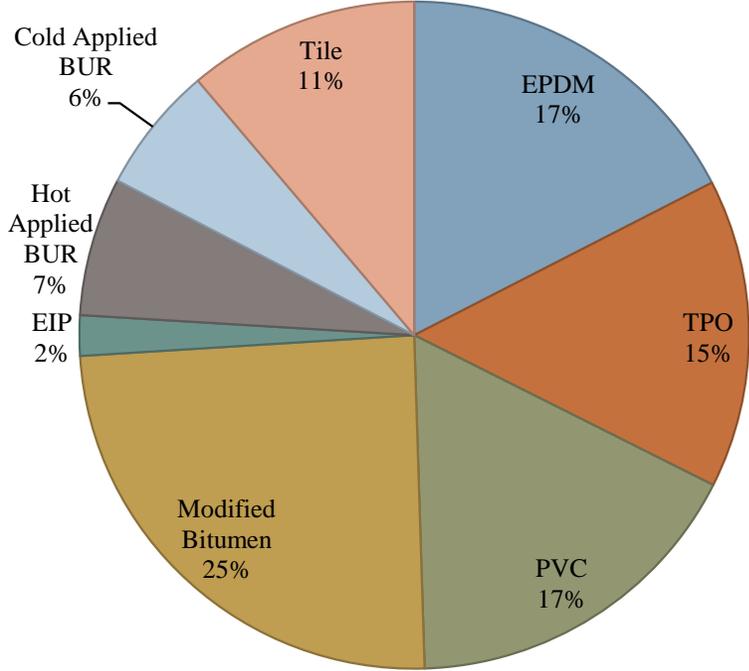
# Objectives

- Basic understanding of the roof as a system.
  - ▣ Common roof types for commercial applications.
  - ▣ Is there such a thing as the best roof?
- Understand importance of roof design, material selection and quality assurance monitoring.
- Common warranty misconceptions
- Don't blame the roofer!
- Use the above to improve quality, lower costs and deliver superior patient experiences

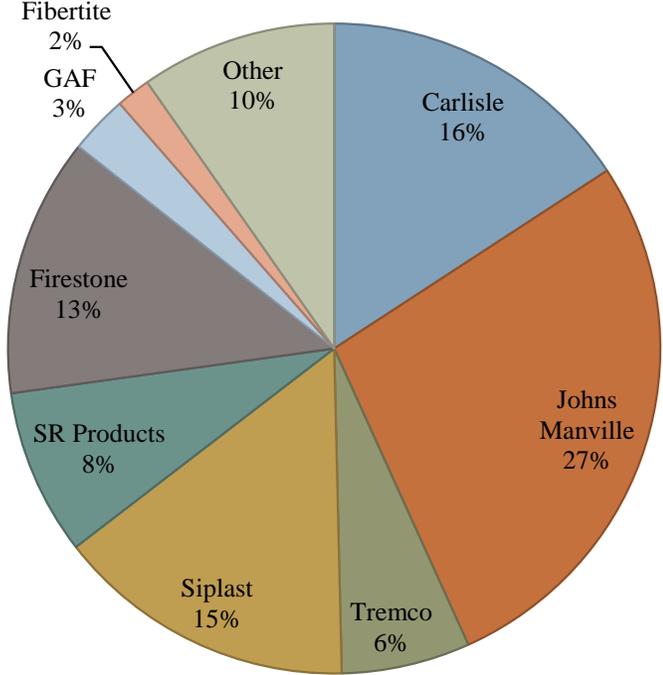
*Unique*

# Unique Perspective

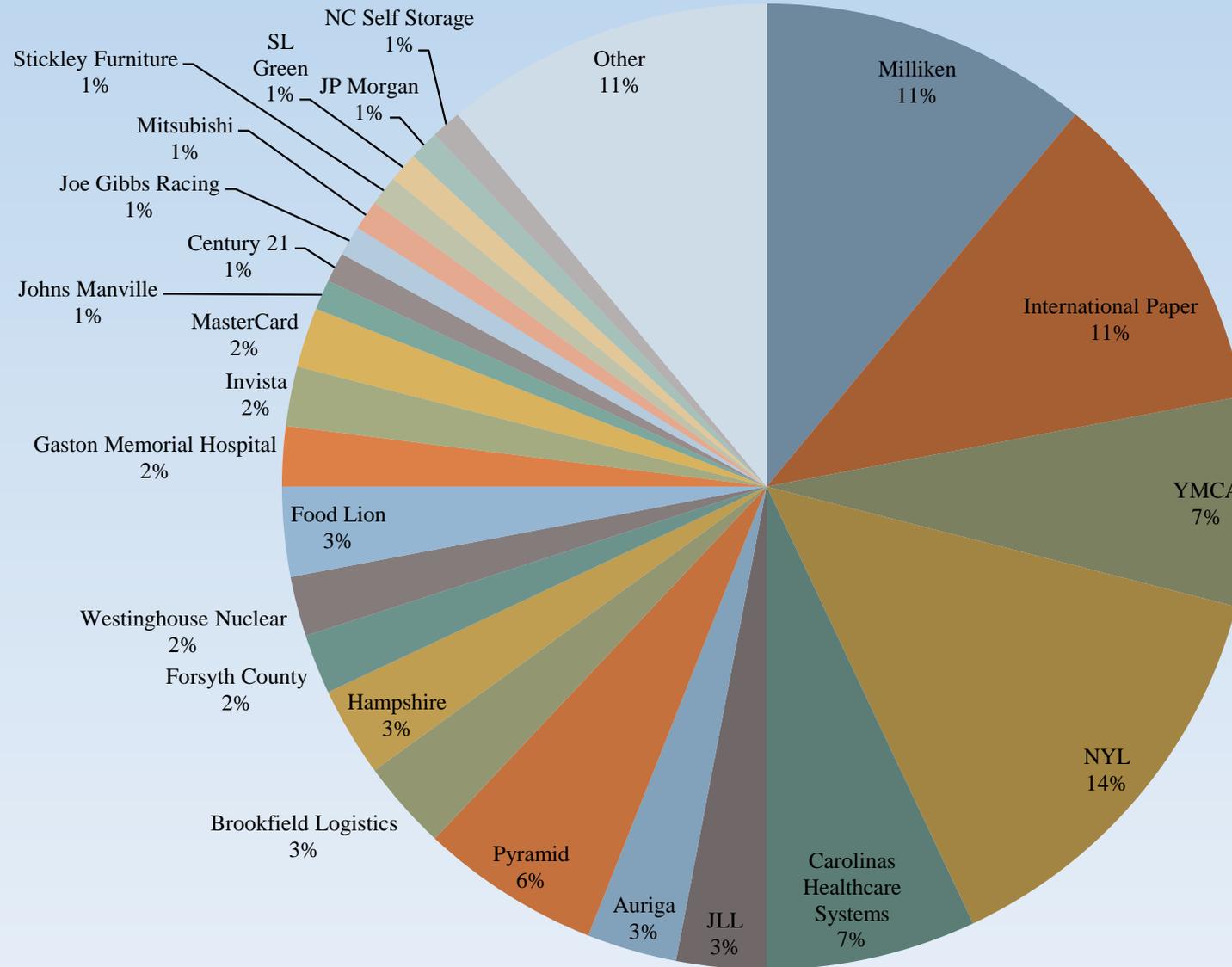
### RSI Roof System Distribution



### RSI Manufacturer Distribution



# RSI Client Distribution List



# Technical Articles and Industry Leadership

- Published numerous technical articles including:
  - ▣ The discovery of highly corrosive wood fiberboard insulation, not previously known.
  - ▣ The truth regarding thermal R-values of roof systems.
  - ▣ Understanding roof warranties and using them to your advantage

— BACK TO THE FUTURE: —

# ROOF DECKS QUICKLY CORRODED BY INSULATION

By Chuck Marvin, RRC, and Bruce Byrne

The roof industry potentially has another "phenolic foam" situation on its hands. Unlike the phenolic challenge from the 1980s and 1990s, today's damage involves a different insulation corroding metal decks within a few years of original construction. For the corrosion to occur, leaks do not need to be present. The dynamics have been known for over 13 years in non-roof-related industries. Through the process of managing a client's assets in Southeast Florida, we found ourselves researching and uncovering a potentially devastating condition.

Bruce Byrne, senior roof consultant for Roof Solutions Incorporated (RSI), was performing routine inspections last year on a group of buildings ranging in age from six to eight years old. The metal decking on one building in the portfolio was

to procurement. This building required a roof replacement due to the deck's deteriorated condition. A third building has since been identified with the same construction and deck condition.

We now have experience with three buildings—all well under ten years of age—with severely corroded metal decks. Portions of these decks were completely rusted through. These three buildings were

constructed within a couple of years of one another using the same construction materials: a mechanically attached TPO single ply directly over 1 inch of wood fiber insulation. In warm states such as Florida, Texas, and California, this inexpensive construction is used in large warehouses not equipped with air conditioning.

It is our opinion that this information needs to be released industrywide. We have



The building was newly constructed 4 years prior to these pictures being taken.

## SEVERELY AFFECTED AREAS



Photo 2 — Note the charred-looking insulation at this severely deteriorated location. This was common on all significantly compromised deck areas, including those replaced to address full-through potential. This is typical of what was sent in originally for testing and showed lower levels of chlorine on all components.



Photo 3 — The severely compromised locations are small but numerous and randomly dispersed. The roof area encompassed between 5% to no more than 10% of the deck area. The two buildings addressed were only six and eight years old. The deterioration is stunning and created a very real safety issue. We suspect deck failure will accelerate exponentially.



Photo 4 — The fasteners and plates were severely attacked.

heard one industry associate note this condition, but no connection was made. We hope this information helps others in assisting clients. At this time, we are releasing selected portions of the report generated from our research and findings. The manufacturer's name is omitted due to the warranty and legal status. The following is otherwise directly from our report:

JANUARY 2011

### FINDINGS IN SUMMARY

The corrosion of the metal decking has been found to be associated with the leaching of the element chlorine from [manufacturer withheld] wood fiber insulation that was originally installed in the roof system when these buildings were erected.

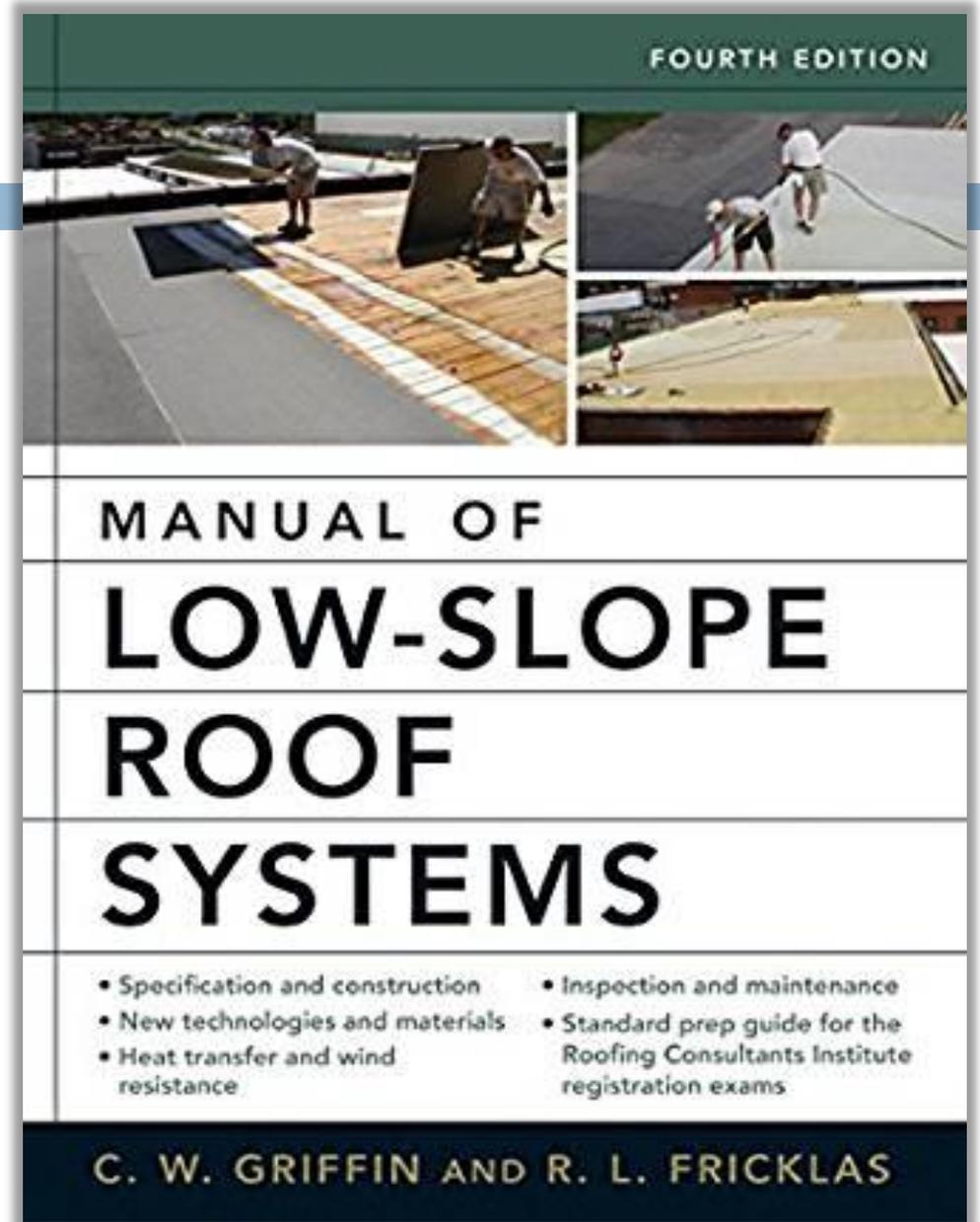
### SUPPORTING RESEARCH AND FINDINGS

RSI used a recognized metallurgical testing laboratory to analyze the TPO membrane, insulation, and metal deck. The laboratory originally theorized that the chlorine was introduced into the roof assembly by an outside source. Possible contamination was originally suspected to have occurred during the cleaning of the top surface of the roof

INTERFACE • 33

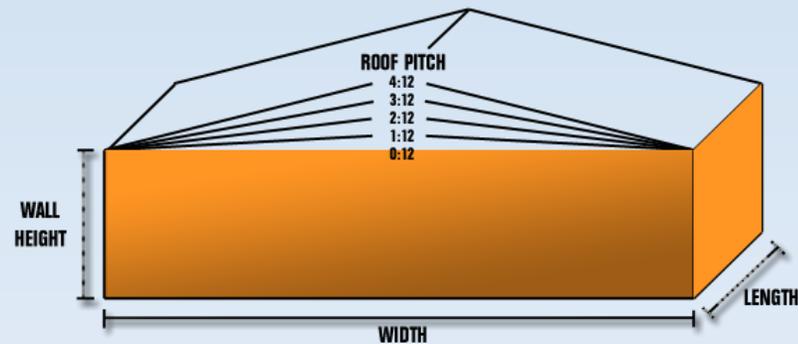
# The Roof As A System

There are thousands of roof types and system combinations. This is a very large text book! We will hit some highlights to help you better understand the basics.



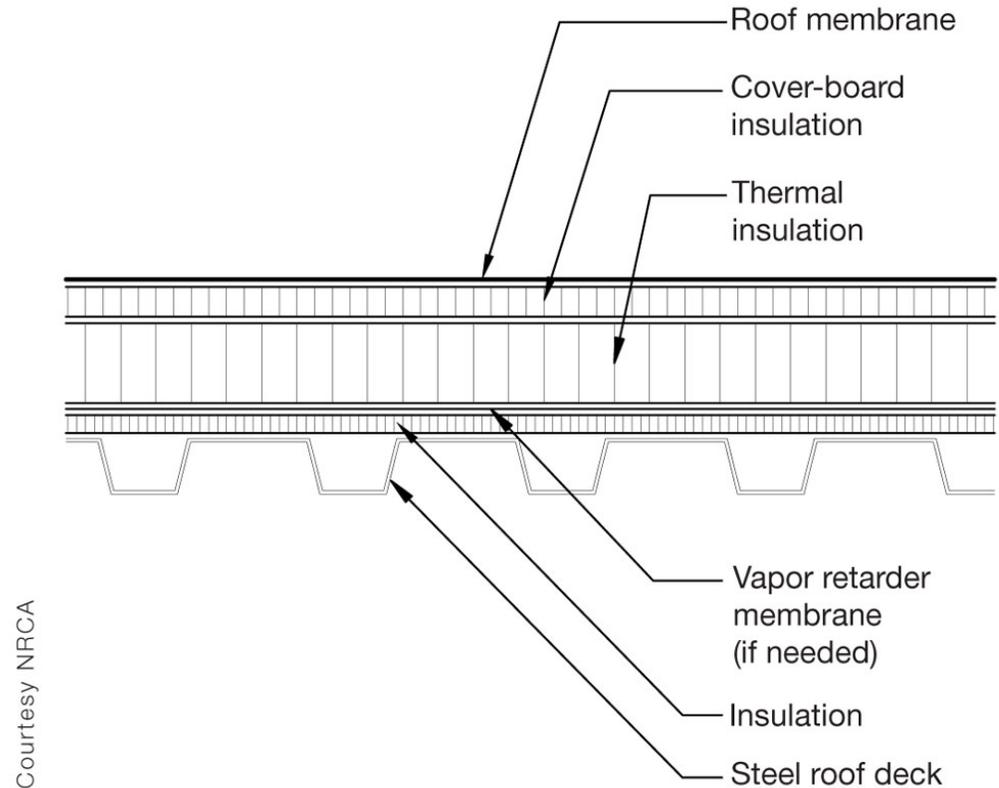
# Low Slope vs Steep Slope

- Low Slope will have a slope of 3:12 or less
- Steep slope is categorized as having a slope greater than 3:12
- Chart below shows slope rating:



# Low Slope Typical Components

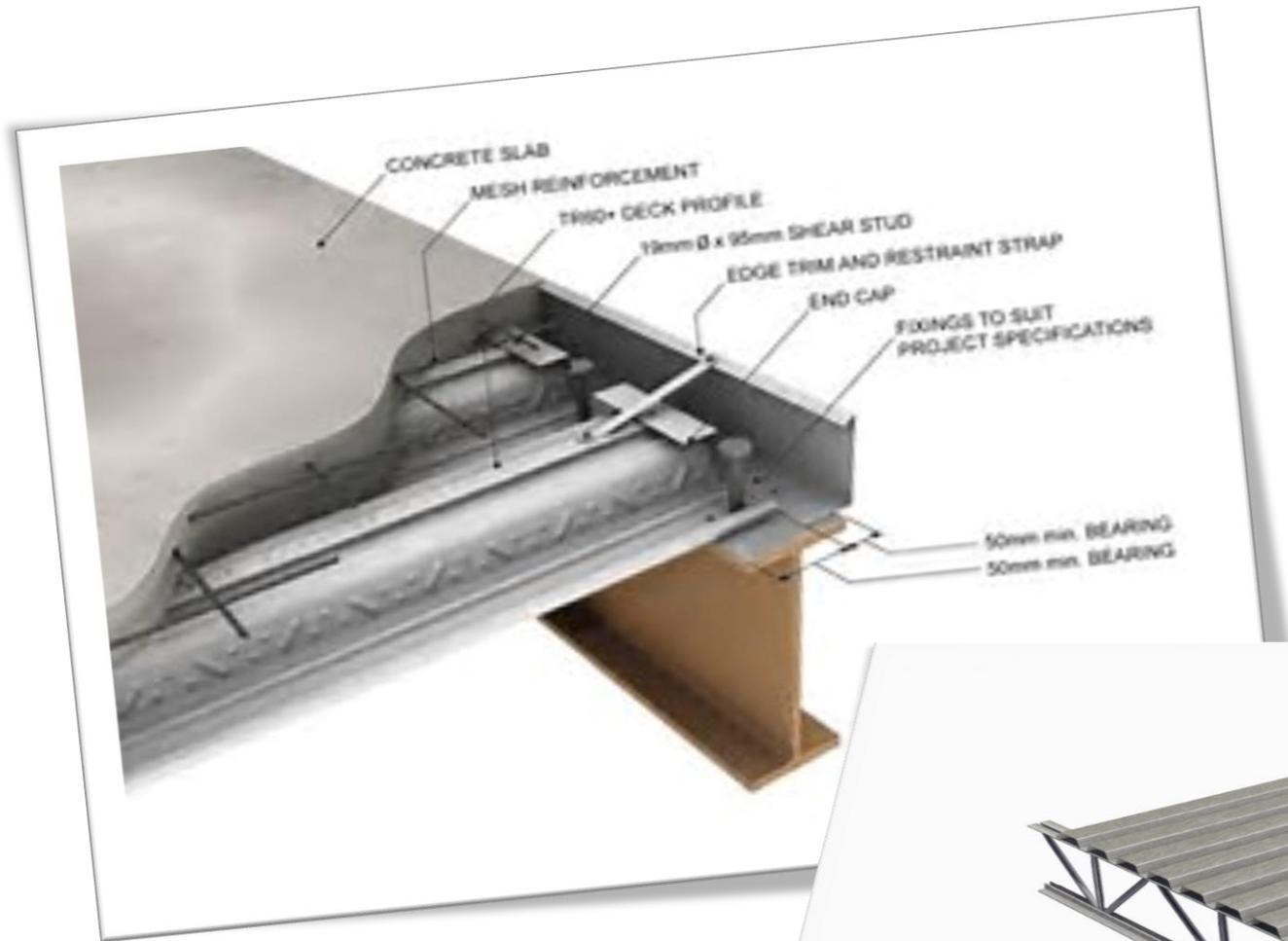
- ▶ Waterproof Membrane
- ▶ Insulation/cover board
- ▶ Insulation
- ▶ Roof Deck



**Diagram 1** A representative cross-section of an insulated low-slope roof assembly is shown here.

# Roof Decks

- ▶ All roofing systems start with the deck.
  - ▶ Roof decks are used to displace the weight to supporting joists.
  - ▶ There are many types of roof decks. Some of the more common decks are:
    - ▶ Steel (metal)
    - ▶ Plywood
    - ▶ Structural Concrete
    - ▶ Poured Gypsum Concrete
    - ▶ Cementitious Wood Fiber



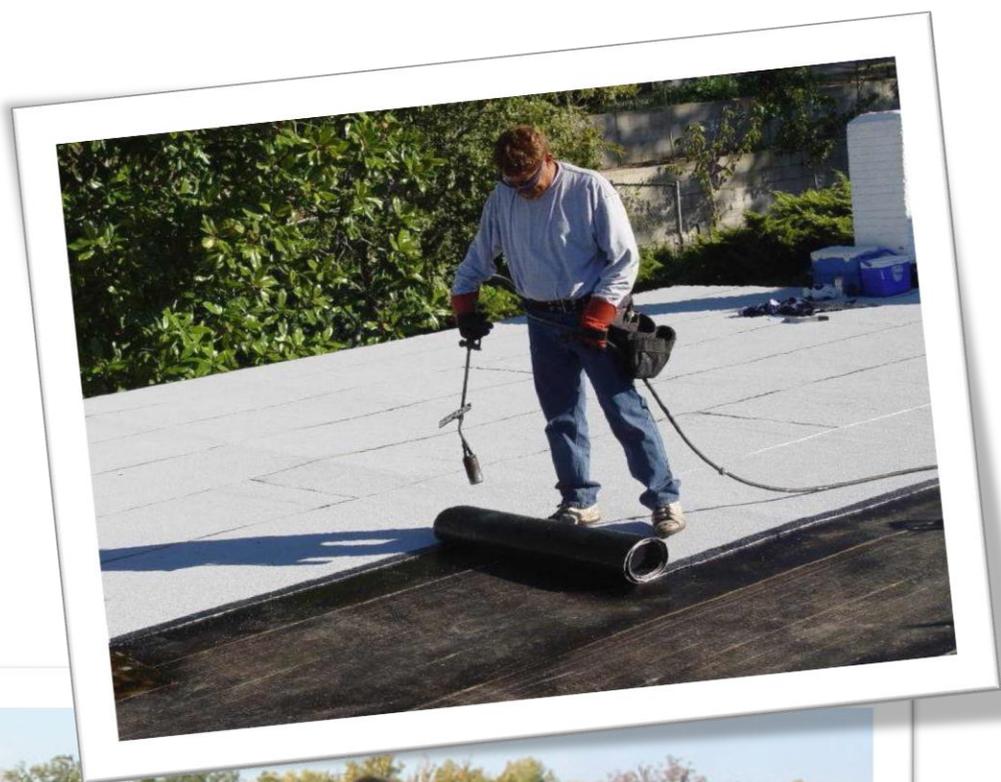
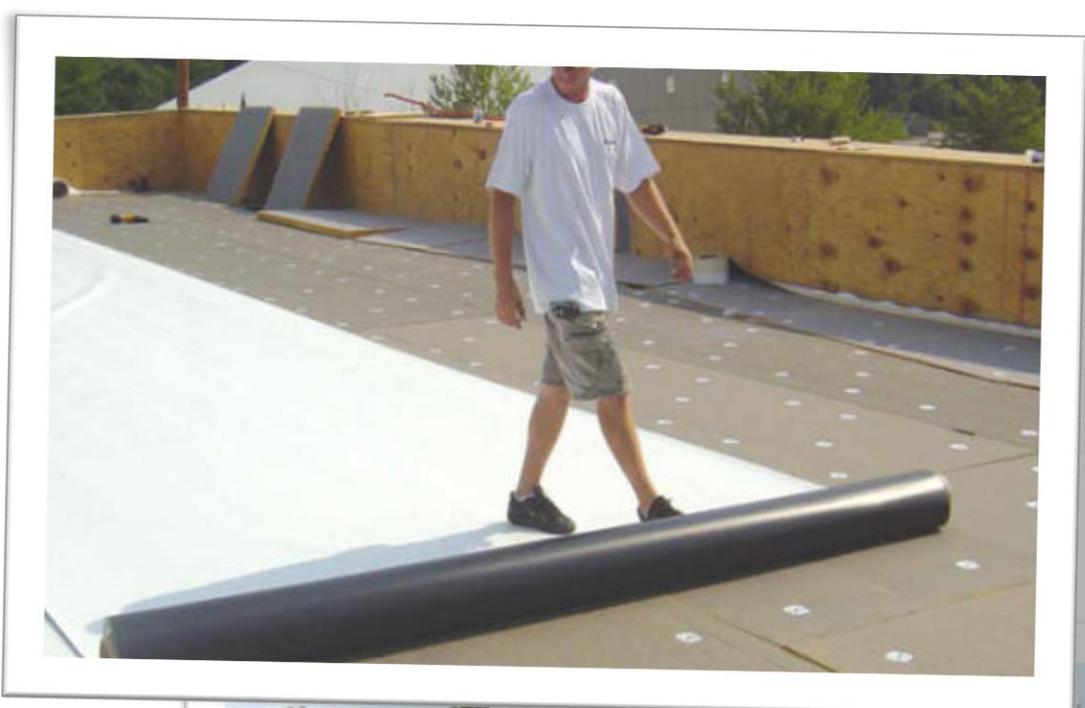
# Insulation

- ▶ Insulation's main function is to protect against outside heat and cold.
- ▶ A few of the most common types of insulation are:
  - ▶ Polyisocyanurate
  - ▶ Extruded Polystyrene (XPS)
  - ▶ Expanded Polystyrene (EPS)
  - ▶ High Density Wood Fiber
  - ▶ Perlite
  - ▶ Gypsum Board



# Low Slope Membranes

- ▶ A roof membrane protects underlying roof assembly components and the building from water entry.
- ▶ Membranes can be divided into four general categories:
  - ▶ Single Ply
  - ▶ Modified Bitumen
  - ▶ Built Up Roof (BUR)
  - ▶ Sprayed or Liquid applied
- ▶ The next few slides will expand on each division.



# Single Ply Roofing Systems

- ▶ Single ply systems implies a roof membrane that is made up of just one layer
- ▶ Single Ply Systems can be divided into two major categories
  - ▶ Thermosets (made from rubber polymers)
    - ▶ EPDM is the most common type of thermoset
      - ▶ It exhibits good resistance to ozone, ultraviolet rays, weathering and abrasion
      - ▶ **Usually black in color** and ranges in thickness from 45 mils to 120 mils
  - ▶ Thermoplastics (made from plastic polymers)
    - ▶ PVC and TPO are the most common types of thermoplastics
      - ▶ PVC (Polyvinyl Chloride)
        - ▶ PVC membranes are resistant to bacterial growth, many industrial chemical atmospheres and plant root penetration
        - ▶ **Predominately White** and are produced in a range of thickness, including 36 mils, 45 mils, 60 mils, 72 mils, and 90 mils



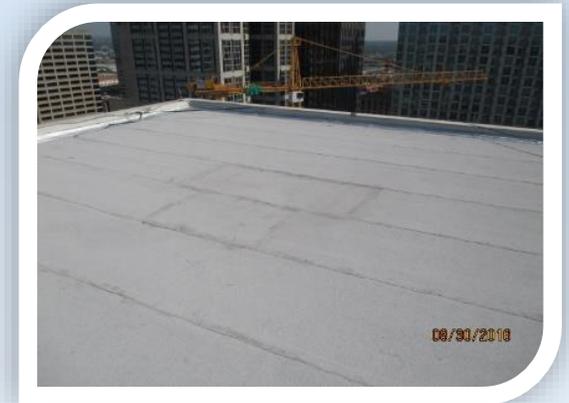
# Single Ply Roof Systems Continued

- ▶ TPO (Thermoplastic Polyolefin)
  - ▶ Majority of low slope market.
  - ▶ Lowest initial cost of installation.
  - ▶ Material pricing in the \$1-2/sqft range.
  - ▶ Resistant to degradation from exposure to animal fats, some hydrocarbon oils and vegetable oils
  - ▶ Will not support the growth of microorganisms
  - ▶ Typically produced in a white or tan sheet
  - ▶ Manufactured in a range of thickness including 45 mils, 60 mils, 72 mils, 80 mils, and 90 mils



# Modified Bitumen Roofing System

- ▶ Modified rolled sheets composed of bitumen, modifiers and reinforcement.
- ▶ Most modified bitumen's employ multiple layer configurations consisting of a base layer and commonly a granulated cap sheet. Popularity grew as manufacturing of a more consistent rolled good product reduced “on the roof manufactured” challenges often encountered when installing asphalt built up roofs.
- ▶ Still employs a redundancy of plies, thicker membranes ~200 mil total thickness.
- ▶ Average material cost of \$4-5/sqft



# Built Up Roof (BUR) Roofing System

- ▶ BUR systems are made up of multiple layers of bitumens and a reinforcement. Bitumens were typically Asphalt & CTP.
  - ▶ Constructed in place, with multiple layers of protection commonly using hot asphalt as a binder, they provide a high quality roof that has a long history of performance and durability.
  - ▶ The plies used are now fiberglass reinforced sheets. The original carriers were organic felts.
  - ▶ A BUR system will have up to 4 layers of adhered ply sheets finished by several possible surface layers; including a flood coat with gravel surfacing, a granulated cap sheet made with oxidized or polymer modified bitumen, or a cold applied solvent-or water-borne coating.



# What Makes A Quality Assembly?



# Design

1. Goal is to provide the building owner with a complete set of documents which clearly outline the project and requirements so that ‘apples to apples’ bids can be received and compared.
2. Good design documents ensure code compliance and address specific details that are often non standard conditions.
3. Contractors proposals do not guarantee code compliance, good design principles or manufacturer compliant systems.

# Hammurabi's Building Code

- Maybe we should go back to Hammurabi's Code?!
- Understand the fiduciary responsibility of all players involved.

## HAMMURABI'S BUILDING CODE

Hammurabi was the sixth king of ancient Babylon, a city-state once located on the Euphrates River in what is now Iraq. He inherited the throne from his father, Sinmuballit, about 1800 B. C. and ruled for 43 years.

His reign is often called the Golden Age of Hammurabi. He set up a strong central government and gathered all the laws of his kingdom into a great Code. This was a collection of more than 282 laws, which he had inscribed on a pillar of black diorite more than 7 feet high. The laws were written in the Sumerian language, in wedgeshaped letters called cuneiform. The pillar was unearthed by French archaeologists in 1801.

The Code shows a certain systematic order. Beginning with accusation of murder and sorcery, it passes through all grades of social and domestic life, ending with a wage scale for all classes of workmen.



- A. If a builder build a house for a man and do not make its construction firm and the house which he has built collapse and cause the death of the owner of the house—that builder shall be put to death.
- B. If it cause the death of the son of the owner of the house—they shall put to death a son of that builder.
- C. If it cause the death of a slave of the owner of the house—he shall give to the owner of the house a slave of equal value.
- D. If it destroy property, he shall restore whatever it destroyed, and because he did not make the house which he built firm and it collapsed, he shall rebuild the house which collapsed at his own expense.
- E. If a builder build a house for a man and do not make its construction meet the requirements and a wall fall in, that builder shall strengthen the wall at his own expense.

# IBC- Chapter 15

- ❑ International Building Code provides minimum standards.
- ❑ Demand that code compliance be called out in every proposal.
- ❑ Did your contractor pull a permit on your last reroofing job?

## CHAPTER 15

### ROOF ASSEMBLIES AND ROOFTOP STRUCTURES

#### SECTION 1501 GENERAL

**1501.1 Scope.** The provisions of this chapter shall govern the design, materials, construction and quality of roof assemblies, and rooftop structures.

#### SECTION 1502 DEFINITIONS

**1502.1 General.** The following words and terms shall, for the purposes of this chapter and as used elsewhere in this code, have the meanings shown herein.

**AGGREGATE.** In roofing, crushed stone, crushed slag or water-worn gravel used for surfacing for roof coverings.

**BALLAST.** In roofing, ballast comes in the form of large stones or paver systems or light-weight interlocking paver systems and is used to provide uplift resistance for roofing systems that are not adhered or mechanically attached to the roof deck.

**BUILT-UP ROOF COVERING.** Two or more layers of felt cemented together and surfaced with a cap sheet, mineral aggregate, smooth coating or similar surfacing material.

**INTERLAYMENT.** A layer of felt or nonbituminous saturated felt not less than 18 inches (457 mm) wide, shingled between each course of a wood-shake roof covering.

**MECHANICAL EQUIPMENT SCREEN.** A partially enclosed *rooftop structure* used to aesthetically conceal heating, ventilating and air conditioning (HVAC) electrical or mechanical equipment from view.

**METAL ROOF PANEL.** An interlocking metal sheet having a minimum installed weather exposure of 3 square feet (0.279 m<sup>2</sup>) per sheet.

**METAL ROOF SHINGLE.** An interlocking metal sheet having an installed weather exposure less than 3 square feet (0.279 m<sup>2</sup>) per sheet.

**MODIFIED BITUMEN ROOF COVERING.** One or more layers of polymer-modified asphalt sheets. The sheet materials shall be fully adhered or mechanically attached to the substrate or held in place with an *approved* ballast layer.

**PENTHOUSE.** An enclosed, unoccupied structure above the roof of a building, other than a tank, tower, spire, dome cupola or bulkhead.

**POSITIVE ROOF DRAINAGE.** The drainage condition in which consideration has been made for all loading deflections of the roof deck, and additional slope has been provided to ensure drainage of the roof within 48 hours of precipitation.

**REROOFING.** The process of recovering or replacing an existing roof covering. See "Roof recover" and "Roof replacement."

**ROOF ASSEMBLY.** A system designed to provide weather protection and resistance to design loads. The system consists of a roof covering and roof deck or a single component serving as both the roof covering and the roof deck. A roof assembly includes the roof deck, *vapor retarder*, substrate or thermal barrier, insulation, *vapor retarder* and roof covering.

The definition of "Roof assembly" is limited in application to the provisions of Chapter 15.

**ROOF COVERING.** The covering applied to the roof deck for weather resistance, fire classification or appearance.

**ROOF COVERING SYSTEM.** See "Roof assembly."

**ROOF DECK.** The flat or sloped surface not including its supporting members or vertical supports.

**ROOF RECOVER.** The process of installing an additional roof covering over a prepared existing roof covering without removing the existing roof covering.

**ROOF REPAIR.** Reconstruction or renewal of any part of an existing roof for the purposes of its maintenance.

**ROOF REPLACEMENT.** The process of removing the existing roof covering, repairing any damaged substrate and installing a new roof covering.

**ROOF VENTILATION.** The natural or mechanical process of supplying conditioned or unconditioned air to, or removing such air from, attics, cathedral ceilings or other enclosed spaces over which a roof assembly is installed.

**ROOFTOP STRUCTURE.** An enclosed structure on or above the roof of any part of a building.

**SCUPPER.** An opening in a wall or parapet that allows water to drain from a roof.

**SINGLE-PLY MEMBRANE.** A roofing membrane that is field applied using one layer of membrane material (either homogeneous or composite) rather than multiple layers.

**UNDERLAYMENT.** One or more layers of felt, sheathing paper, nonbituminous saturated felt or other *approved* material over which a steep-slope roof covering is applied.

#### SECTION 1503 WEATHER PROTECTION

**1503.1 General.** Roof decks shall be covered with *approved* roof coverings secured to the building or structure in accordance with the provisions of this chapter. Roof coverings shall be designed and installed in accordance with this code and the

# Importance of Proper Design, Specs and Quality Assurance

80%

of Construction lawsuits involve or are over roofing while the cost accounts for less than 6% of a buildings total price.

80-95%

of all roof failures are due to substitution of materials or poor workmanship\*

*\*Based on studies and reports from RICOWI and The Manual of Low Slope Roofing*

# Manufacturer's can agree on one thing...

The need for design considerations to be evaluated by a design professional.

# Johns Manville

- “JM does not design, install or construct commercial/industrial roofs, nor do we own an interest in any firm that does. Thus, except under the terms of a JM Guarantee, we cannot be responsible for the design of the roofing system, or any roofing contractor’s workmanship in the repair/installation of the roofing system.”
- “JM will not be responsible for failure of the roof, or its roofing products, or for direct or consequential damage except as is expressly stated in the applicable guarantee. The roofing specification provided by JM is for guidance only and JM will not accept any responsibility for design or construction of the building.”

**JM**  
Johns Manville

## Single Ply Roofing Systems Peak Advantage Roofing Systems Guarantee

**2.1 JM Peak Advantage Roofing Contractor**

**2.1.1** JM does not design, install or construct commercial/industrial roofs, nor do we own an interest in any firm that does. Thus, except under the terms of a JM Guarantee, we cannot be responsible for the design of the roofing system, or any roofing contractor’s workmanship in the repair/installation of the roofing system.

**2.1.2** We do maintain a list of contractors, called JM Peak Advantage Roofing Contractors, who are eligible to install and to repair JM Guaranteed Roofs. **THE NAME “APPROVED ROOFING CONTRACTOR” MERELY IDENTIFIES AN INDEPENDENT CONTRACTOR CONSIDERED ELIGIBLE TO APPLY FOR A PEAK ADVANTAGE ROOF GUARANTEE AND IN NO WAY DESIGNATES THE CONTRACTOR AS AN AGENT FOR JM. JM ROOFING CONTRACTOR APPROVAL IS SPECIFIC TO THE ROOFING SYSTEM TYPE, I.E. PVC, TPO AND EPDM. NO DOLLAR LIMIT (NDL) GUARANTEES ARE ONLY AVAILABLE THROUGH NDL DESIGNATED CONTRACTORS.**

**2.1.3** The Approved Roofing Contractor must notify JM in writing at least two weeks before starting any roof that requires a Peak Advantage Roofing Systems Guarantee. All JM requirements must be met before a Guarantee will be issued.

**2.2 Peak Advantage Roofing Systems Guarantee**

**2.2.1** JM offers roof guarantees on the roofing systems published in this manual. Contact the local JM Roofing Systems representative for current guarantee information. Guarantees are limited to the 50 United States, Canada and Mexico. Some restrictions or special requirements may apply on installations in Alaska and Hawaii. Contact a JM Technical Services Specialist for specific details about applications in these areas.

**2.2.2 What is a Roof Guarantee?** An agreement between the owner and JM that assures the owner that JM, under the Roof Guarantee agreement, is responsible for keeping the roof in a watertight condition if leaks occur solely as a result of normal deterioration of the JM materials or poor workmanship in applying Johns Manville materials or products. The obligation under the guarantee is limited to a specific number of years and, except in the case of No Dollar Limit Guarantees, a specified maximum monetary amount.

**2.2.3** If a Peak Advantage Roofing Systems Guarantee is to be issued, the JM Approved Roofing Contractor must obtain authorization from JM before roofing application begins.

**2.2.4** Once a JM Roofing System has been installed by a JM Approved Roofing Contractor and is inspected and approved by a JM representative, JM may issue a Peak Advantage Roofing Systems Guarantee. The Guarantee will be delivered to the roofing contractor, for a charge based upon the fee schedule in effect when the application is received.

**2.2.5** JM’s obligation under the Guarantee relates solely to Johns Manville materials as specified in the guarantee, supplied by JM and identified as JM on the original proposed packaging. Any damage to the roofing system caused by performance of, application of, or compatibility with materials not sold or supplied by JM is not covered under the terms of the guarantee. The Roofing Guarantee terminates if the term of the agreement expires, the maximum monetary amount of the liability is expended, or any alterations, additions, or repairs are made to the roof structure without prior written approval from JM. The guarantee may also be terminated at any time by mutual consent of the building owner and JM.

**2.2.6** JM will not be responsible for failure of the roof, or its roofing products, or for direct or consequential damage except as is expressly stated in the applicable guarantee. The roofing specification provided by JM is for guidance only and JM will not accept any responsibility for design or construction of the building.

**2.2.7** The roof guarantee provided by JM may provide the entire type of coverage for the flashings if constructed in accordance with the published flashing specifications and specified in the guarantee. Only those flashings which are constructed in accordance with JM specifications may be included in the guarantee. Gravel stops, curb details, or flashings incorporating metal not supplied by JM will be excluded from Guarantee coverage.

**2.2.8** JM Expand-O-Flex and Prosto Lock Fossils and Coping Systems may be included in the Guarantee, if installed according to JM published specifications, factory-fabricated intersections are used and they are specified in the Guarantee. Under the same conditions, Flex-I-Drain and FP-10 One-Way Roof Vents may also be covered in the Guarantee.

**2.2.9** THE ROOF GUARANTEE PERIOD WILL COMMENCE ON THE DATE THE INSTALLATION OF THE ROOF IS COMPLETED.

**2.2.10 What Does It Promise?** The Peak Advantage Roofing Systems Guarantee promises that for a defined period of time JM will pay for repairs to stop leaks resulting from natural deterioration of the materials or poor workmanship in applying the guaranteed materials. The owner agrees to notify JM in writing of any defects or of any proposed changes to the roof, and also agrees to properly maintain the roof.

**2.2.11** The Peak Advantage Roof Guarantee covers leaks from the following causes except where caused by the exclusions set forth in Paragraph 2.2.12.

- A. Natural deterioration of the membrane.
- B. Natural deterioration of the membrane flashings.
- C. Natural deterioration of the roof insulation, if the insulation is supplied by JM.
- D. Splits, unless due to movement or failure of the substrate as used or negligence.
- E. Wrinkles.
- F. Workmanship in application of the roofing membrane.
- G. Workmanship in application of the membrane flashings.
- H. Workmanship in application of the roof insulation, if insulation is supplied by JM.
- I. Requires due to local wind gusts less than, or equal to 72 mph (115 km/h).

**WATER** **FIRE** **HAIL** **WIND**

2-1



### **A Few Things to Consider...**

- This manual contains the latest information relating to the application of GAFMC roofing systems and is based on our years of experience in the commercial roofing field. It has been prepared as a general guide to assist architects, engineers, roofing contractors, and owners in the use of our roofing systems.
- GAFMC manufactures and sells roofing materials and does not practice architecture or engineering. GAFMC does not accept responsibility for the performance of its products when damage to its products is caused by such things as improper building design, construction flaws, or defects in workmanship.
- The design responsibility remains with the architect, engineer, roofing contractor or owner and construction details illustrated and described herein are furnished solely for guidance purposes. These guidelines should not be construed as being all-inclusive, nor should they be considered as a substitute for good application practices.

# Sika

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While Sika provides general instructions for the installation of its membrane, the means and methods used by the contractor for surface preparation as well as the means and methods employed by the contractor in the installation of the Sika membrane are the responsibility of the contractor.

Visit our website at [www.sikaconstruction.com](http://www.sikaconstruction.com)

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CARLISLE'S

# DESIGN REFERENCES

*The information contained in this generic specification represents a part of Carlisle's requirements for obtaining a roofing system warranty. Construction materials and practices, building siting and operation, climatic conditions, and other site-specific factors will have an impact on the performance of the roofing system. Carlisle recommends that the building owner retain a design professional to determine appropriate design measures to be taken in order to address these factors.*



Tremco takes responsibility for furnishing quality materials and for providing specifications and recommendations for their proper installation.

As neither Tremco itself nor its Representatives practice architecture or engineering, Tremco offers no opinion on and expressly disclaims any responsibility for the soundness of, or the effect upon, any structure or building materials. If any questions arise as to the soundness of or the effect upon any structure or building materials, or the structure's ability to support a planned installation properly, the Owner should obtain opinions of competent structural engineers or other qualified design professionals before proceeding. Tremco accepts no liability for any structural effects or for resultant damages, and no Tremco Representative is authorized to vary this disclaimer.



### C. DESIGN:

1. Firestone does not perform engineering or design functions and does not approve or make comments regarding them.
2. Firestone recommends that a design professional be consulted to assure proper design, (i.e. roof system selection) installation, and conformance to building codes, insurance requirements, etc.
3. Refer to the Attachment Guide of this manual for specific membrane attachment requirements for mechanically attaching insulations and membranes.



The following are just a few of the conditions, which may influence the need for a design professional:

- Structural conditions that might not be sufficient to support the anticipated load of the completed roof installation
- Support the dynamic loading of the roof system
- The need to review the proposed system assembly for its applicability on specific projects
- The requirements of local building codes for the need of a thermal barrier
- The requirements of local building codes for the need of a vapor retarder
- The requirements of local building codes for the need of an air barrier
- When considering the effect of loads on the structure/decking due to the loading/staging of materials as a part of system installation. The design professional should specify the load limitations to be observed by the Firestone licensed applicator

# Design – Real World Challenges

Thru-wall flashings installed too low and did not allow for adequate roof flashing height.

The contractor wanted to install his flashings over the existing flashing to “comply with manufacturer minimum flashing heights”



Tim points to the finished elevation of the taper system. The thru wall receiver extends almost to the insulations termination point. It is not possible to attach the 4” counterflashing to the receiver.

# Design Challenges Continued

Doors installed with no flashing height. This has resulted in constant leak issues after installation and reliance on caulking to prevent leaks.



# Materials -

1. **The best roof for your facility depends on a variety of factors. There is no panacea.** Contributing factors include environment, foot traffic, geographic location, slope, interior conditions etc.
2. Thousands of roof system types and manufacturers. What one is right for your facility? Who should make the decision?
3. Single Plies – Normally low cost with several types and formulations
4. Modified Bitumen – asphalt based with redundancy achieved by installing 2 plies.
5. Built-up asphalt/CTP roofs – Skilled labor a must, depends on redundancy, various applicable surfacing's.
6. Liquid applied membranes – Not just coatings anymore.

# Labor/Skill and the Importance of Monitoring

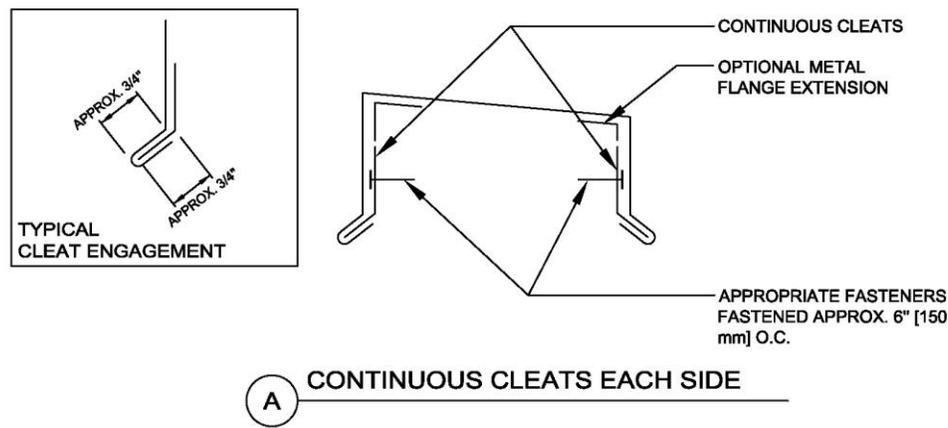


# Monitoring



This insulation was not properly stored to manufacturers requirements and the insulation got wet. Is was being installed.

# Monitoring



The coping cleat above is improperly attached and does not meet ANSI/SPRI ES-1 (building code)

Do you need a new roof?  
20% of roof replacements are needless.  
Leak Investigations are Key



# Importance of Maintenance

- “Lack of care and maintenance...is cause for cancellation of this warranty”
- Not only can it cause new warranties to become void, it can cost you money in the short and long term.

General roof top housekeeping does not eliminate or replace the building Owner’s responsibility for keeping effluent and debris from the roof surface. Customer production-related materials are excluded as part of the housekeeping services. If scheduled cleaning is insufficient to maintain the roof integrity, Owner must pay for additional cleaning/inspections or assume responsibility for such cleanings. Owner agrees that all debris on or removed from the roof is the sole property of Owner, and it is the sole responsibility of Owner to properly dispose of said debris.

The Owner shall, at all times, exercise reasonable care in the use and maintenance of the RRS.

In order to protect the investment this RRS represents, the building Owner must fulfill his responsibilities as outlined in the attached Owner’s Manual. Lack of care and maintenance can have significantly damaging effects on the system’s overall performance, and is cause for cancellation of this warranty.

Care and maintenance guidelines include, but are not limited to:

- Regular ongoing inspection by the Owner – This will allow for implementation of good housekeeping practices and early detection of problems such as any physical damage.
- Verification that no alterations or unauthorized repairs have been made to the roofing system.

If alterations are being considered, the Owner must notify Tremco in order for the proper authorized follow-up to be completed.

# Leak Investigations



Large amounts of condensation on the underside of the deck. A new roof is not going to stop this leak.

# Don't Blame the Roofer

- “....poorly maintained roofs where there are always roof problems to fix and nothing else is considered. Even on maintained roofs, roofers will look for roof problems and make repairs to anything in the vicinity, thinking the “roof leak: is solved. Meanwhile, air-conditioning units or skylights continue to take in water.”

## Roofing Solutions

How to Set Up a Roof Maintenance Program

### Don't Blame the Roofer

Many 'roof' leaks are caused by mechanical equipment

BY STEVEN A. MANDZIK, RRC, CDT

As the in-house roof consultant in charge of more than 12 million square feet of roofing for a large property owner, I've had the advantage of managing the same roofs for many years.

My associate and I have walked each of 400 roofs yearly to review their condition, specify repairs, reroof when necessary and inspect the completed work. Naturally, I've become familiar with what works and what doesn't work, where leaks come from, and most importantly, why they are many times never fixed.

#### Tracking the leaks

Thanks to a sophisticated property management department that tracks leak calls from more than 1,600 tenants, we have kept records on where roofers found leaks and what repairs were made. Most building owners would be surprised about what they are sending roofers out to fix (see chart below). Amazingly, only 21% of these leaks came from the roof.

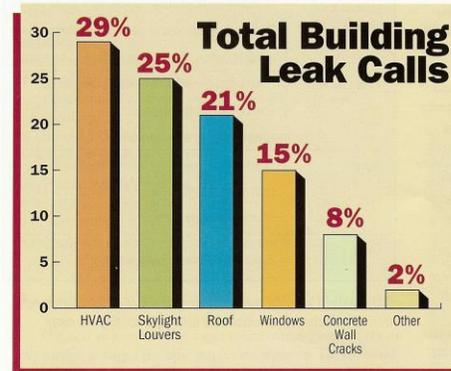
Unfortunately, the roof is a working platform and drop spot

for every construction trade (mechanical, electrical, plumbing, etc.), and many times the equipment itself is not waterproof. This often leads to roof leaks; maybe not immediately, but sometimes years later, when the warranty has run out.

Tenants incorrectly assume that all wet ceiling tiles mean roof leaks, but in reality it is often rooftop equipment that is no longer waterproof—not the roof membrane. So a roofer is called to look at the roof, while mechanical, electrical and plumbing contractors remain blissfully unaware of the equipment problems.

This dilemma is compounded on poorly maintained roofs where there are always roof problems to fix and nothing else is considered. Even on maintained roofs, roofers still look for roof problems and make repairs to anything in the vicinity, thinking the “roof leak” is solved. Meanwhile, air-conditioning units or skylights continue to take in water.

Roofers have typically concentrated on roofing only, not mechanical, electrical or plumbing. Consequently they are untrained in these areas. Many times they are told directly by their management not to inspect or repair rooftop equipment for fear of liability, or simple lack of know-how. When calling in the non-roofing trades to fix the equipment problems, finger pointing is often the result. The building manager or



The huge amount of equipment placed on this EPDM roof will require careful monitoring by maintenance personnel.

# Leaks Are Not Good For Business



No matter where they come from





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# Roofing Solutions

US \$19.95

Reference Manual for Property Managers, Owners, Architects, and Specifiers

Money-saving roof restoration options

Why problem prevention is your best value

“....not to have maintenance program can cost an owner as much as \$0.15 per sq. ft. per year.”



Does maintenance pay?  
We do the math!

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## Why Roof Maintenance Pays

# Proof that roof maintenance pays big dividends

Or, how not to lose \$0.15 per square foot per year on your roofs

BY CHUCK MARVIN, RRC

### Case history: the Polygram Facility

#### Polygram Facility

Roof Size: 220,000 square feet

Cost of aggressive roof maintenance program: \$0.03 per year

Roof and related costs without a maintenance program: \$0.15 per year

Annual cost to owner of not having a roof maintenance program: \$54,700 per year

program was started after the roofs exceeded 10 years of age. The earlier years are typically much less costly and would pull this average lower still.

This \$0.03 per sq. ft. number is exactly the estimated cost Dennis Firman suggested based on his experience with more than 600 million sq. ft. of roofing with the U.S. Air Force. A review of five other clients conducting this type of aggressive maintenance program for at least five years also proved to be around this \$0.03 number. It is accurate to say the cost of an aggressive maintenance program will fall between \$0.03 and \$0.04 per year, per sq. ft.

#### The costly alternative

Firman suggests the choice not to have maintenance program can cost an owner as much as \$0.15 per sq. ft., per year. Based on this estimate, the owner would be losing \$33,000 per year. If only a fraction of this amount is correct, the cost savings more than offset the most aggressive maintenance programs.

#### Cost without a roof maintenance program\*

Year 1	\$135,000
Year 2	\$0
Year 3	\$135,000
Year 4	\$180,000
Year 5	\$20,000
<b>FIVE YEAR TOTAL:</b>	<b>\$470,000</b>

\*Based on a conservative estimate of expansion of existing wet areas (30-120 square feet); assumes (unrealistic) cost advantage of no money spent prior to Year 1.

#### Why roof maintenance worked

The Polygram story begins with its original roof survey, including an infrared scan, that located and defined six wet areas of insulation. Each subsequent year, up to three new wet areas were discovered until the last year, when the number jumped to six.

Each year all wet insulation was replaced and new roofing installed. The cost of this restoration process is a valid factor in selecting a maintenance approach. Wet areas average out to be about 30 sq. ft. The largest one identified was in 1988 at only 120 sq. ft. This means they were repaired while still small.

Based on the facility being approximately 220,000 sq. ft. and the program being provided over a seven-year period, the cost is only \$0.03 per sq. ft. per year. Remember also that this

At this point we decided to see what this facility would look like if only patching was done to stop leaks with minimum maintenance. Very conservative estimates were used to paint a best-case scenario for the owner.

Included in the study were actual infrared photos of one wet area taken eight months apart. In that time, the area of wet insulation increased 20% or more. However, to be ultra-conservative, we charted linear dimensions of the wet areas to expand at a rate of only 5% per year. Of course, this comparison is unrealistic in evaluating the true cost to the client. If the wet insulation remains, the following are sure to happen:

A. Freeze thaw cycles will cause

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ROOFING SOLUTIONS 13

# Roof Collapse Due to Lack of Maintenance



- Outside view of roof collapse



- Clogged drain beside roof collapse



- Inside view of roof collapse

## Maintenance and Proper Roof Management Benefits

- ❑ **Save money**
- ❑ **Identify problems before they become catastrophic**
- ❑ **Comply with warranty obligations**
- ❑ **Save time**
- ❑ **Comprehensive Roof Data in one place**
- ❑ **Reduce headaches and complaints from reoccurring leaks**

# Common Items Overlooked in Warranties

- NDL vs Value Limitations and Depreciation Schedule
- Roof warranties require regular inspections to remain valid.
- Leaks must be reported within 30 days **in writing**.
- All alterations to the roof system require authorization and written approval from the manufacturer.
- New Owners must transfer the warranty and it will require a fee (Some warranties are nontransferable).

# Warranties: They do pay!

Properly design the roof

- Comply & document

How to collect: Fair & Reasonable

Cone Mills, Carlisle SC

Examples of the \$3,000,000.00 plus collected.

JP Morgan Florida Portfolio: Wood (Cane) Fiberboard (Dow)

GMH Hospital, BSA Bldg Roof Replaced (SR Products)

Westinghouse Nuclear (Stevens)

NYL Data Center, GA (GAF)

NYL Data Center, NJ (Carlisle)

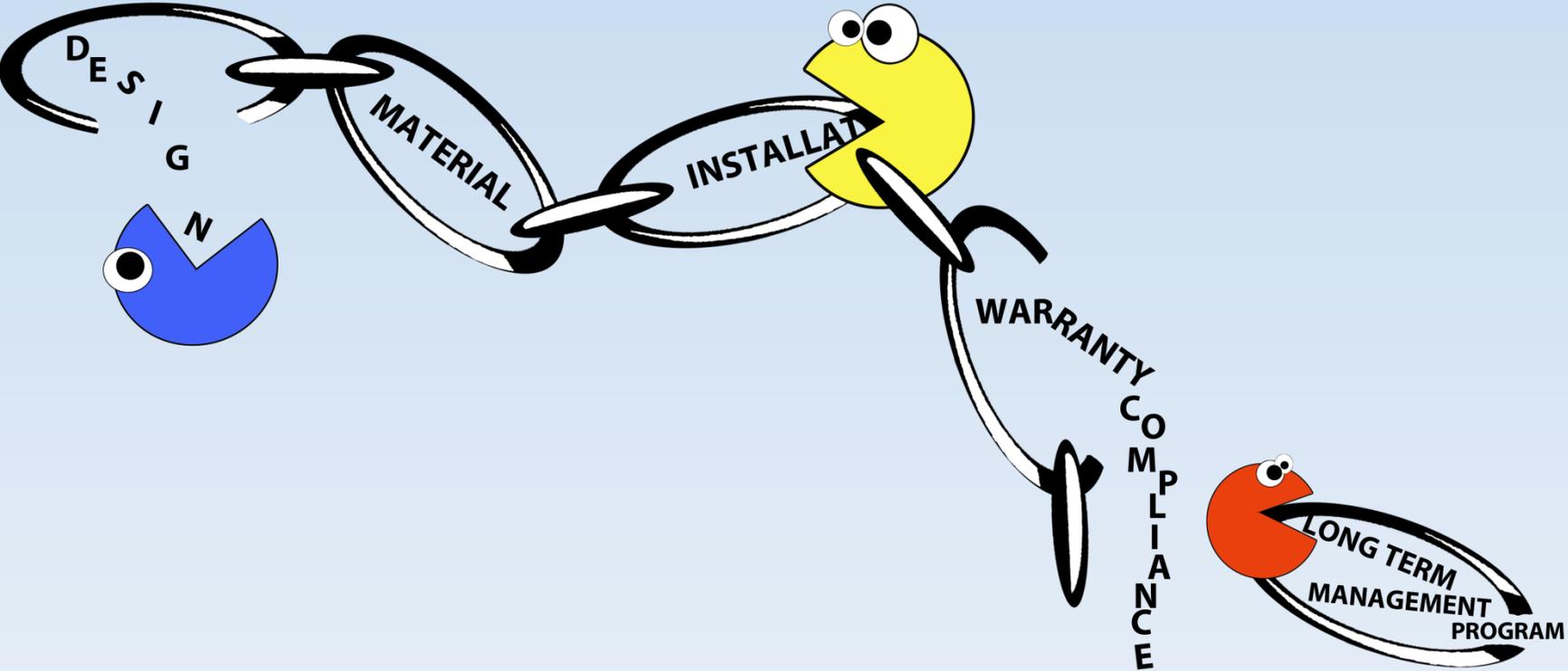
Cone Mills, Carlisle SC (JM)

Forsyth County, Fleet Service (VP)

IP, Augusta; Square D, SC (Tremco)

DTI (Siplast)

# BIASED OVERSIGHT



# UNBIASED OVERSIGHT



CHAIN OF PROTECTION



# Key Takeaways

- ❖ Be an informed customer. Ask questions until you understand.
- ❖ Maintain a questioning attitude and understand the role of each player in the process (designer, manufacturer, contractor) and why each is important.
- ❖ Put everything in writing and expect the same from your contractors.
- ❖ Think like Ben Franklin: An ounce of prevention is worth a pound of cure.
- ❖ Source leak challenges first prior to allowing repairs or recommendations to be made.
- ❖ Develop partners not vendors.



THANK YOU

