

Advanced Single Ply Solutions



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GAF **ITK** **UNIVERSITY**
Professional Development...On Demand

Where I Learned





What's New In Roofing?

- Single Ply Technologies
- Market Trends
- Common Mistakes
- Restoration Options



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Major Types of Low Slope Roofing Systems

- Built Up (BUR) asphalt and coal tar
- Modified Bitumen (APP, SBS)
- Single Ply (EPDM, TPO, PVC)
- Metal
- Others:
 - Sprayed Polyurethane Foam
 - Roof Restoration Systems



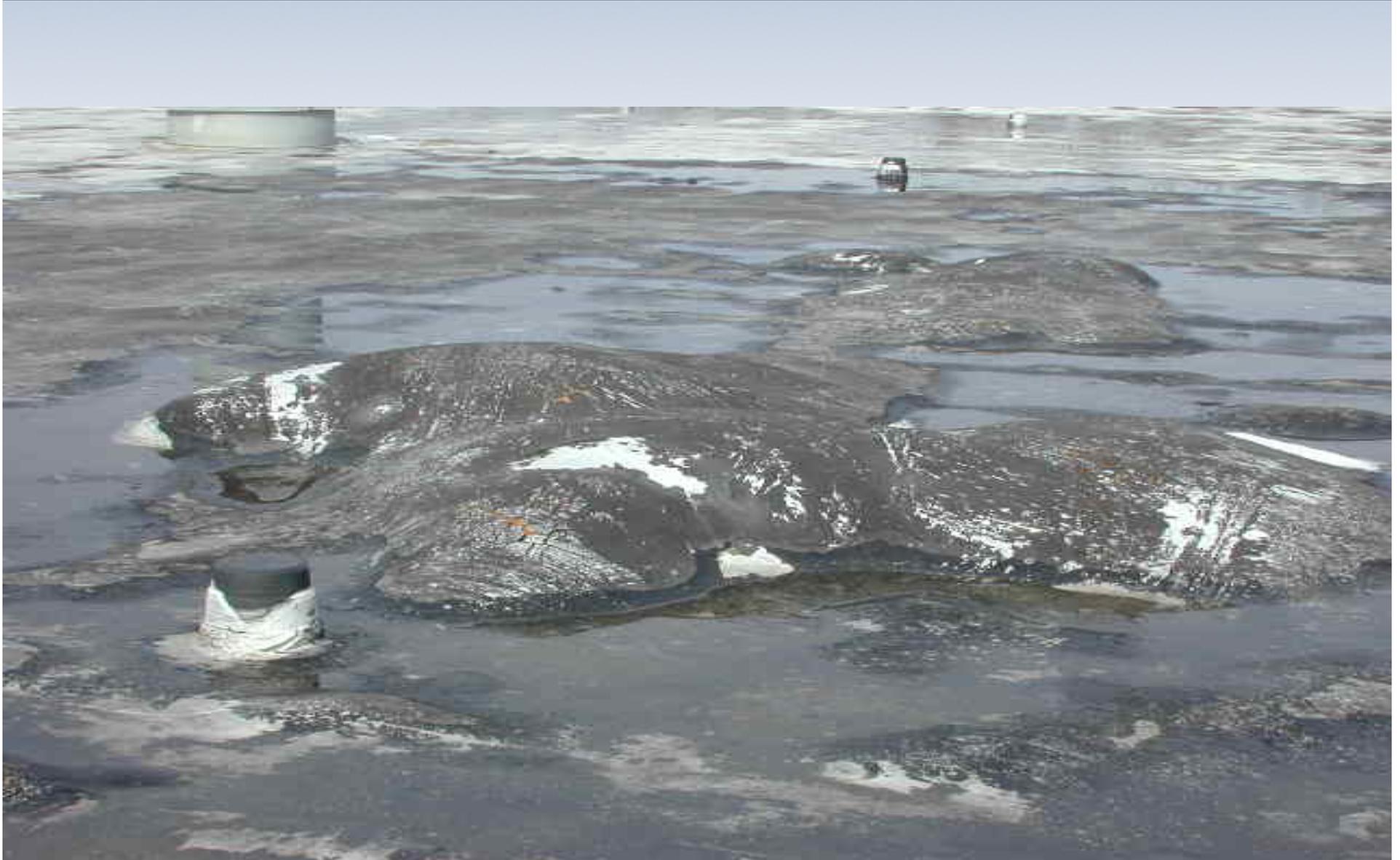
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Roof Problems Are Common



What's in a roof?

- 2% to 5% of building cost
- 60% to 80% of construction litigation
- 100% of the protection for the building from above
- Out of sight and out of mind until.....It leaks!



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New Trends In Roofing

- Reflectivity
- R-Value
- Thermal Bridging
- Emissivity
- Urban Heat Island
- SRI
- “As Manufactured” vs. “Aged”



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What's new- "Reflectivity"



Reflectivity

- How much of the sun's solar energy is reflected (vs. absorbed) by a surface
- The higher the value (can go from 0.00 to 1.00 ~ usually stated as a percentage), the more reflective the material
- Low reflective materials have a benefit when?



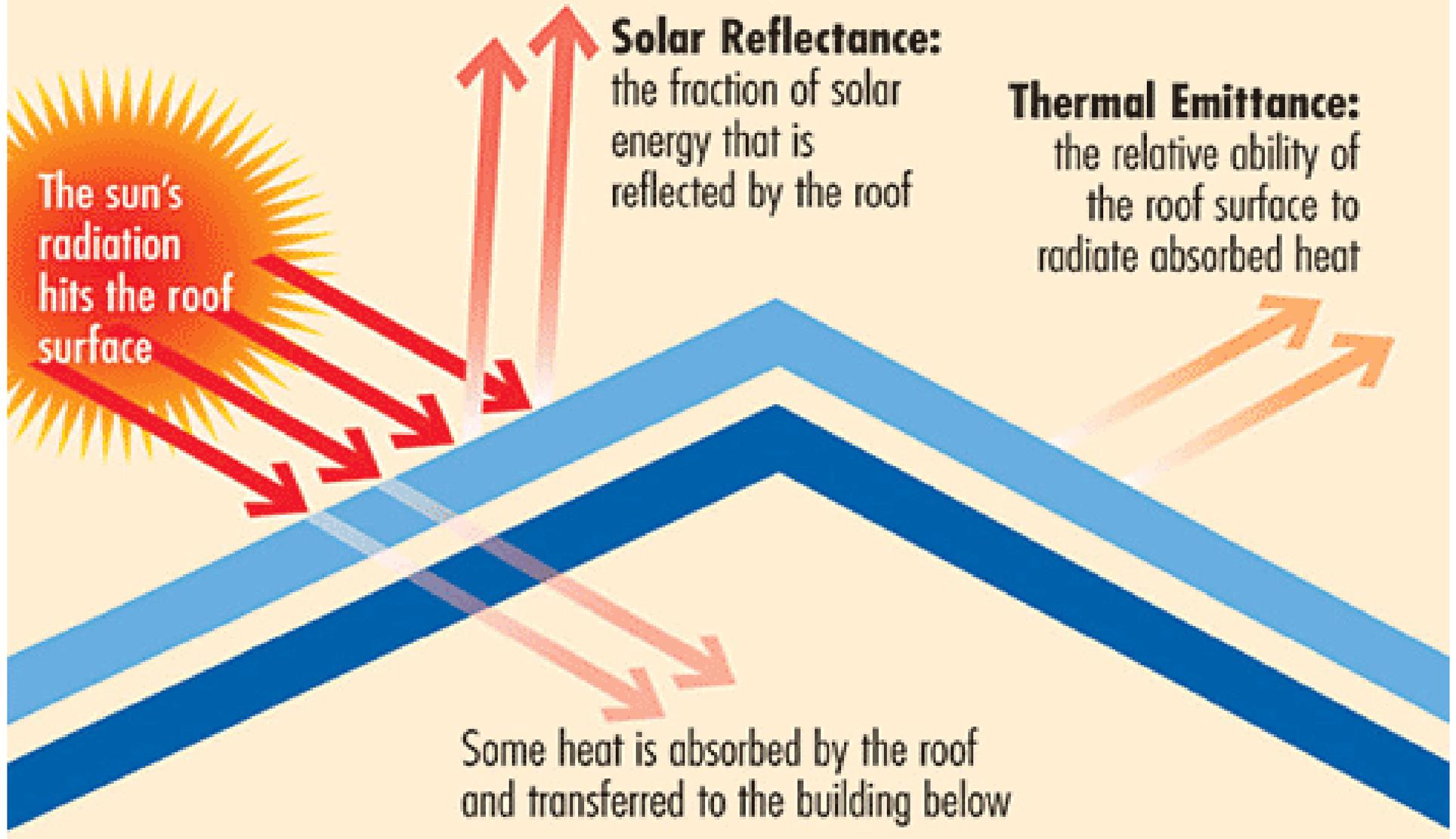
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Reflective Roofing Facts...

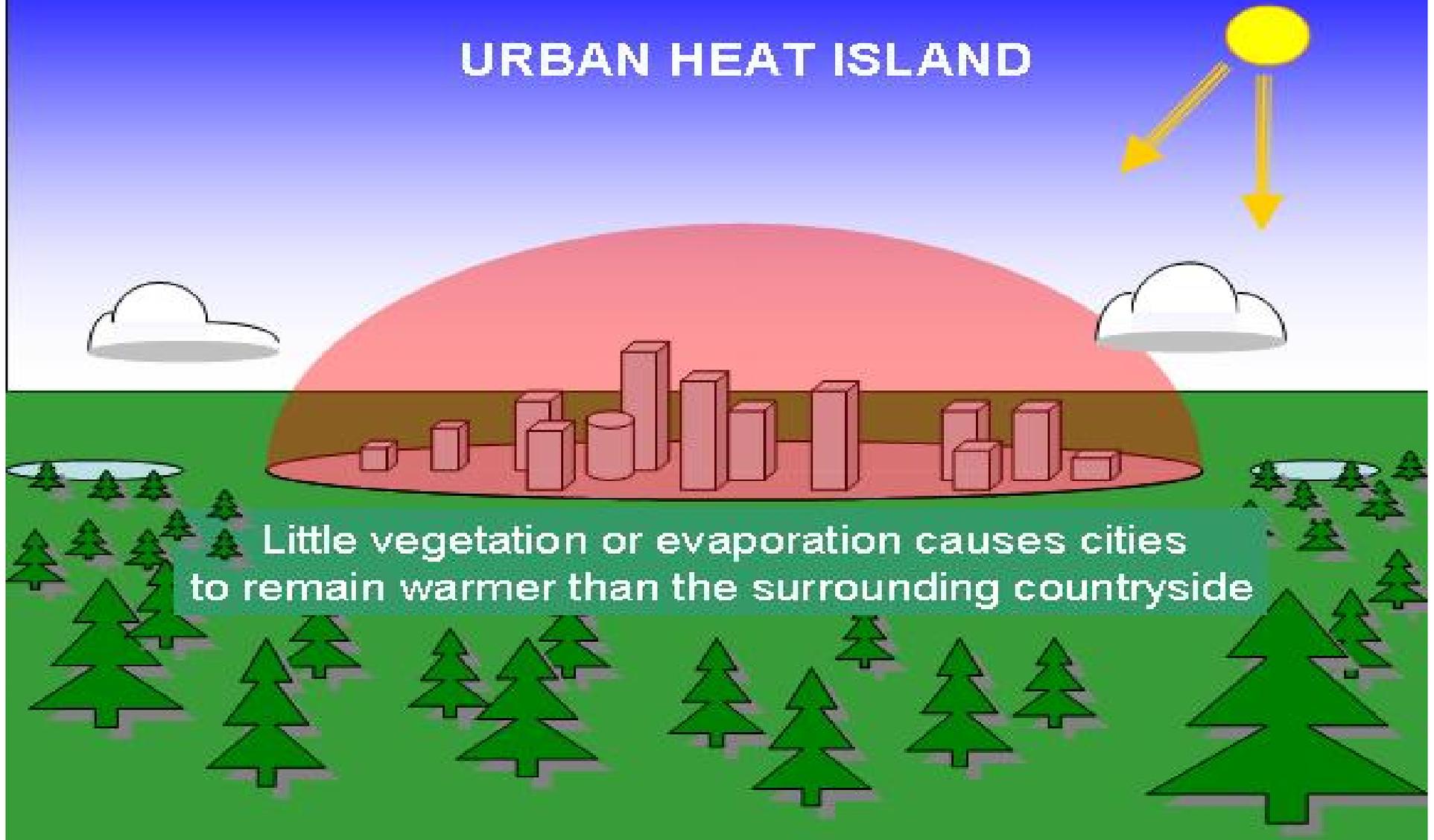


Save as much as 22%



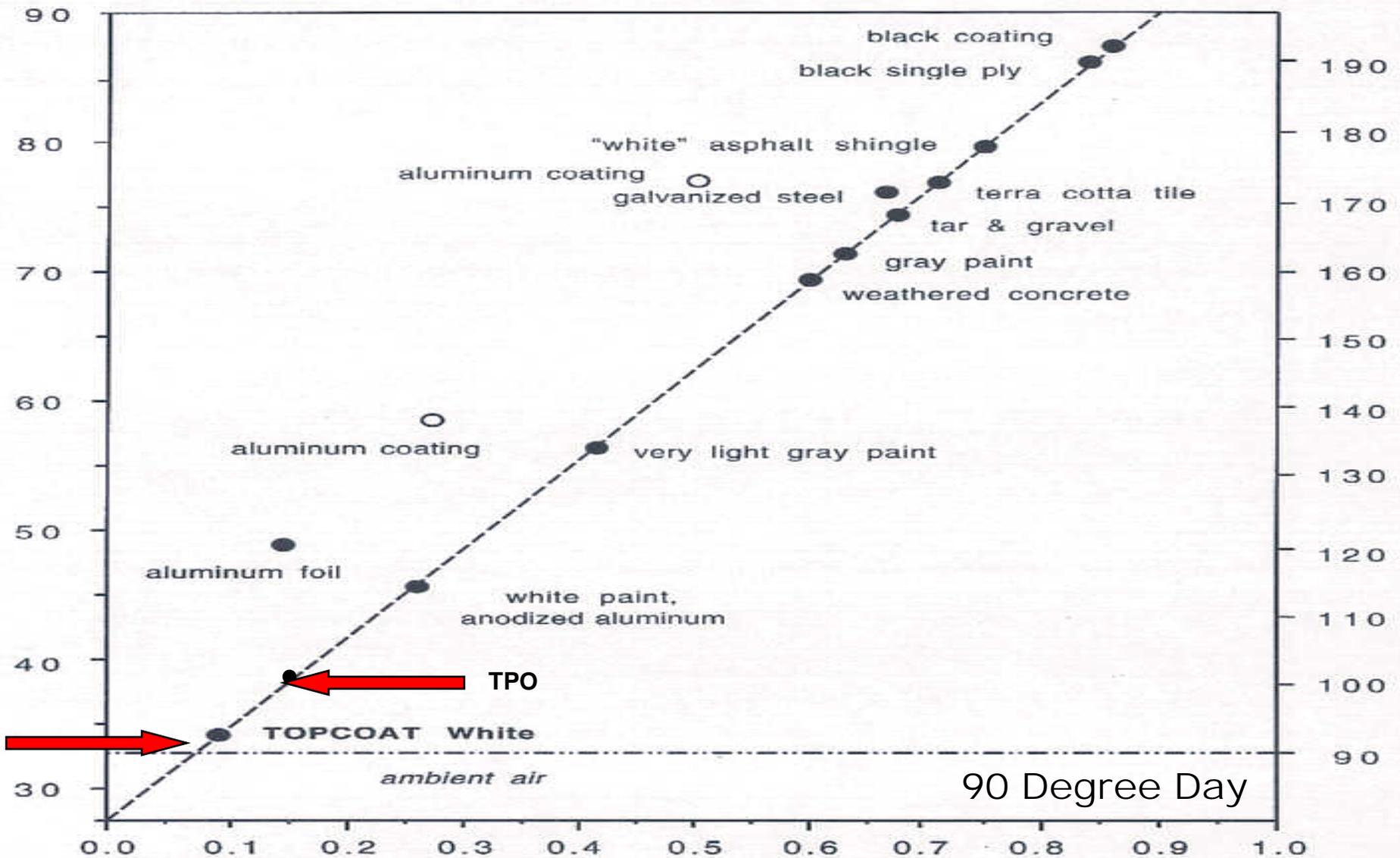
Our Cities Are Too Hot

URBAN HEAT ISLAND



Little vegetation or evaporation causes cities to remain warmer than the surrounding countryside

Roof Top Temperatures



What Is Single Ply...?



The History of Single Ply



EPDM Single Ply Roofing*

(Ballasted, Mechanically Attached, Fully Adhered)

Advantages:

- Decades of proven performance
- 20-Year system warranties available
- Ballasted: typically low costs
- Easy to repair (unless ballasted)
- Mechanically fastened and adhered systems are light weight

*ETHYLENE, PROPYLENE, DIENE MONOMER



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EPDM Single Ply Roofing

(BALLASTED, FASTENED, ADHERED)

Disadvantages:

- Seams dependent on tape or adhesive
- Black surface is not reflective
- Adhered EPDM: odor concerns during installation
- Fair life cycle cost
- Ballasted EPDM: installed weight design concern
- Some membranes affected by “shrinkage”
- More prone to punctures



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Common EPDM Problems

- Poor seam integrity.
- Excessive energy costs- black
- Time consuming- imperfect seams
- Not very puncture-proof
- Doesn't stand up to chemicals



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PVC



PVC

PVC Advantages:

- Decades of performance history
- Highly reflective surface
- 20-Year system warranties available
- Heat welded seams: very strong
- Resistant to most chemicals



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But PVC's were Imperfect

- Can shatter with excessive UV
- Somewhat expensive – Up to 60% more than EPDM
- Added chlorides aren't environmentally friendly



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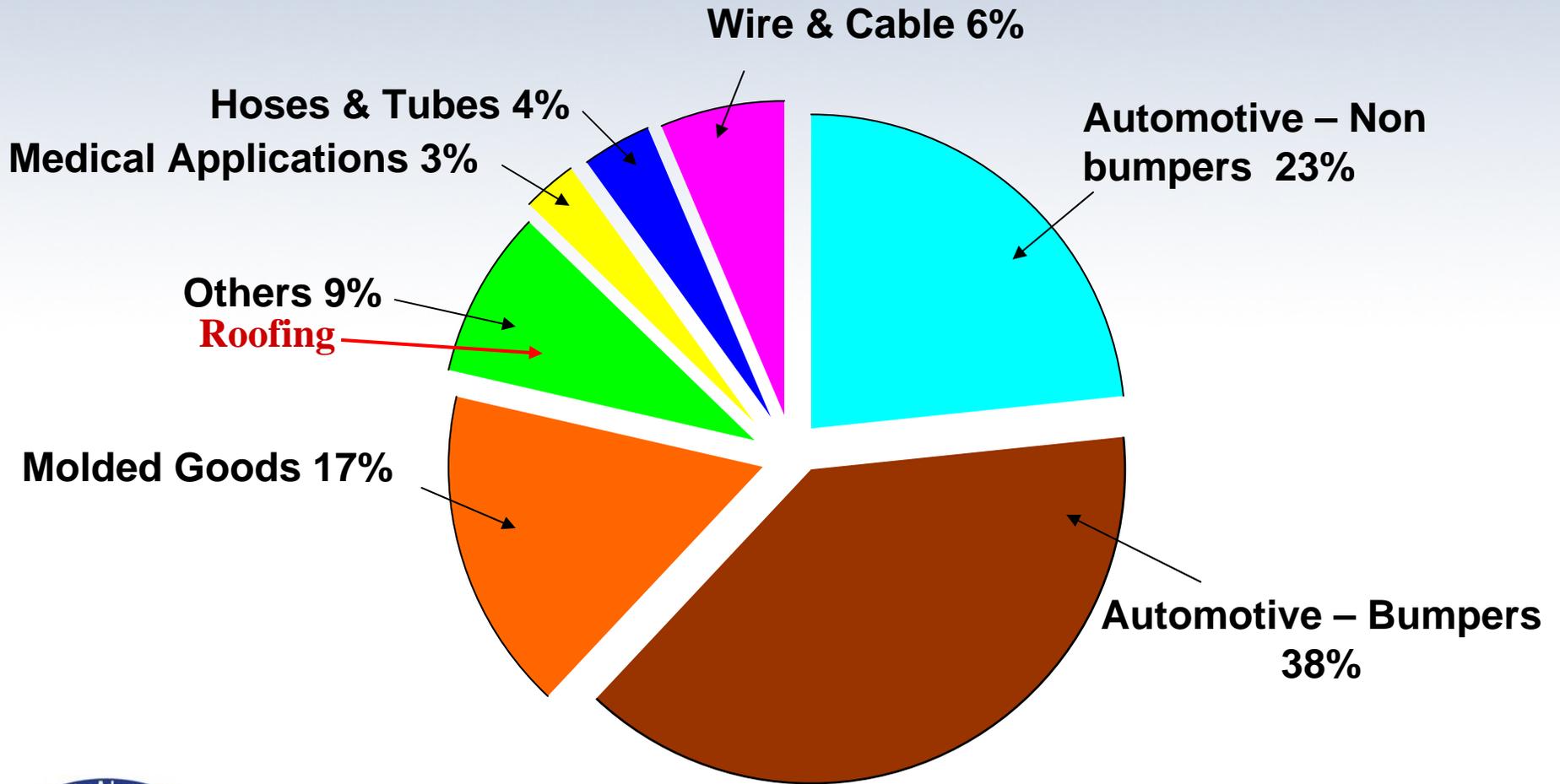
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TPO (Thermoplastic Polyolefin)



Where Is TPO Used...?



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TPO Uses

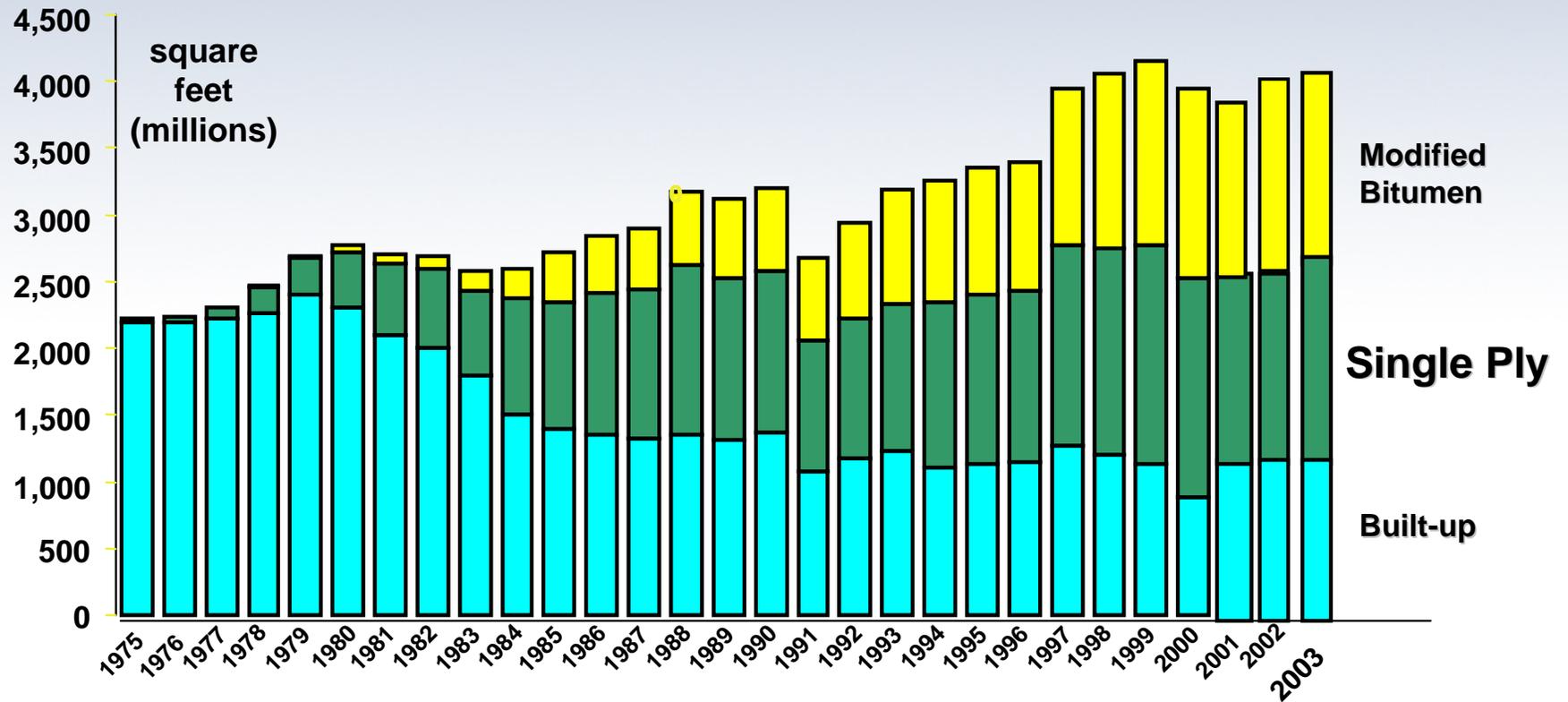


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Single Ply Slow Steady Growth

Roof System Market Share



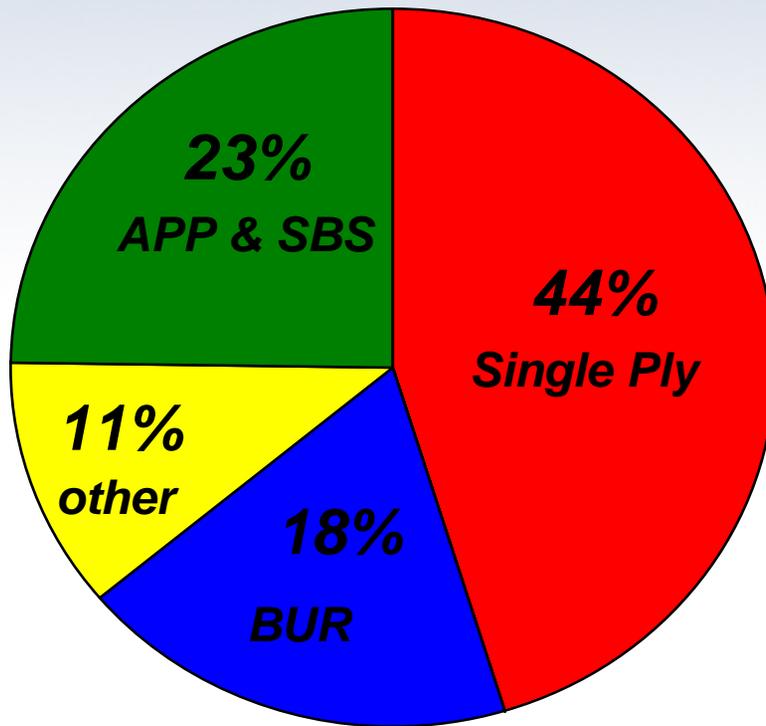
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Low Slope Market... 2008



44% Single Ply
23% APP & SBS
18% BUR
11% Other

Source: ARMA 2008



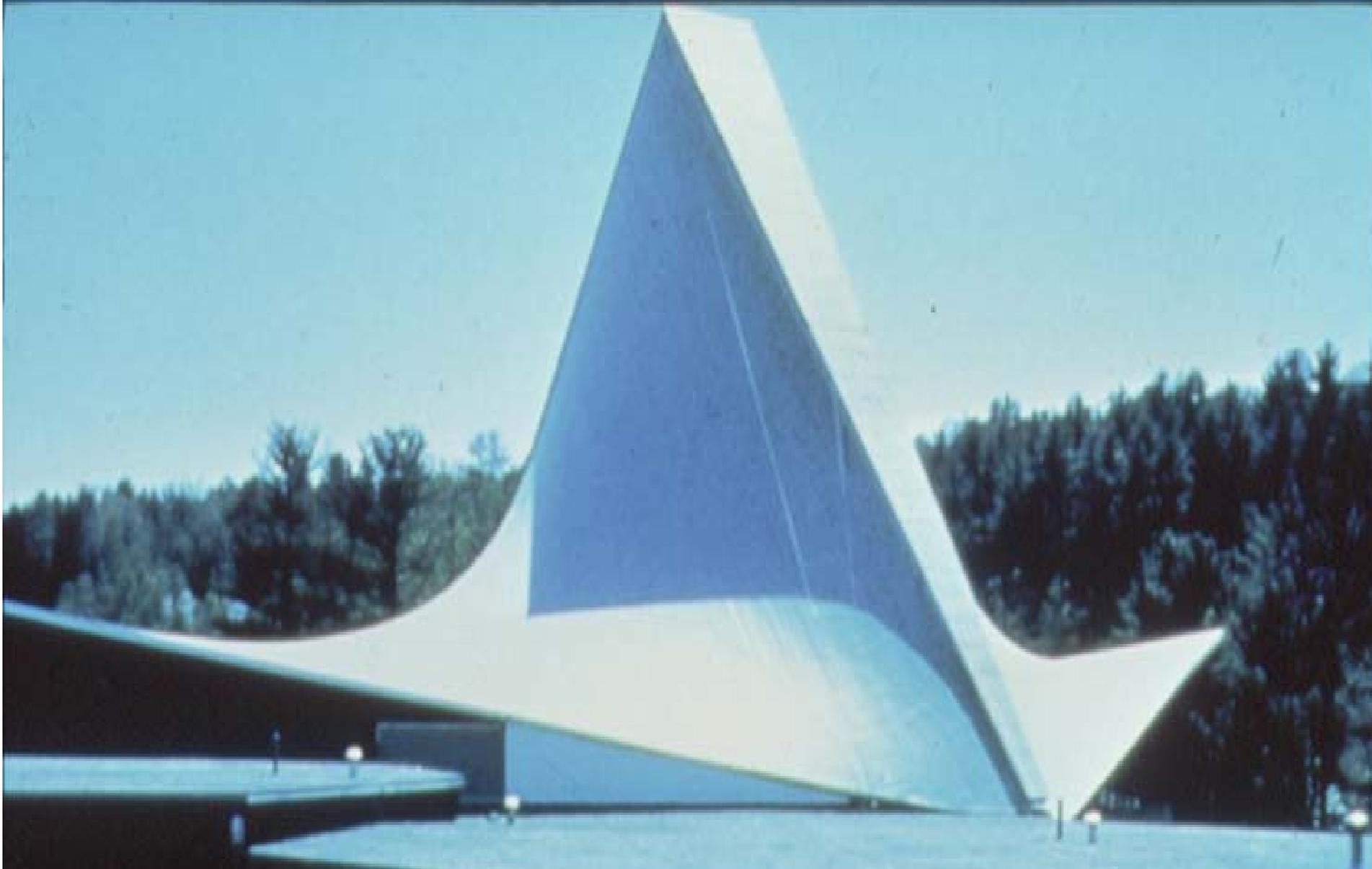
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TPO Is Versatile



Thermoplastic Single Ply

TPO / PVC Disadvantages:

- Moderate installed costs.
- Adhered systems: moderate odor during installations
- Ballasted: high installed weight, tough to repair
- Fair life cycle costs



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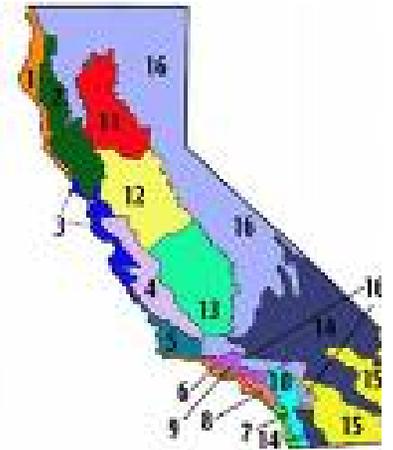
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What Is California Title 24...

Establishes an energy budget for residential and nonresidential...

- New buildings and additions/alterations (**alterations include re-roofing**)
 - Budget is in kBtu/square foot/year
 - Budget varies by climate zone
 - 16 climate zones in California



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California - Title 24...

The Rules:

- Reflectance of 0.70
- Emittance of 0.75
- Measured by CRRC standards

- Effective Date: October 1st, 2005



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Design Issues

Factory Mutual Property Loss Prevention Data Sheet 1-49

“The majority of roof covering failures caused by windstorms involve improperly designed or constructed perimeter flashings”

- 59% occur because perimeter flashing failed
- 20% typically have damage at the edge with no mention of edge failure
- **It's All In The Details!**

Source: FM loss prevention data sheet 1-49



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Details Make The Difference...



Flexible Easy to Seam



Ponding Water Warranties



Hot Air Robotic Welder



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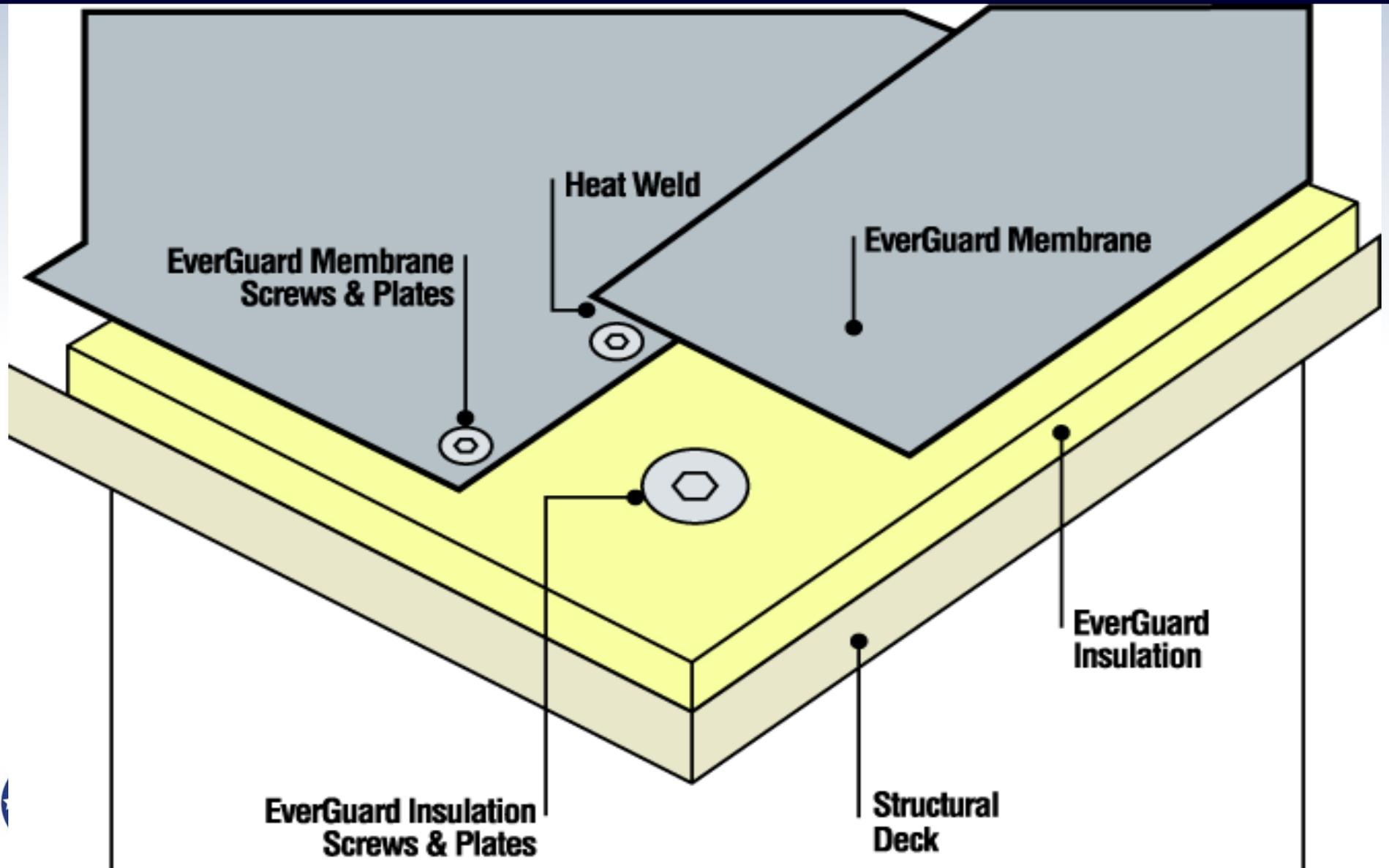
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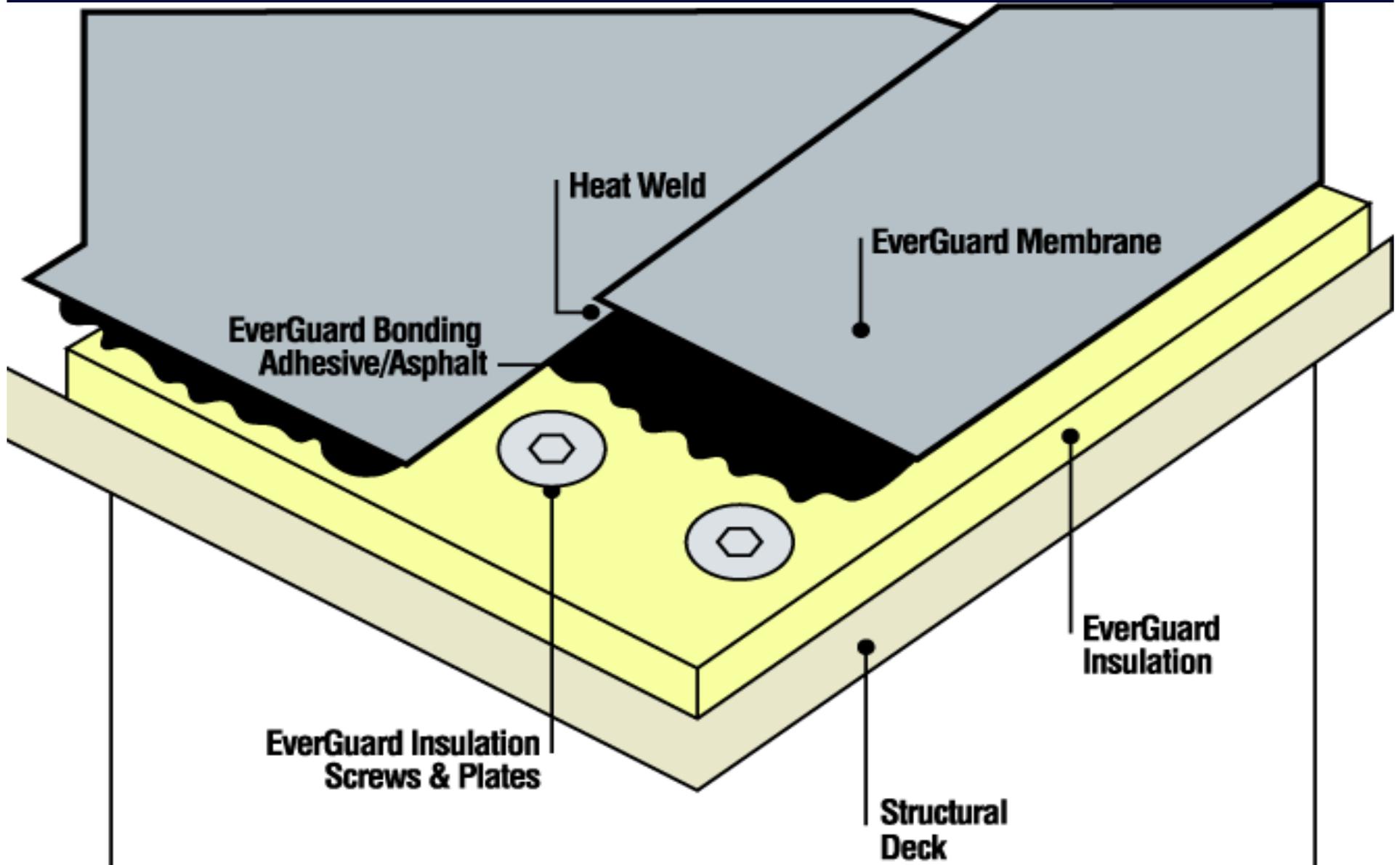
Welded T-Joint Covers



Mechanically Attached Single Ply



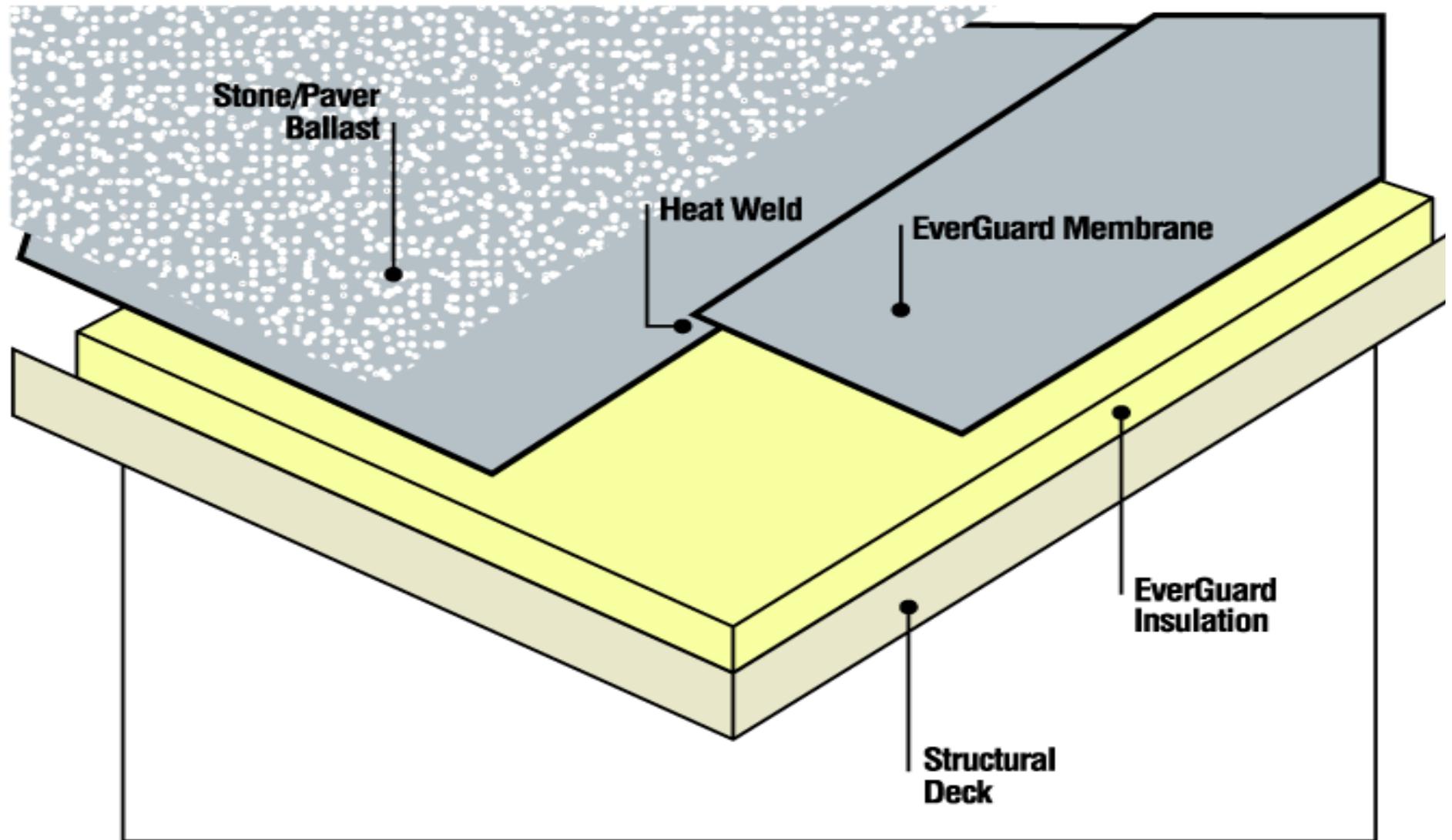
Fully Adhered Single Ply



Fully Adhered Single Ply



Ballast Applied Single Ply



No Torch Required



Fire Safety



Torch Burned Through Deck

No Fumes!



CNA / NRCA New Guidelines

- CNA Requirements / NRCA Involvement
- New Application Methods
- New Guidelines
- Training Required



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Why Self-Adhered TPO?

- **No Glue's**
 - No Mess, Less Space & Time For Staging
- **No Tapes**
 - Faster Seaming With Heat Welded Lap or Self Adhered Lap
- **Decreased Labor Cost**
 - Speeds Up Application Approximately 33%



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Freedom™ Self Adhered TPO



Voted 2005 Product Of The Year



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Proven Roofing Solutions

A supplement to RSI magazine

Roofing Solutions

\$19.95

Money-saving roof restoration options

Why problem prevention is your best value

How roof maintenance saves wasted dollars

Does maintenance pay? We do the math

Asset management: Tips & tricks from the experts

How to establish a roof maintenance program

GAF RSI

Contents

Why Roof Maintenance

- How roof maintenance can work for you.....
- Don't live a roofing nightmare.....
- Problem prevention is your best value.....
- Making a case for roof maintenance.....
- Is maintenance a good investment? Try the math.....
- Proof that roof maintenance pays big dividend.....

How to set up a roof ma

- How to establish a roof maintenance program.....
- Don't blame the roofer.....
- Proactive vs. deferred roof maintenance.....
- Fixing the leak.....
- New tools help owners track roofing assets.....
- The search for a "worry-free" roof.....
- Protecting roofs from Bigfoot.....

Problem prevention is your best value

BY DICK FRICKLAS - RSI CONTRIBUTING EDITOR

Business guru Peter Drucker recognized the true value of a roof system

Some 10 years ago, business guru Peter H. Drucker published an article in The Wall Street Journal entitled, "We need to Measure, not Count." The thrust of the article was that traditional cost accounting does not take into account the cost of nonproducing. He proposed activity-based accounting as a better alternative.



Dick Fricklas

To translate this into a roofing context, traditional accounting methods would consider the capital cost of a new roof system, and might even consider the Operating and Maintenance costs of keeping that roof going. This tends to seek the lowest cost roof that will do the job, or perhaps a more sophisticated owner might even compare options on a life-cycle basis.

Mr. Drucker suggests we could do more. Consider the scenario where a reasonably priced roof is installed by a reputable contractor. The life expectancy is 20 years, and a life-

cycle comparison has indicated the best value. The roof budget would be prepared as part of an overall corporate plan.

But in Drucker's context, let's look at a potential case where all does not go as planned. A severe storm moves through, with wind gusts reported to 100 mph, and hailstones as large as 2" in diameter.

This severe hail causes many punctures in the roof system, and the presence of hailstones causes temporary blocking of the roof drains. Even worse, the metal edging on the corner of the building facing the wind has failed, and 40 squares of roofing along that edge have pedaled back.

This results in considerable water entry, damaging critical components, including inventory, electrical systems and computers. The building is out of operation for two weeks. Orders are unfilled, sending customers to seek other sources.

As Mr. Drucker might ask, "Where are these costs in the overall accounting program? Had some "best guess" costs been applied, things might have been different.

Mr. Drucker's article is aimed at convincing those businesses that use traditional accounting methods to incorporate these new measurements. When the critical true value of the roof system is recognized, we'll build better roofs and take better care of them. **RSI**

What "wears out" roofs?

- ▶ **Exposure...**
Either long-term exposure to the elements (sun, water, freeze-thaw) or shorter-term exposure to damaging air pollutants and chemicals
- ▶ **Structural Movement...**
Such as building settlement or expansion/contraction not accommodated by the roofing system
- ▶ **Biological Growth...**
Such as vegetation in areas of standing water or algae
- ▶ **Not Fixing Problems Promptly...**
These can add up to a much shorter roof life - e.g., if a small problem is not repaired, then a large amount of insulation can be damaged
- ▶ **Forgetting About Maintenance...**
This is perhaps the single biggest cause of premature roof failure
- ▶ **Change in the Use of the Building...**
e.g., an increase in the interior relative humidity of a building can cause severe condensation problems within the roofing system



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Remember It's All In The Details



Maintenance Checklists

Owners
Maintenance
Checklists

Scheduled Maintenance Checklists
"Help Prevent Roofing Problems Before They Happen"
GAF Select Commercial Roofing Contractor

CONTENTS:

Welcome to the GAF Family!
What Types of Things Our Commercial Contractors Roof Folks?

As

Project Name: _____
File Number: _____

Roof Maintenance

High Profile-Ac Membership is made building owners happy by maintaining and improving the value of their investments.

The key to roof maintenance – catching problems before they are problems.

If you would like us to send a reminder to your building owner in 6 months on the importance of a good roof maintenance program, just let us know by filling out and returning this card.

Your Name: _____ Firm: _____
Phone: _____ Address: _____

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Single Ply Accessories

- **Pipe Boot**
 - One Size Fits All
- **Corners**
 - Inside And Outside
- **Metal**
 - TPO & PVC Coated Metal
- **Water Block**
 - Compression Sealant
- **Cut Edge Sealant**
- **Pourable Sealant**
 - 2 Part Sealant
- **Walk Pads**
 - Glued Or Welded
- **Bonding Adhesive**
 - Water Or Solvent Based
- **Non Reinforced Membrane**
 - Field Wraps
- **TPO Tape**



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Single Ply Accessories

- **Polyester Mat**
 - 3oz. Or 6oz. / Fan Fold
- **Insulation**
 - ISO; EPS; XPS
- **Screws And Plates**
 - 2", 2 3/8", 2 3/4"
- **Primer Cleaner**
 - EverGaurd TPO Primer



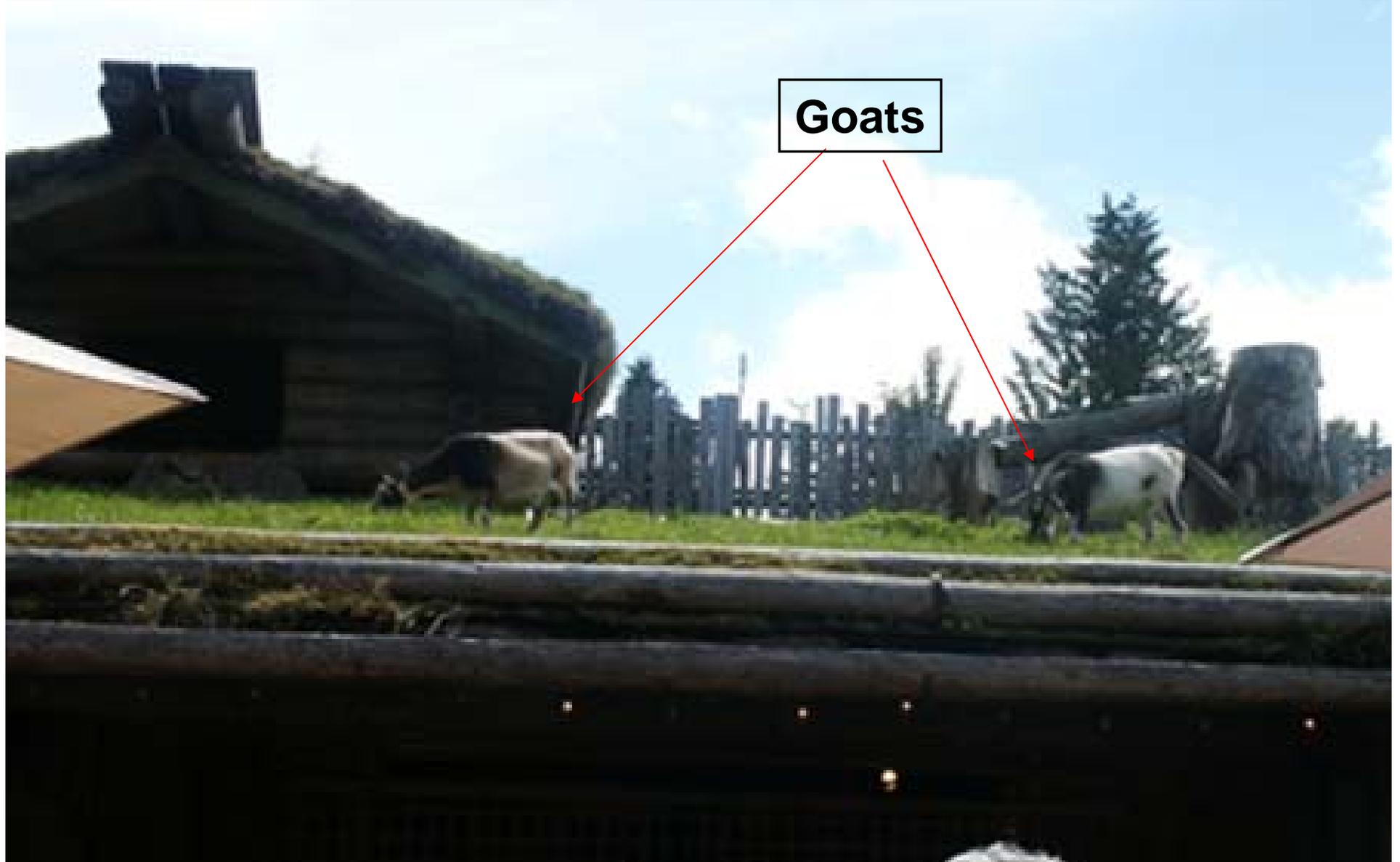
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Green Roof Basics



So Why Care About Green Roofing?

- Potential for Energy Savings... if the cooling benefit exceeds the heating loss
- Urban Heat Island Effect... in a moment, we'll explain
- Possibility of Saving Costs on Insulation... some offset the amount of insulation used
- Reducing Peak Energy Demands... on overtaxed utilities – Brown or Black Outs!! – and the high cost of adding capacity
- Cost of Energy... “somewhat pricey” and can be unstable



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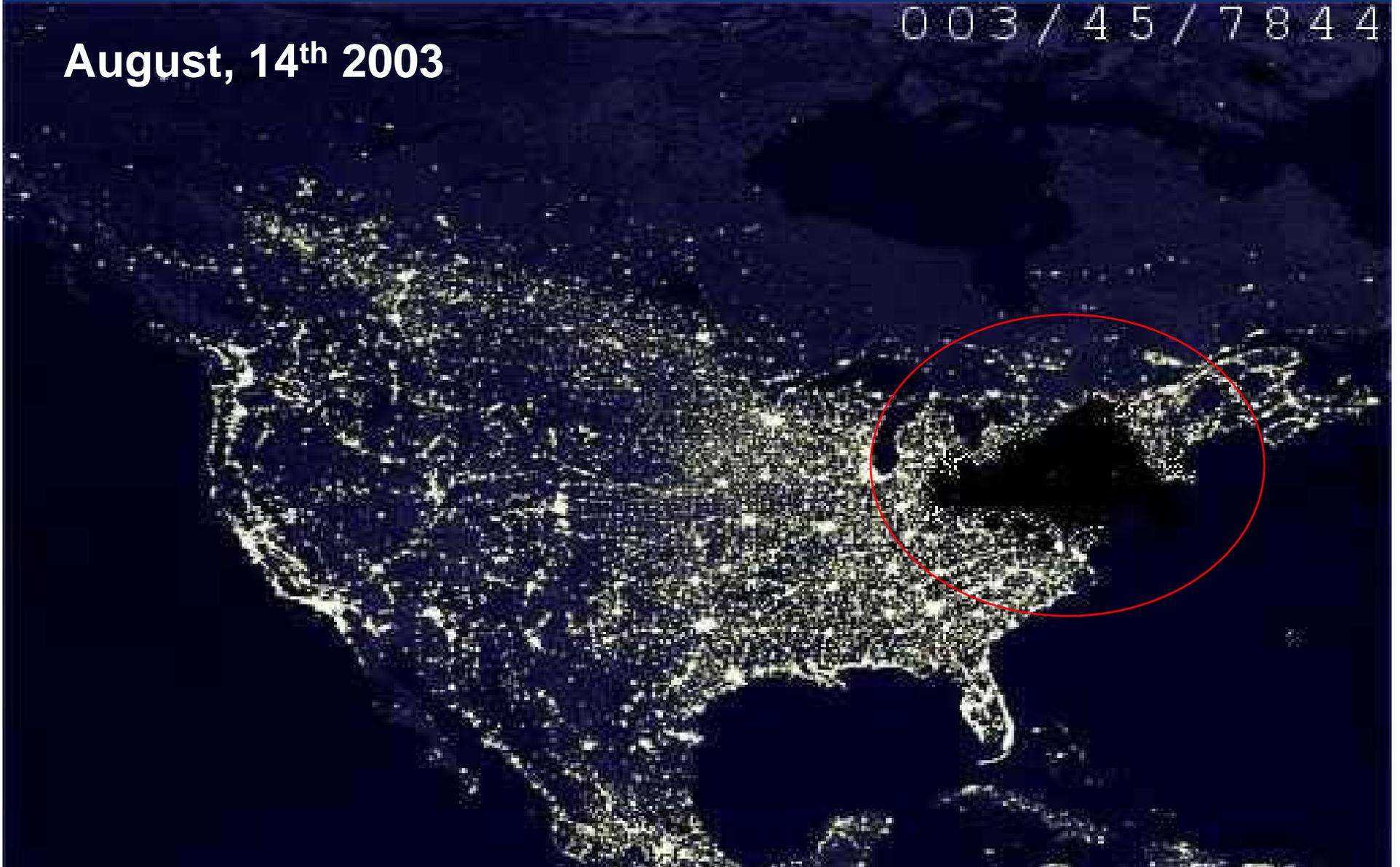
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A \$6 Billion Black Out

August, 14th 2003

003 / 45 / 7844



Codes and Standards

Three primary sources for roofing:

- Factory Mutual Research Corporation (FMRC) – provide testing and evaluation of loss potential related to wind, fire, hail, etc.
- Underwriters Laboratory (UL) – testing and certification services for a myriad of properties; typically associated with external fire classifications
- American Society for Testing Materials (ASTM) – standards development group made up of users, producers, and general interest parties



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Green Roofs Are Not New

Hanging Gardens of Babylon – Iraq 600 B.C.



Germany Lead the Way

- German green markets expanded quickly in the 1980's
- 15% - 20% annual growth
- By 2003 15% of all flat roofs in Germany were green!
- Europe has followed with government incentives to stimulate development.



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North America



Millennium Park - Chicago

How Does it Work...?

Plants / sedums & succulents
Lightweight growing medium
Root repellent system
Drainage system
Waterproofing



Roof Type	Extensive	Semi-Intensive	Intensive
Growing Media Depth	6" or Less	25% +/- 6"	More than 6"
Accessibility	Often Inaccessible	Partially Accessible	Usually Accessible
Fully Saturated Weight	Low 10-35 lbs / sq. ft.	Varies 35-50 lbs / sq. ft.	High 50-300 lbs / sq. ft.
Cost & Maintenance	Low	Varies	High
Plant Diversity	Low	Greater	Greatest

Public Benefits

- Storm water management:
reduce quantity and improve quality
- Improved air quality
- Reduce urban heat island effect
- Aesthetic improvement (marketability)
- New recreation spaces - HEALTH



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Storm Water Management

- Aging cities have combined sanitary and storm water sewer systems... cause combined sewer overflows
- Dense urban areas have a limited capacity to handle surface runoff
- High cost of capital investment to upgrade



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Reduce Urban Heat Island

Improved Air Quality

- reduce air pollution levels by lowering extreme summer temperatures, trapping particulates, and capturing gases on leaf surfaces
- reintroduction of vegetation into urban environments increases oxygen



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Private Benefits

- Energy efficiency
 - Noise reduction
 - Increased membrane durability
 - Fire retardation (not tested)
 - Marketability – LEED Certification
- Can help increase occupancy



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Can be more at first glance...

- Extensive will range from \$10 to \$15sf above the roofing membrane
- Intensive is more due to maintenance
- Lifecycle and energy savings make up for initial expense!
- No two green roofs are alike!

microclimate, wind, plants etc...



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Incentives Help

Leverage private roofs for public gain:

- Fast track permitting
- Grants
- Tax credits
- Low interest loans
- Storm water rebates
- Energy efficiency incentives



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Design Requirements

- Load requirements must be met
 - 10-50 lbs/sq.ft. saturated Extensive system
 - 80-150 lbs/sq.ft. saturated Intensive system
- Slopes up to 20° ≈ 4/12
- Waterproofing System
- Native densely planted growing medium



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GA
Pro

Waterproofing System

Much the same principles as protected roof membrane assemblies

- Structural deck
- Insulation
- Membrane – TPO works great
- Membrane protection
- Overburden



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GA
Pro

What is LEED...?

Leadership in Energy & Environmental Design

- System for certifying design & construction of the greenest buildings in the world.
- Site planning, water management, material use, air quality etc...



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LEED For Roofing Systems

Roofing ... can find points in 3 categories



- Sustainable site (14 points)
- Energy and atmosphere (17 points)
- Materials and resources (13 points)



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Recap

- Asphalt based technologies will continue to play a large role in the Industry.
- Single Ply technologies are quickly gaining ground.
- Primary growth is ThermoPlastic
- Primary reasons are energy driven.



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Thank You



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