The Six Sides of Building Enclosure Restoration – A Jacket of Protection #2

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Credits: 1 AIA LU

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Course Description

Roofing is often out of sight and out of mind until it leaks. When a 20-year-old roof starts leaking, most immediately resort to budgeting roof replacement. We'll look at case study investigations of existing roofing systems through both the lens of well-established and developing technologies 40 years ago the Army Corp of Engineers said were impossible. Additionally, with the current severely disruptive roofing supply chain issues, what other options must now be considered? Some roofing replacement raw materials and final end use products are just not available right now and may not be for some time. We will explore reliable solutions and demonstrate how both well established and new advancements contribute to the energy efficiency, resiliency and long-term sustainability of your structures.

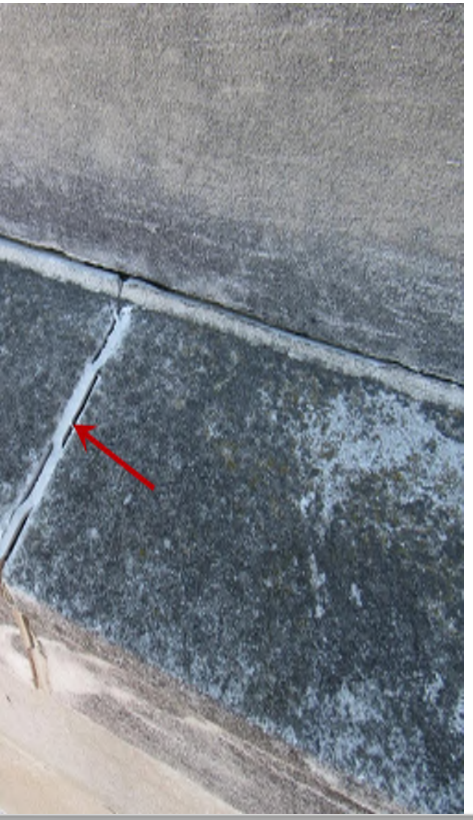
Learning Objectives

By the end of this course, attendees should be able to:

1. Identify water intrusion issues on a variety of roof system types.
2. Understand historical roof restoration obstacles.
3. Dissect the current massively disrupted roofing replacement material supply chains.
4. Explore what both these well established and new approaches offer and how they contribute to increasing building operating system efficiencies.

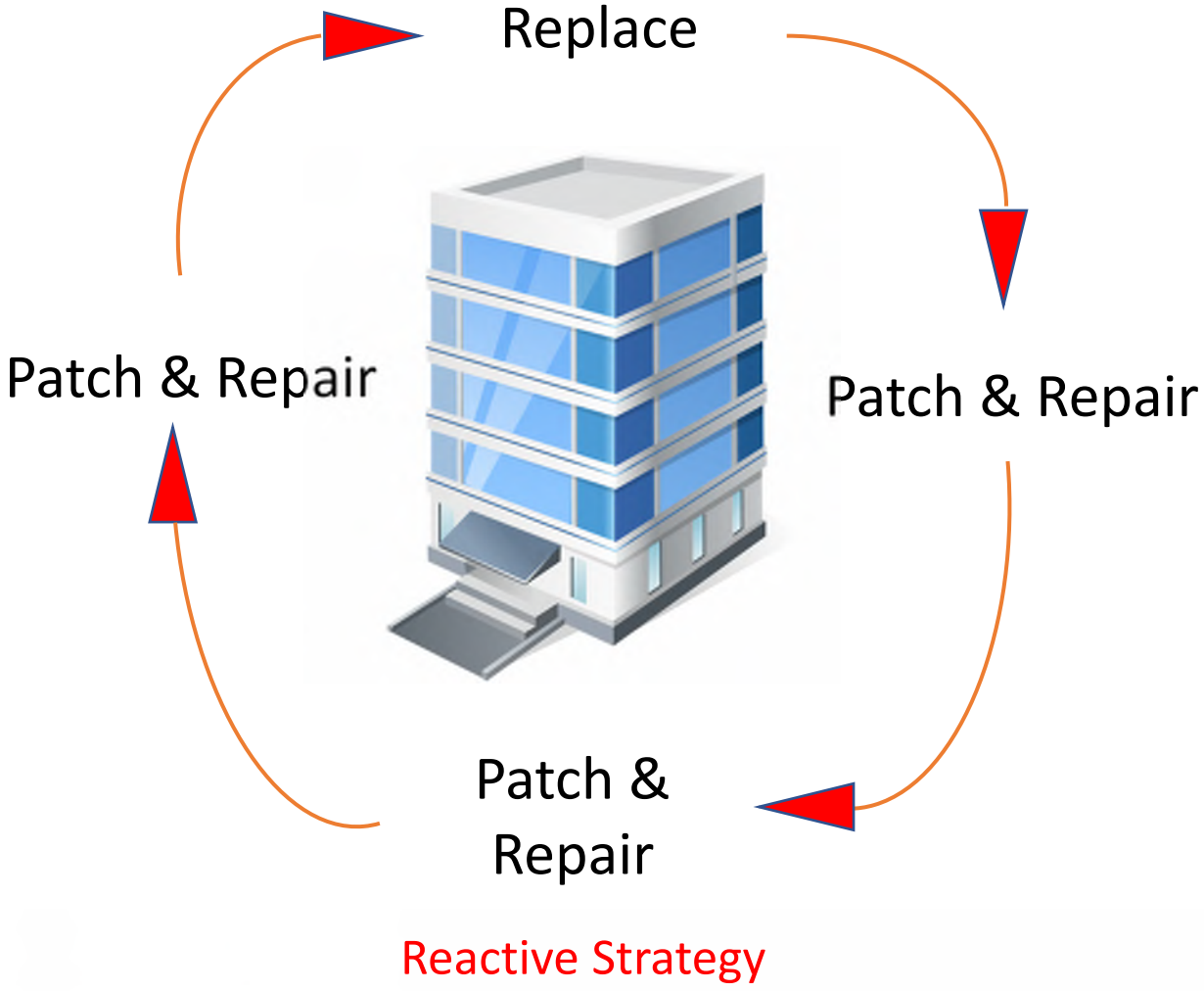
The Mantra…

The roof system is **ALWAYS** guilty until proven innocent.

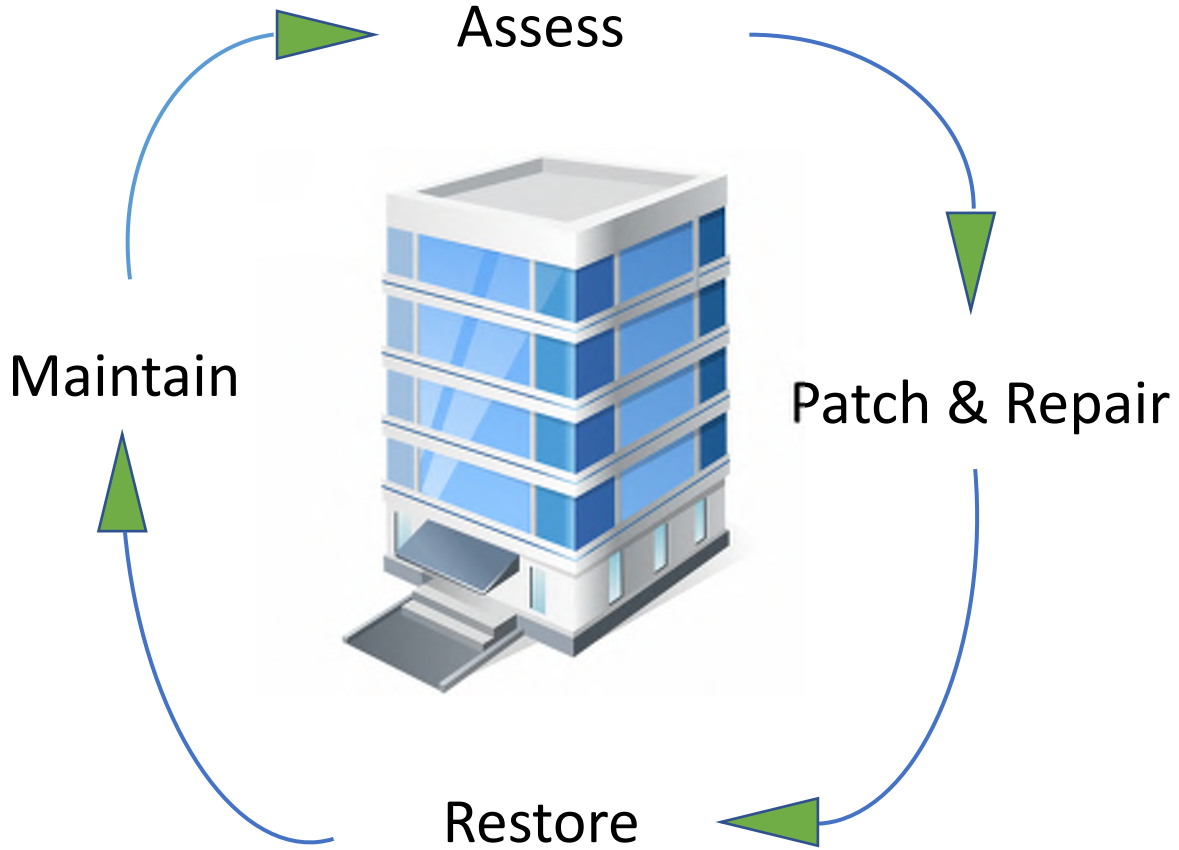




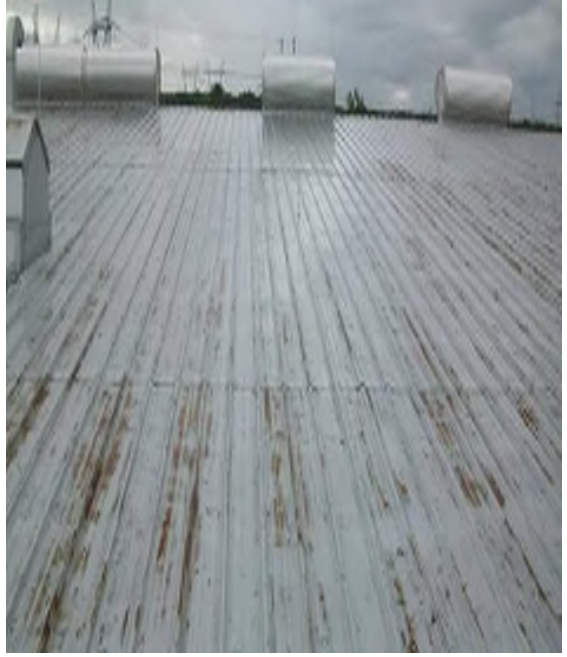
Breaking The Cycle



Reactive Strategy

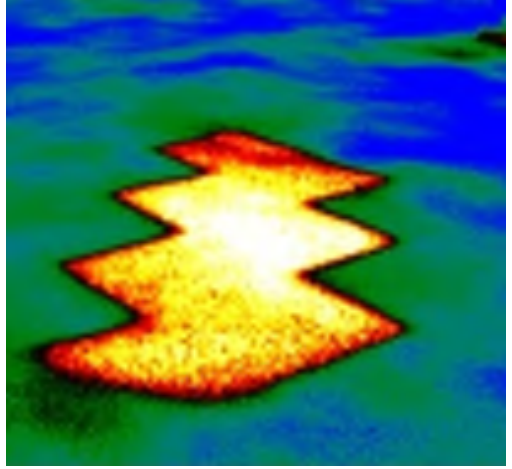


Proactive Strategy



Membrane Types

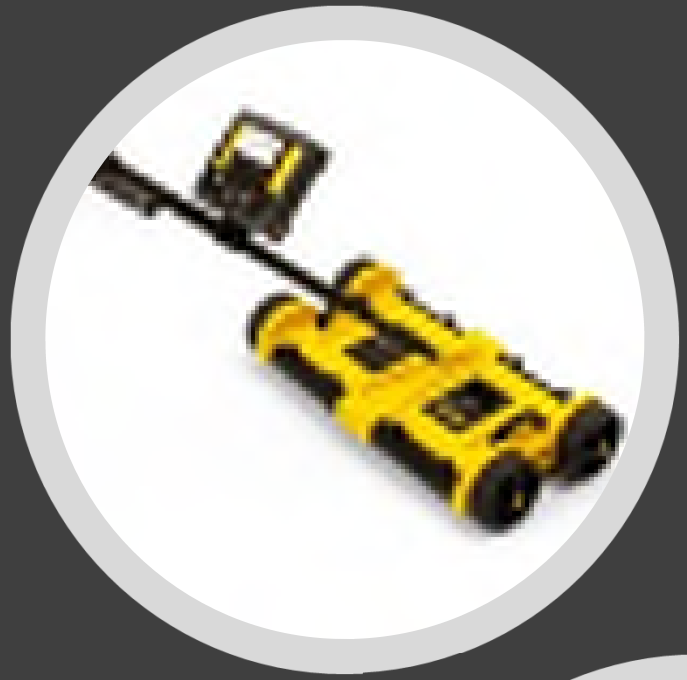
- Built-Up Roofing (BUR)
- Modified Bitumen Membrane Roofing
- Thermoplastic Single Ply Roofing
- Thermoset Single Ply Roofing
- Metal Roofing
- SPUF Roofing
- Fluid-Applied Roofing
- Vegetative Roofing



Roof Restoration Diagnostics

The preliminary restoration process is usually the same for all systems:

- Visual inspection of roof deck
- Visual inspection of membrane
- Core sampling
- Diagnostic testing
- Drying and/or removal of wet insulation and other materials
- Infill and repair
- Preparation



Diagnostic Tools

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Diagnostic Tools

Infrared Analysis/Thermal Imaging

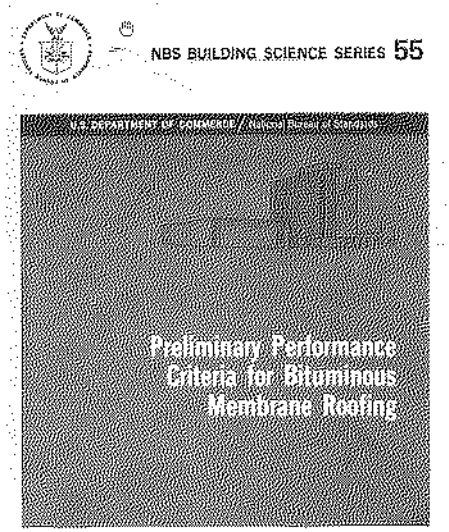
“When performing infrared inspections of smooth surfaced roofs, a shortwave (midwave) thermal imager can significantly outperform a longwave imager.
Although longwave imagers can be used for smooth membranes, they can significantly understate the size of moisture-damaged areas or miss them entirely.”

Diagnostic Tools

Core: _ _ _, Roof 10
Identification Number: **20817H019**

Analysis	Procedure	Result
Core Size:	ASTM D 2829-95	**18.00 X 14.00 in²**
Estimated Weight of Membrane:	ASTM D 2829-95	**183 lbs/100 ft²**
Surfacing Bitumen Type:	SOLVENT TEST	**Asphalt**
Surfacing Bitumen Weight:	TRC 875	**24 lbs/100 ft²**
Softening Point of Surfacing Bitumen:	ASTM D 3461-85	**287 °F**
Penetration of Surfacing Bitumen: (@ 77 degree F)	ASTM D 5-95	**3 dmm**
Interply Bitumen Type:	SOLVENT TEST	**Asphalt**
Softening Point of Interply Bitumen below the First Ply	ASTM D 3461-97	**240 °F**
Penetration of Interply Bitumen below the First Ply (@ 77 degree F)	ASTM D 5-95	**8 dmm**
Ply Type	ASTM D 2829-95	**Fiberglass & Polyester**
Number of Plies	ASTM D 2829-95	**3**
Interply Bitumen Weight	ASTM D 2829-95	**31 lbs/100 ft²**
Tensile Strength, Machine Direction (@ 0 degree F, 0.05 in/min)	ASTM D 2523-78	**175 lbf/in**
Tensile Strength, Cross-Machine Direction (@ 0 degree F, 0.05 in/min)	ASTM D 2523-78	**134 lbf/in**

Comments: Core construction is one polyester felt over two fiberglass felts.



6.1. Performance Format

6.1.1. Tensile Strength

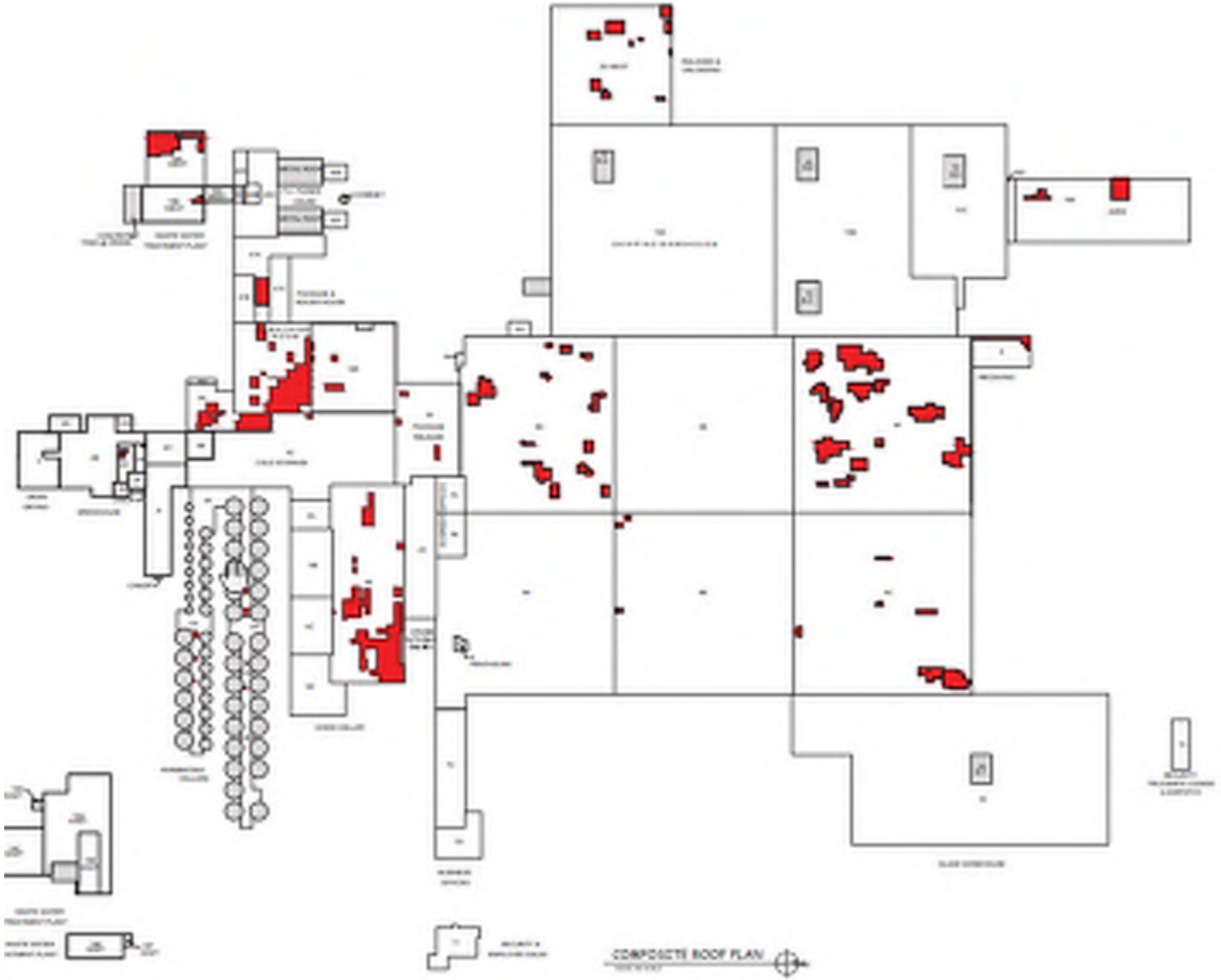
Requirement The roof membrane shall withstand, without rupture, the normal stresses imposed from internal or external causes.

Criterion The tensile strength shall not be less than *200 lbf/in* in the weakest direction of the membrane when tested at 0 °F.

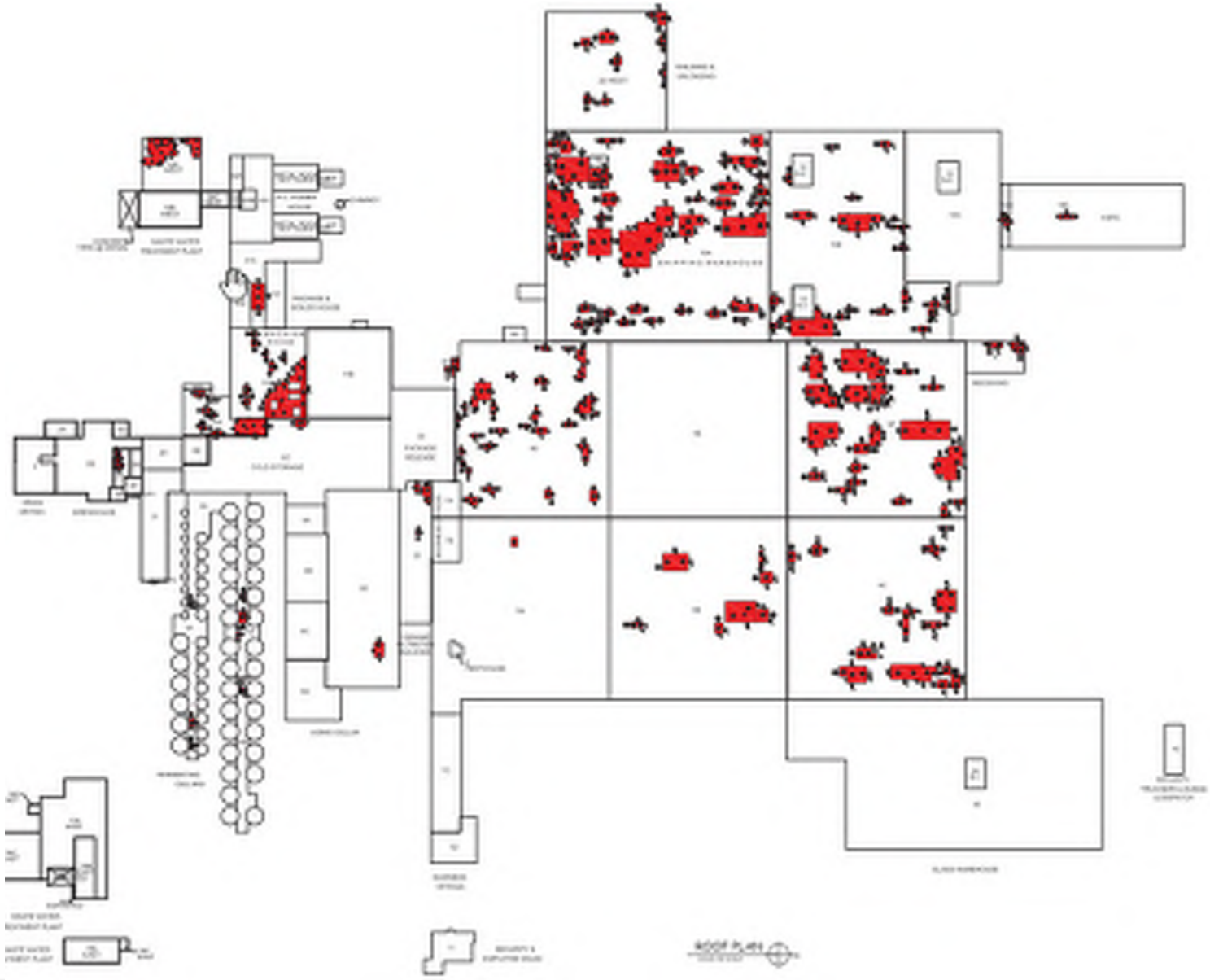
Test ASTM D-2523 testing load-strain properties of roof membranes.

Commentary This criterion is based on performance in service. Certain membranes exhibit anisotropic behavior. Therefore, the results of tests in the weakest direction (usually transverse or "cross machine" direction) should apply.

Cost of Neglect



Cost of Neglect



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Why Restoration?

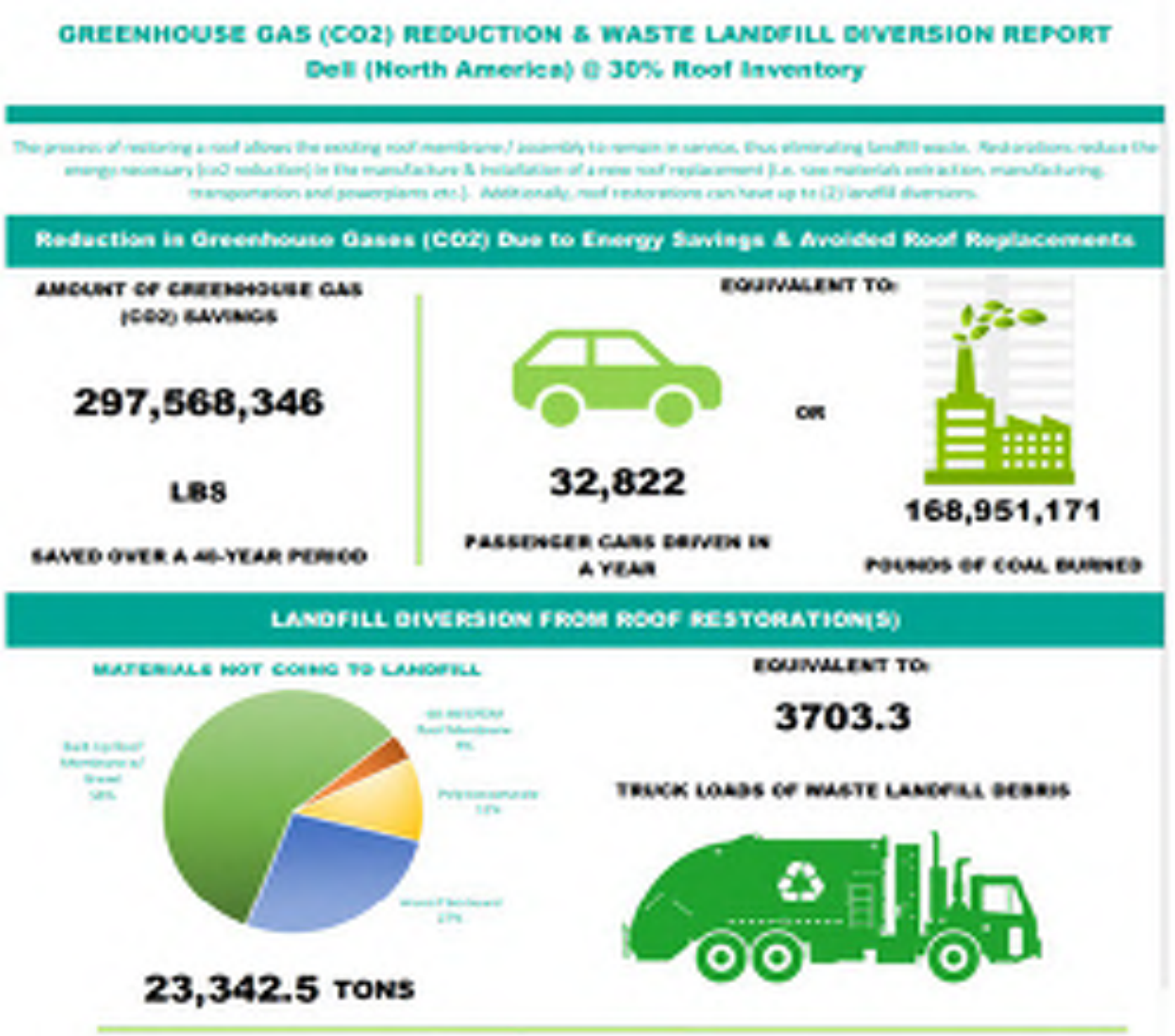
<u>Traditional Reasons</u>

- Less materials sent to landfills
- Leverage existing assets
- Minimum disturbance to ongoing activities
- Contractor-friendly
- Improve building efficiencies
- Warrantable
- Costs 33-50% less than replacement

<u>New Reasons</u>

- Material availability
- Escalating costs

Diverting Construction Waste



What has changed?

Historic Restoration Obstacles

1. Too wet
2. Too weak

Paradigm Shift

1. Ability to dry out a roof
2. Reliance on the performance of the existing membrane

Fluid Restoration 2.0

- Existing roof membrane must provide a solid substrate
- Not dependent on performance of the BUR membrane – acts independently
- Seamless, no laps
- Virtually odorless
- 400 to 500 mils of Waterproofing
- Bonds to clean, swept surface

Roof Drying 2.0

Can Wet Roof Insulation Be Dried Out?

- *Tobiasson, Korhonen, Coutermarsh and Greatorex*
- *US Army Corps of Engineers*
- *Published 12.1.1981*

"We have succeeded in drying fibrous glass insulation in a roof by removing he water with a vacuum cleaner. In a series of tests with a total duration of 134 h, about 0.42 m^3 (110 gal) of water was removed from a 180 ft^2 area of 38-mm chick insulation. Before the water was removed the insulation had only 21 percent of its dry insulating ability; afterward it had 83%."

Preparation

"The pandemic has thrown the vital but usually humdrum world of logistics into a tailspin, spurring shortages of everything: masks and vaccine vials, semiconductors, plastic polymers, bicycles, and even baseball bobbleheads."

Just Get Me a Box': Inside the Brutal Realities of Supply Chain Hell – Bloomberg Businessweek, September 16, 2021

"Delays, product shortages, and rising costs continue to plague businesses of all sizes. And customers are confronted with an experience that was once unheard of in modern times: no stock available and no idea when it will arrive."

"There is no end in sight"

The World is Still Short of Everything. Get Used to It. – New York Times, August 31 2021

Raw Material Shortages Dramatically Impacting the Roofing Industry

MDI (Methylene Diphenyl Diisocyanate)

Polyol

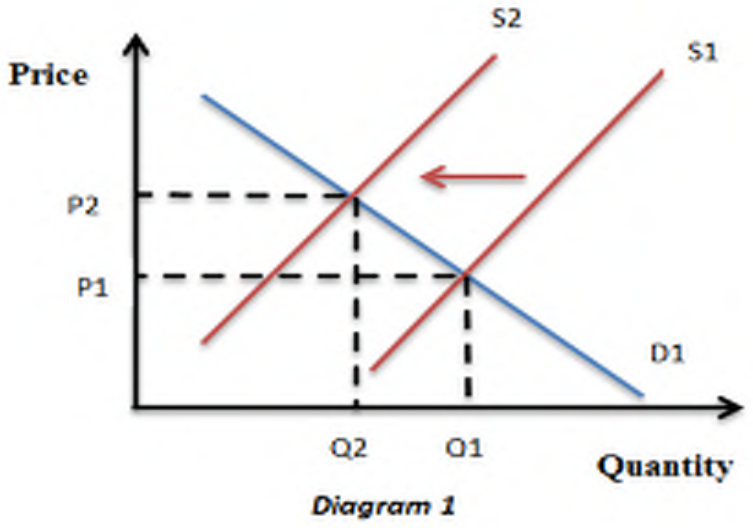
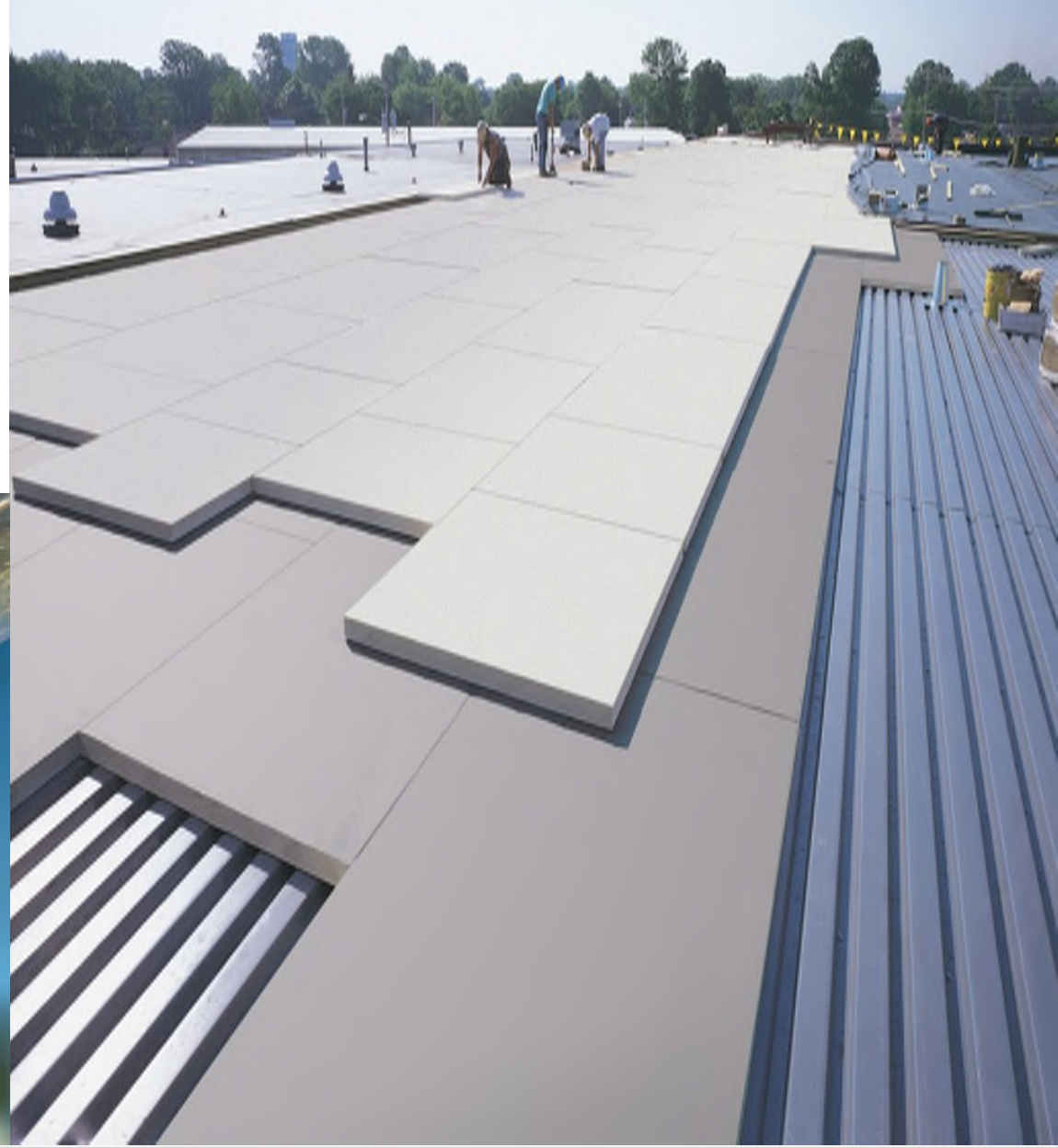


Diagram 1



Environmental Challenges

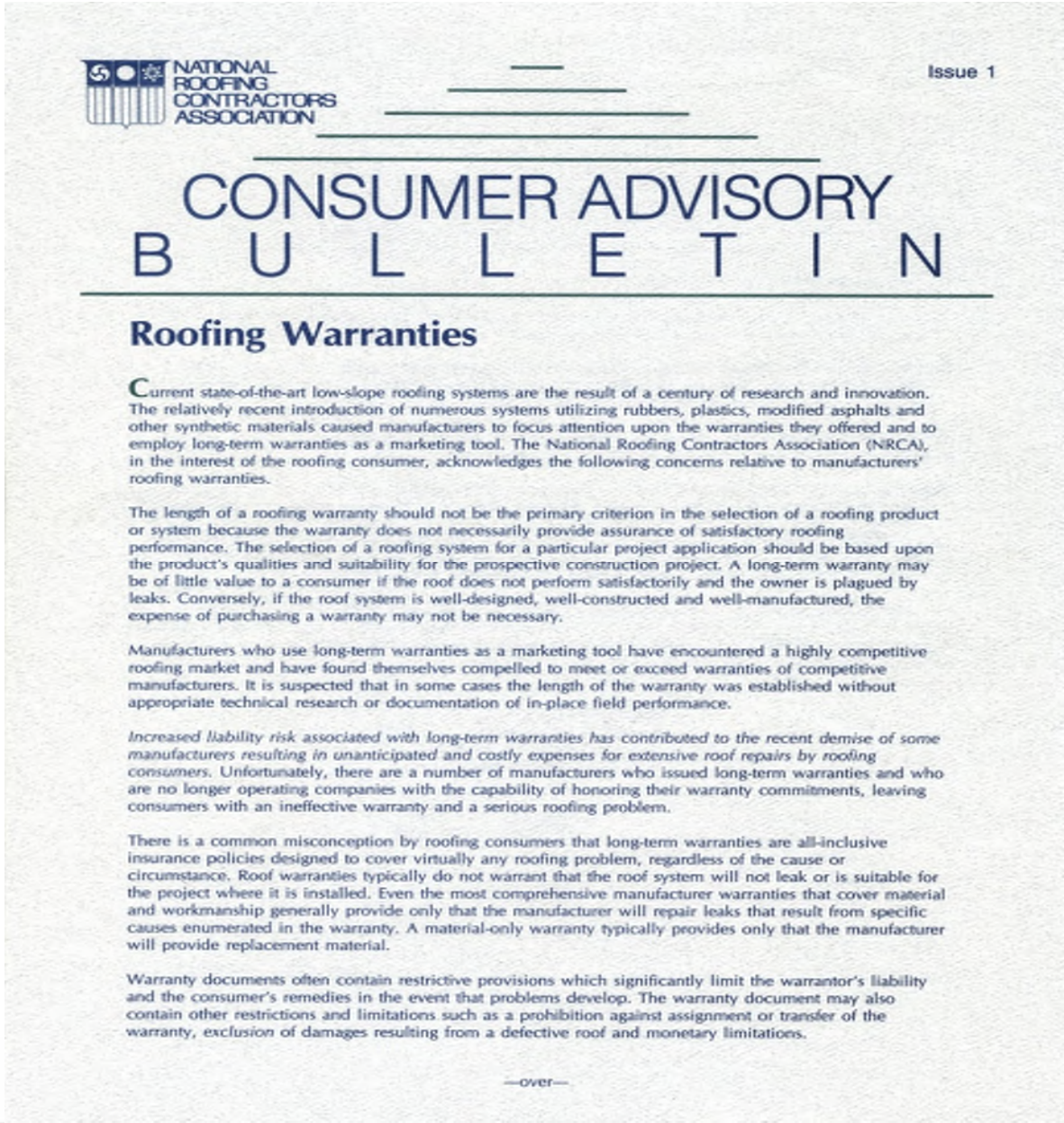
re·sil·ien·cy – noun - An ability to recover from or adjust easily to adversity or change

Environmental Challenges

Avoid Common Pitfalls

Main points

- Selection of a system for a particular project application should be based upon the product's qualities and suitability for that project.
- If the system is well-designed, well-constructed and well-manufactured, the expense of purchasing a warranty may not be necessary.
- Warranty documents often include restrictive provisions limiting the warrantors liability (exclusions).
- Clearly state in writing all recommended and required owner maintenance responsibilities during the projected service life of the roof.



NATIONAL ROOFING CONTRACTORS ASSOCIATION

Issue 1

CONSUMER ADVISORY BULLETIN

Roofing Warranties

Current state-of-the-art low-slope roofing systems are the result of a century of research and innovation. The relatively recent introduction of numerous systems utilizing rubbers, plastics, modified asphalts and other synthetic materials caused manufacturers to focus attention upon the warranties they offered and to employ long-term warranties as a marketing tool. The National Roofing Contractors Association (NRCA), in the interest of the roofing consumer, acknowledges the following concerns relative to manufacturers' roofing warranties.

The length of a roofing warranty should not be the primary criterion in the selection of a roofing product or system because the warranty does not necessarily provide assurance of satisfactory roofing performance. The selection of a roofing system for a particular project application should be based upon the product's qualities and suitability for the prospective construction project. A long-term warranty may be of little value to a consumer if the roof does not perform satisfactorily and the owner is plagued by leaks. Conversely, if the roof system is well-designed, well-constructed and well-manufactured, the expense of purchasing a warranty may not be necessary.

Manufacturers who use long-term warranties as a marketing tool have encountered a highly competitive roofing market and have found themselves compelled to meet or exceed warranties of competitive manufacturers. It is suspected that in some cases the length of the warranty was established without appropriate technical research or documentation of in-place field performance.

Increased liability risk associated with long-term warranties has contributed to the recent demise of some manufacturers resulting in unanticipated and costly expenses for extensive roof repairs by roofing consumers. Unfortunately, there are a number of manufacturers who issued long-term warranties and who are no longer operating companies with the capability of honoring their warranty commitments, leaving consumers with an ineffective warranty and a serious roofing problem.

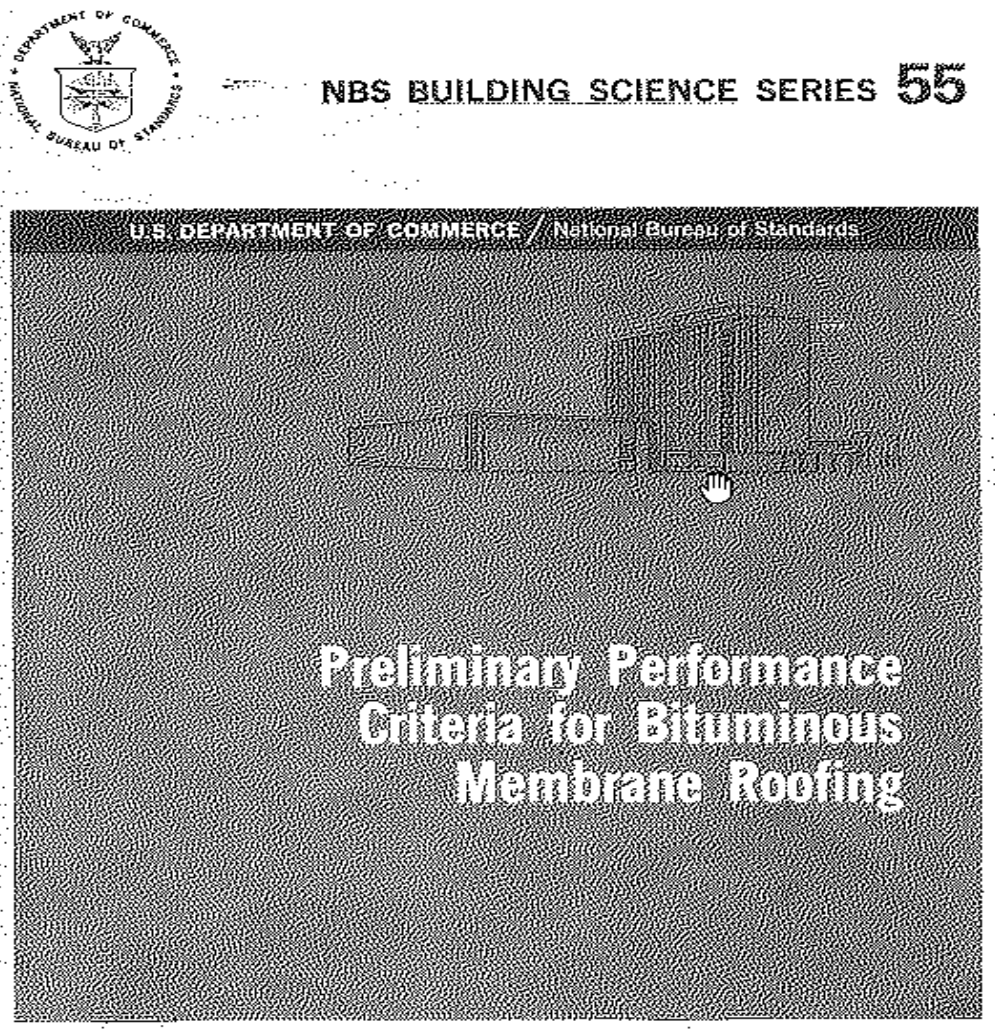
There is a common misconception by roofing consumers that long-term warranties are all-inclusive insurance policies designed to cover virtually any roofing problem, regardless of the cause or circumstance. Roof warranties typically do not warrant that the roof system will not leak or is suitable for the project where it is installed. Even the most comprehensive manufacturer warranties that cover material and workmanship generally provide only that the manufacturer will repair leaks that result from specific causes enumerated in the warranty. A material-only warranty typically provides only that the manufacturer will provide replacement material.

Warranty documents often contain restrictive provisions which significantly limit the warrantor's liability and the consumer's remedies in the event that problems develop. The warranty document may also contain other restrictions and limitations such as a prohibition against assignment or transfer of the warranty, exclusion of damages resulting from a defective roof and monetary limitations.

—over—

Avoid Common Pitfalls

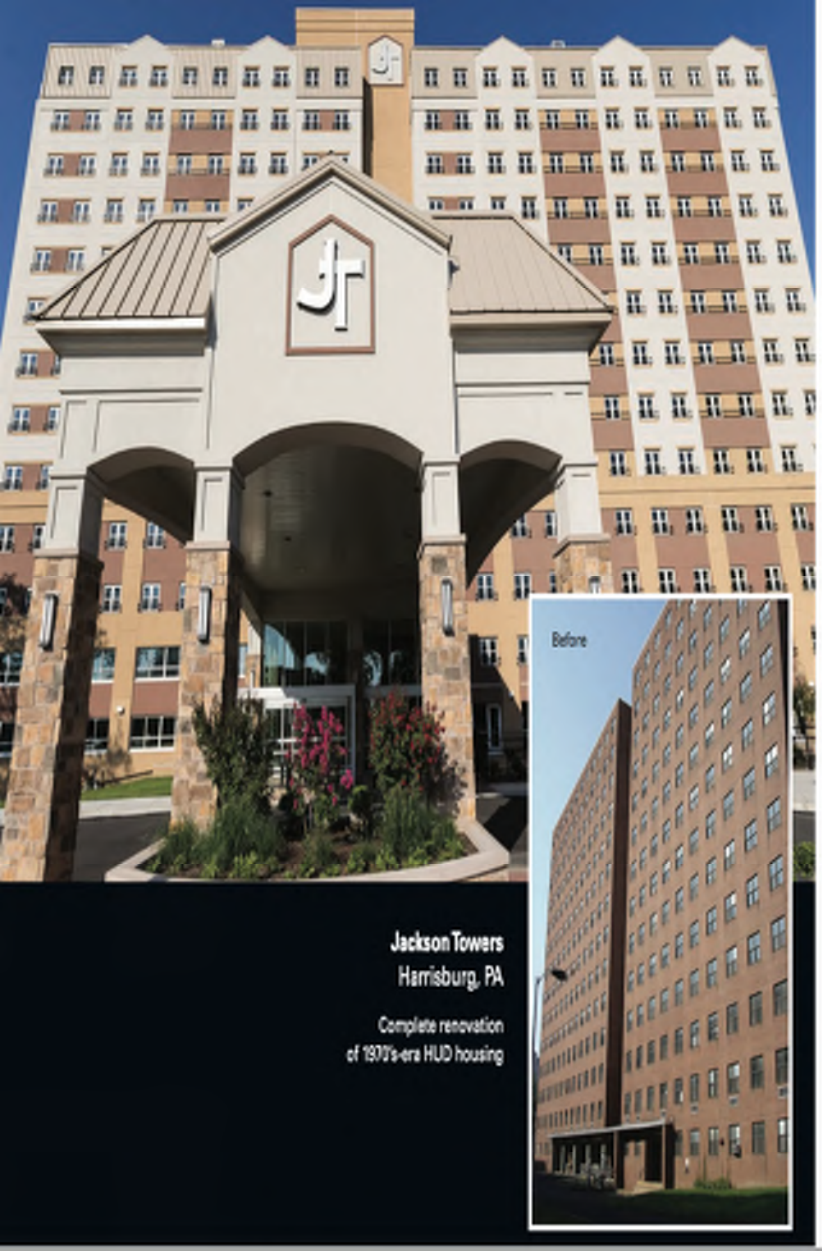
“The successful implementation of the performance approach to the design, manufacturer, and installation of bituminous membrane roofing will represent a significant achievement in the application of bituminous roofing technology. In addition to providing guidance for the development of better and more economical bituminous membranes, the performance approach will the way for both new products and innovative systems which are so badly needed by the roofing industry.”



Summary

1. A paradigm shift is happening right now
2. Data via diagnostic testing is **ALWAYS** the best strategy
3. Traditional challenges + new challenges = The new norm
4. Countless benefits to restoration
5. What's next?




BUILDING ENVELOPE
WARRANTY

WARRANTY NUMBER [Issuer Identifier/Project Number]-[Warranty Number]

PROJECT NAME & ADDRESS:		CONSTRUCTION MANAGER:	
OWNER:		GENERAL CONTRACTOR:	
ARCHITECT/ENGINEER:		AGGREGATE MATERIAL PURCHASE VALUE:	
ISSUER (THE "COMPANY"):	[List all manufacturers/sellers of Products listed in the Exhibit. For example, Tremco Incorporated, Dryvit Systems, Inc., The Euclid Chemical Company, etc.]	DATE OF PROJECT SUBSTANTIAL COMPLETION:	

WHAT IS WARRANTED AND WHAT WILL THE COMPANY DO?

Subject to the terms, conditions, and limitations stated in this warranty, the products (the "Products") will be free from manufacturing defect at the time of purchase, will remain in a watertight condition and will perform as warranted in this manner specified for the stated term(s) measured from the Date of Substantial Completion, all as outlined on the attached Exhibit A. The Exhibit is an integral part of this warranty.

THE COMPANY WILL SUPPLY LABOR AND MATERIALS TO REPAIR OR REPLACE ANY PRODUCTS THAT DO NOT PERFORM AS WARRANTED HEREUNDER. The Company will determine in its sole discretion the appropriate scope and method of repair or replacement to remedy any condition covered by this warranty.

The total liability of the Company over the life of this warranty shall not in any event exceed the aggregate dollar value of the original cost of the Products specified in the attached Exhibit.

The term of this warranty may be extended for an additional 2 years with involvement on the project of a Company-approved, third-party consultant ("Consultant") engaged by the Owner or its certified GAF representative, at the Owner's sole expense. Inspection reports generated by the Consultant shall be made available to the Company and the Owner. All deficiencies identified by the Consultant in the inspection reports must be addressed and corrected in accordance with the project specifications, good waterproofing practices generally accepted in the industry, and the Company's published application instructions. Written confirmation that all deficiencies have been addressed and corrected must be

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This concludes the American Institute of Architects Continuing Education Systems Course

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