

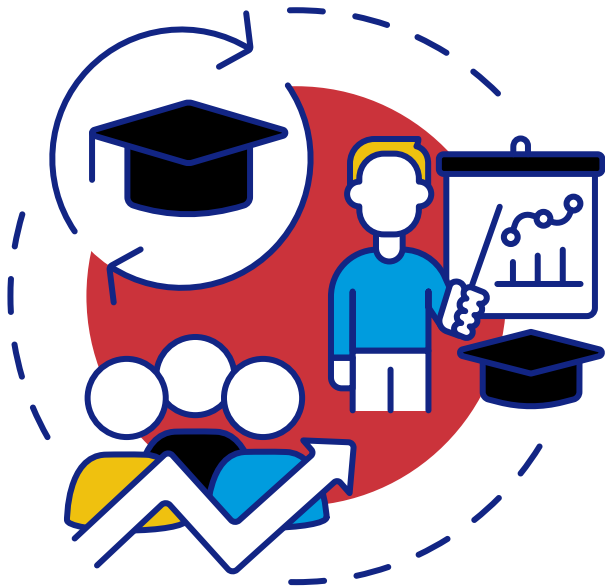


TEX-COTE® KYNAR®

**INFRARED (IR) HEAT-REFLECTIVE
WATER-BASED POLYVINYLIDENE FLUORIDE
(PVDF) FLUOROPOLYMER COATINGS**



AIA Continuing Education Provider



AIA/CES
1 HSW LU

Tex-Cote LLC, is a Registered Provider with The American Institute of Architects Continuing Education Systems (AIA/CES). One (1) Health, Safety, and Welfare Learning Unit (LU/HSW) Hour earned on completion of this program for both AIA members and non-AIA members are available on request. Please be sure to sign in to receive credit.

This program is registered with AIA/CES for continuing professional education.

Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.

COURSE DESCRIPTION

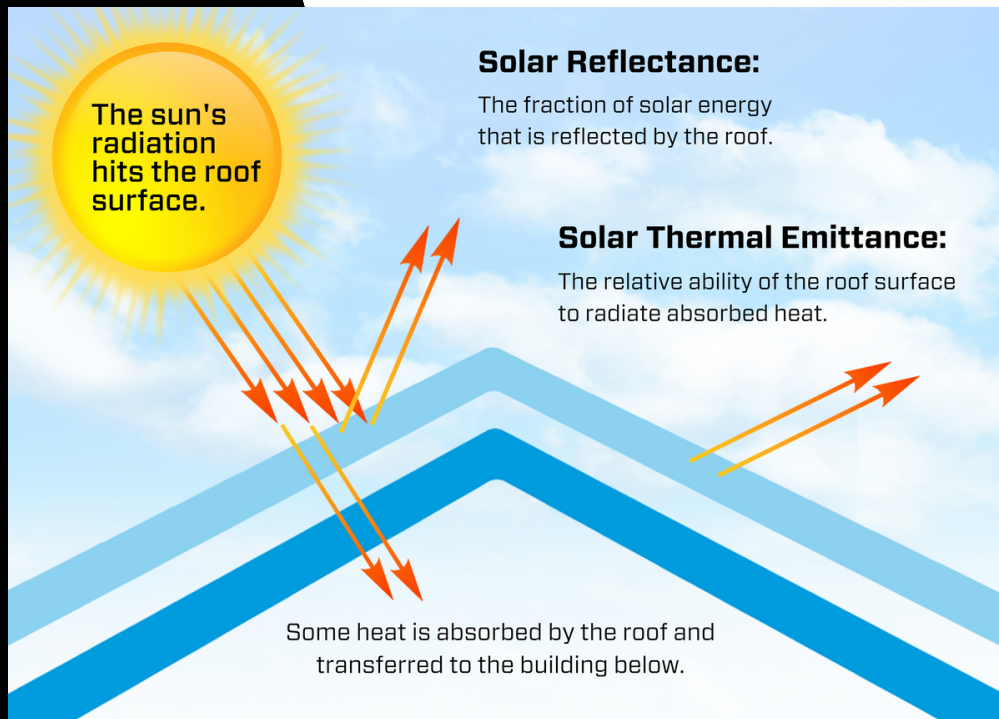
- Infrared (IR) heat-reflective PVDF coating systems for walls and roofing are a technological breakthrough.
- Water-based, low VOC, field-applied, offers advantages and opportunities in commercial, industrial, and residential applications.
- This program will provide an overview of this innovative coating technology, as well as an update on key energy-saving standards.



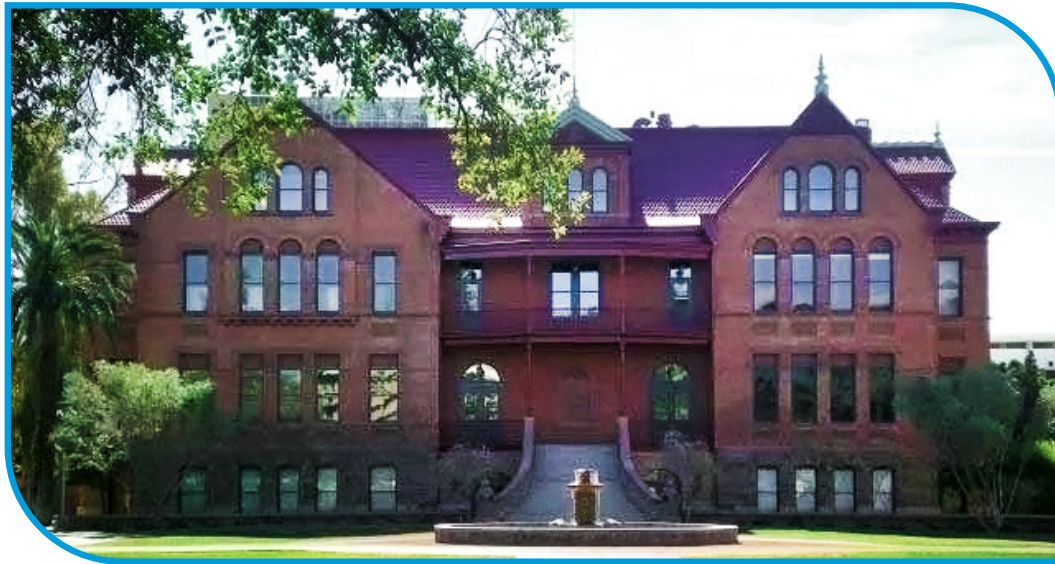
LEARNING OBJECTIVES

At the end of this program, participants will be able to:

- Define IR heat-reflective coatings for walls and roofs.
- Define properties of PVDF Coatings field-applied coatings.
- Identify Uses and Benefits of low VOC, water-based IR Heat-Reflective Coatings.
- Identify potential energy savings and fade resistance inherent in Cool Wall and Cool Roof Products.
- Understand recent updates and upcoming changes to environmental building programs and requirements.



WHAT IS A "COOL" WALL & ROOF?



Arizona State University "Old Main" with IR Heat-Reflective Coating and over five years of exposure.

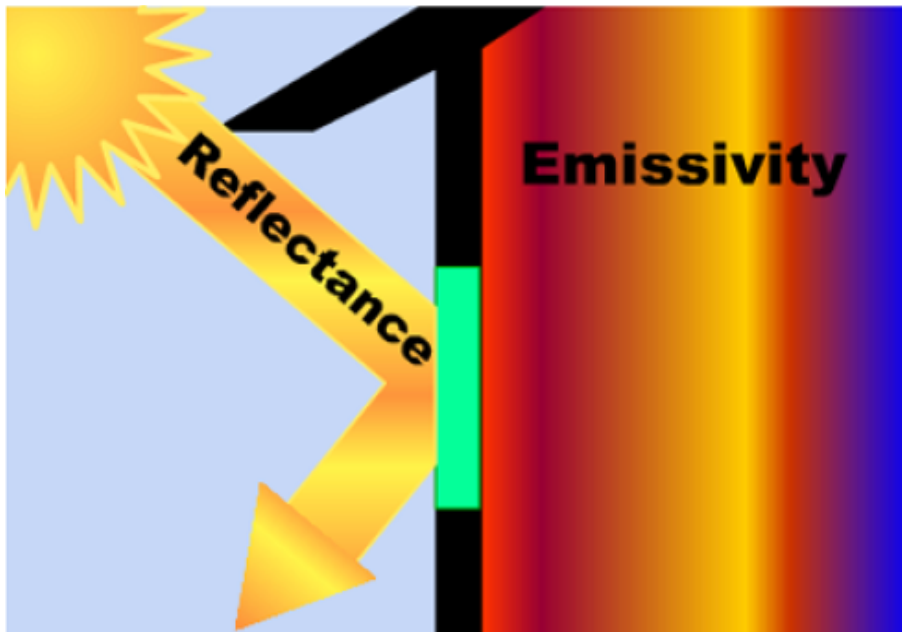
"Cool" describes the reflection of the sun's heat back into the atmosphere.

The building does not absorb the reflected heat.

"Cool-ness" is measured by Total Solar Reflectance (TSR) and Thermal Emittance (Emissivity).

ASPECTS OF COOL WALLS AND ROOFS

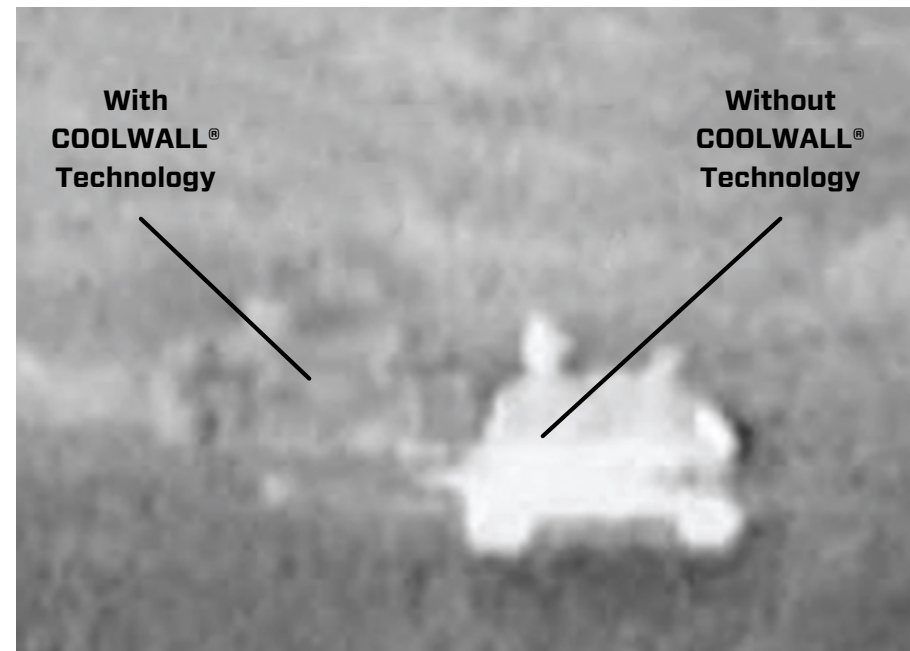
Reflectivity and Emissivity



- Two considerations for the energy efficiency of a surface.
- Reflectivity: a measure of how well a material rejects solar energy.
- Emissivity: the degree that the material holds that energy.

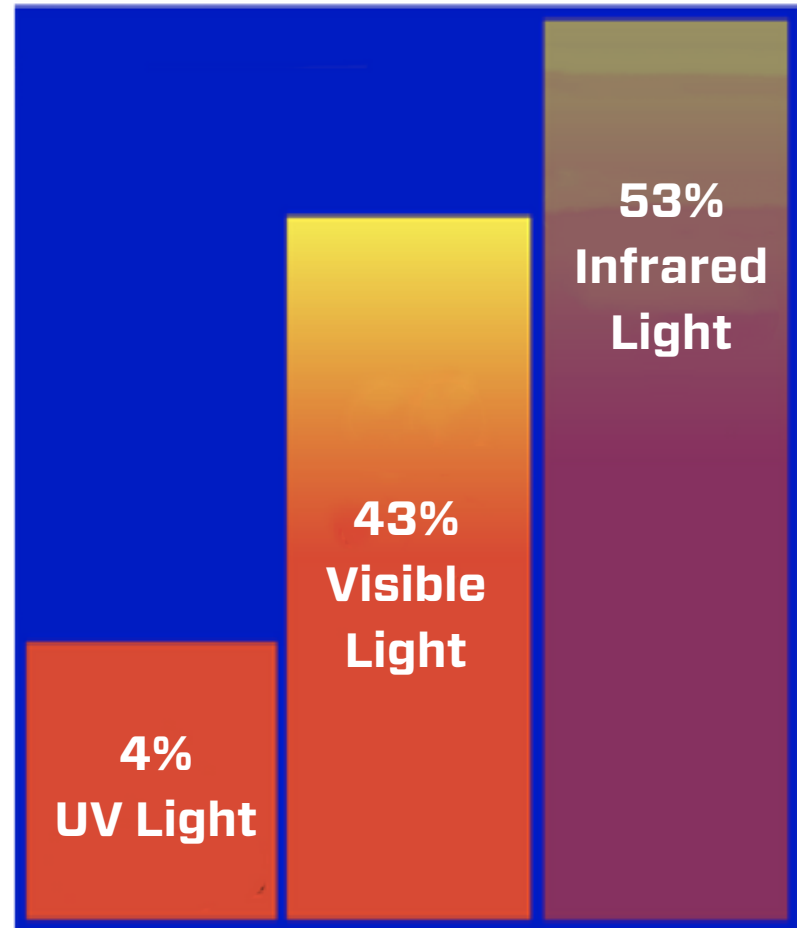
ORIGIN OF IR HEAT-REFLECTIVE COATINGS

- IR Heat-Reflective coatings originated within the U.S. Military.
- Utilized in the STEALTH program.
- Used to diffuse heat to eliminate radar detection.



THE LIGHT SPECTRUM

- The light spectrum consists of visible light.
 - The light we can see.
- A large portion of it is invisible to the eye.
- The near-infrared light.
- IR heat-reflective coatings reduce the damaging effect of this light spectrum.
- Making this portion of the light spectrum highly reflective, darker colors can perform much like lighter colors.



DARK COLORS vs. LIGHT COLORS

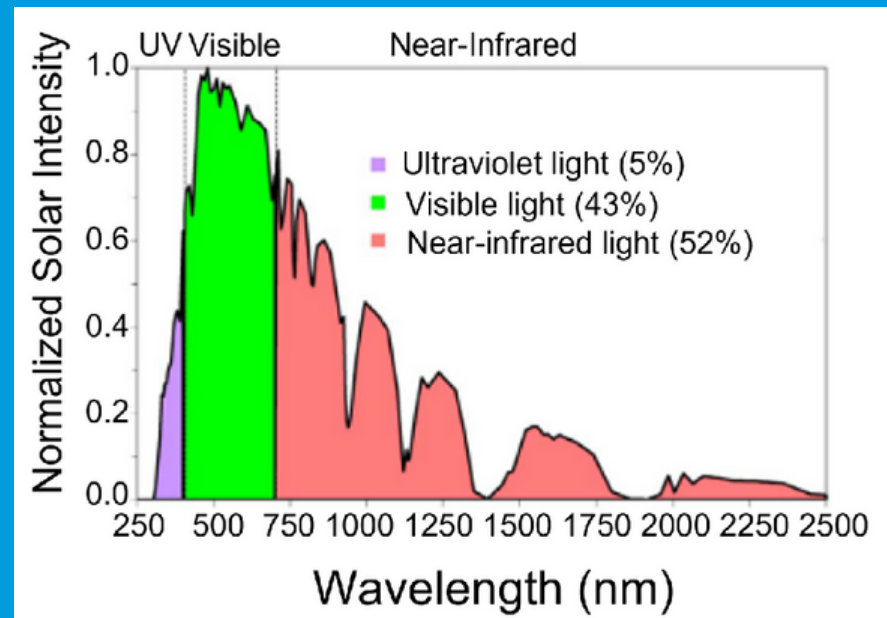
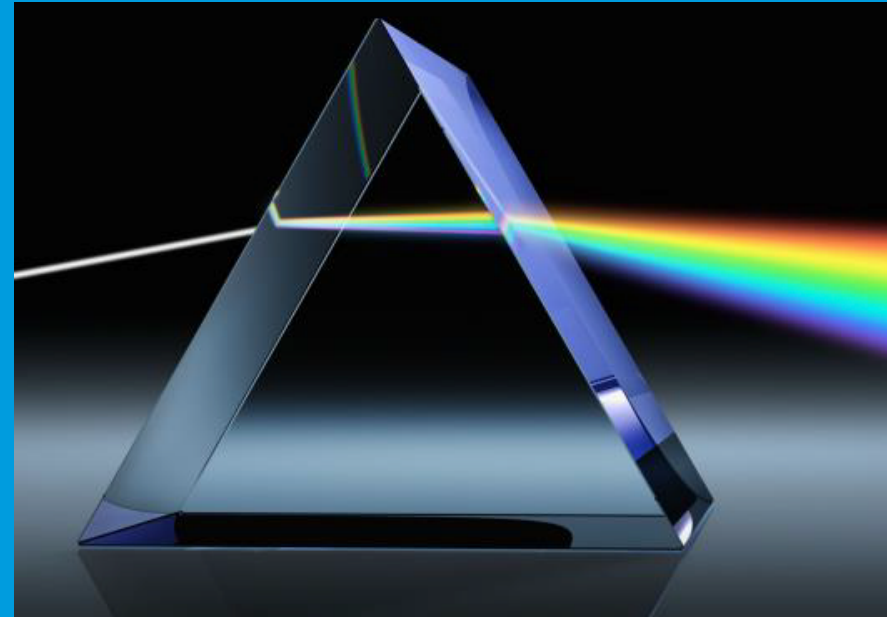
- If you have ever owned a dark-colored car, you know dark colors absorb more heat than light colors.
- Dark colors reflect less of the sun's energy than light colors. In fact, traditional black only reflects about 5% of the sun's energy.
- IR heat-reflective coatings allow dark colors to perform like light colors.
- An advantage to designers, and building owners concerned about rising energy costs and the urban heat island effect.



DEVELOPMENT OF IR HEAT-REFLECTIVE COATINGS

IR Heat-Reflective Coatings are...

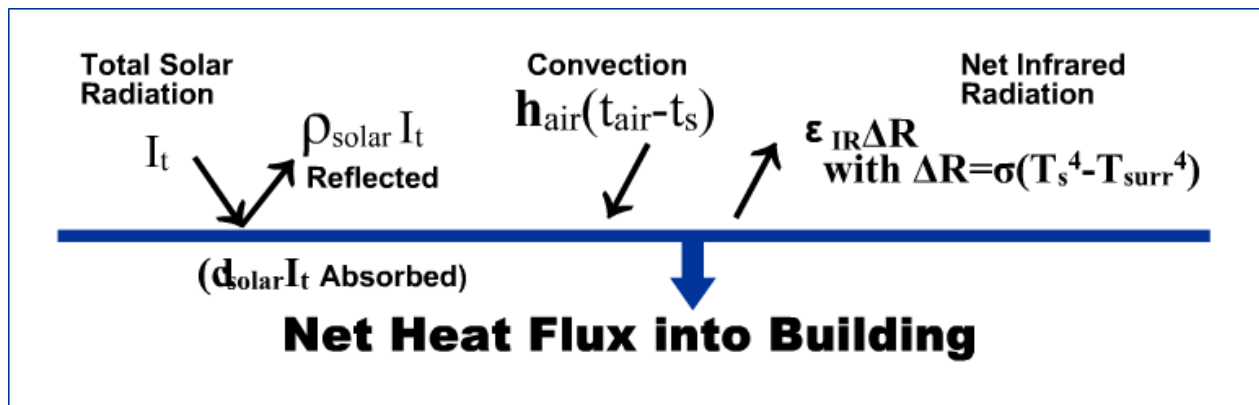
- Designed to influence the infrared, the invisible portion, of the light spectrum.
- Reflecting IR light, reducing heat absorption, even in dark colors.
- Designed to diffuse heat evenly across the surface.
- Reflective without ceramic additives that may be damaged during application.



MATERIALS AND HEAT ABSORPTION

Surfaces can absorb as much as 90% of the radiant energy.

- Increase interior temperature
 - More energy consumption
 - More demand on HVAC systems
 - Increase carbon emissions
- Advanced infrared heat-reflective coatings are on average 100% more reflective than ordinary paint, even in darker colors.



PVDF AIR-DRIED FLUOROPOLYMER COATING

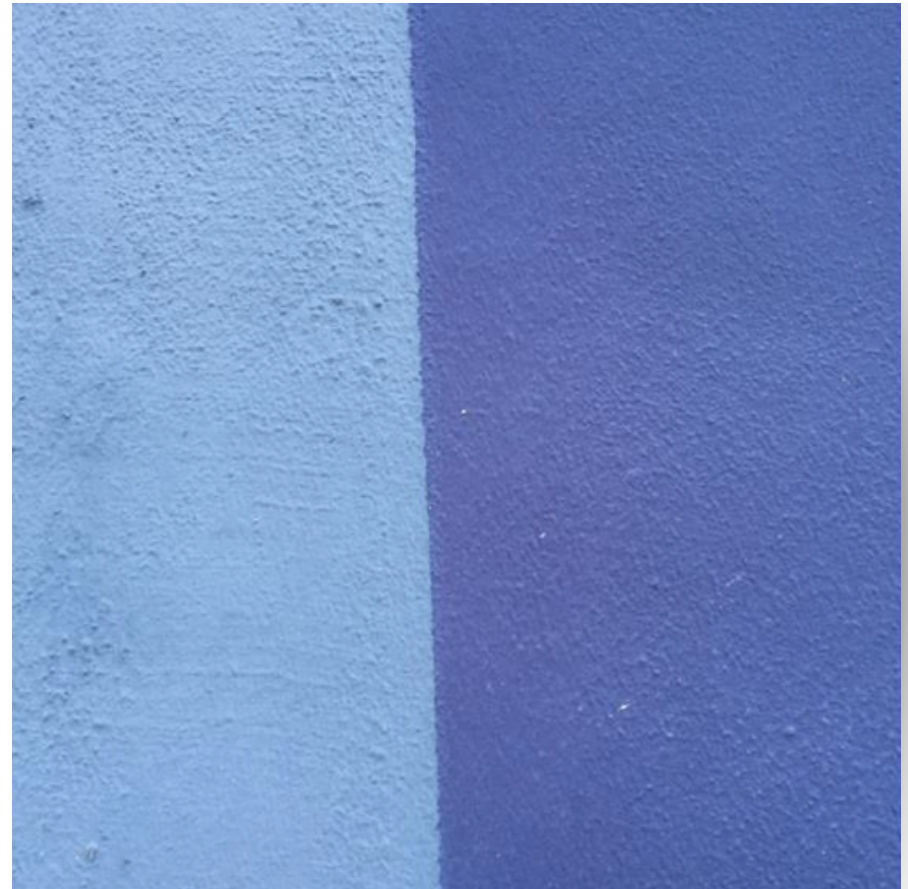
- As compared to typical acrylic or elastomeric coatings, the advantages of water-based PVDF Coatings include:
 - A harder more robust film
 - Long-term color retention
 - Resistance to dirt pickup and biological growth



IR Heat-Reflective PVDF Coating
applied to tile roof surface.

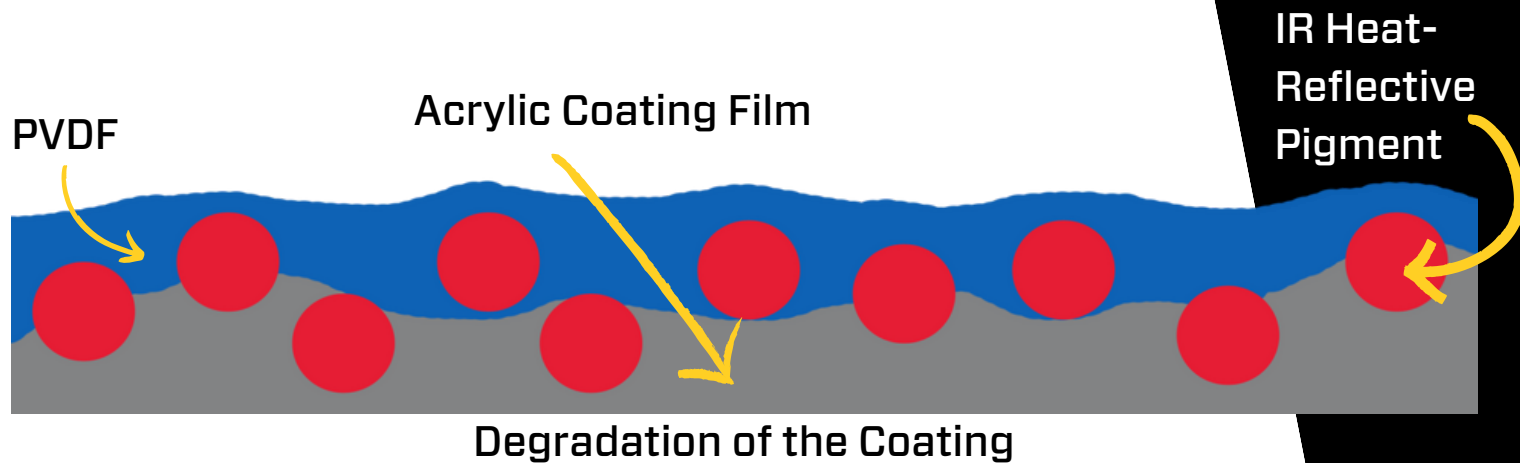
USES OF FLUOROPOLYMER (PVDF) RESIN

- Baked-On Factory Finishes
- Photovoltaic/Solar
- Protective Films
- Fiber Optic Cable
- Water Treatment Piping
- Windmill Coatings
- And Now... Field-Applied
- Architectural Coatings



*Best Buy Blue Test Wall
After 3 Years Exposure*

DEGRADATION OF THE COATING FILM



PVDF coatings can actually get better over time. As the acrylic properties age and weather, the PVDF properties are more concentrated on the surface, greatly improving the life of the coating and continuing to encapsulate pigments.

FUNCTIONAL COATINGS

Compared to typical acrylic and/or elastomeric coatings, IR Heat-Reflective PVDF Wall and Roof Coatings can...

- Greatly reduce absorbed heat.
- Lower exterior surface temperatures by over 50 degrees
- Greatly reduce colors from fading.
- Reduce building fatigue from expansion and contraction.
- Provide a "passive" cooling.
- Reduce the urban heat island effect, which contributes to urban smog and causes increased demands on power plants.

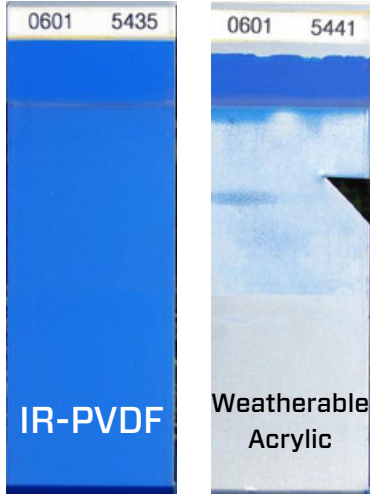
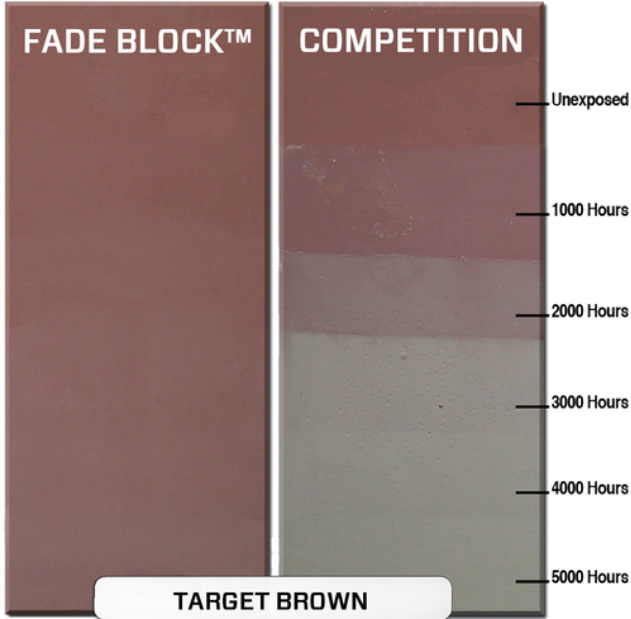


FUNCTIONAL COATINGS (CONT.)

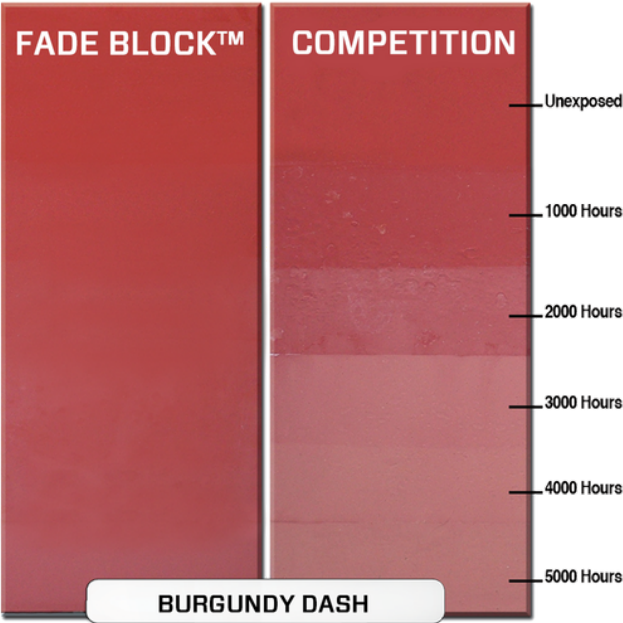


- **Aesthetic Appeal**
 - Design flexibility through the use of dark colors.
- **Resistance to Dirt Pick-Up**
- **Resistance to Mold/Mildew**
- **Prevents Moisture Penetration**
- **Reduced Environmental Impact**
 - Low (VOC) that meets the "green" building's requirements and rating systems.

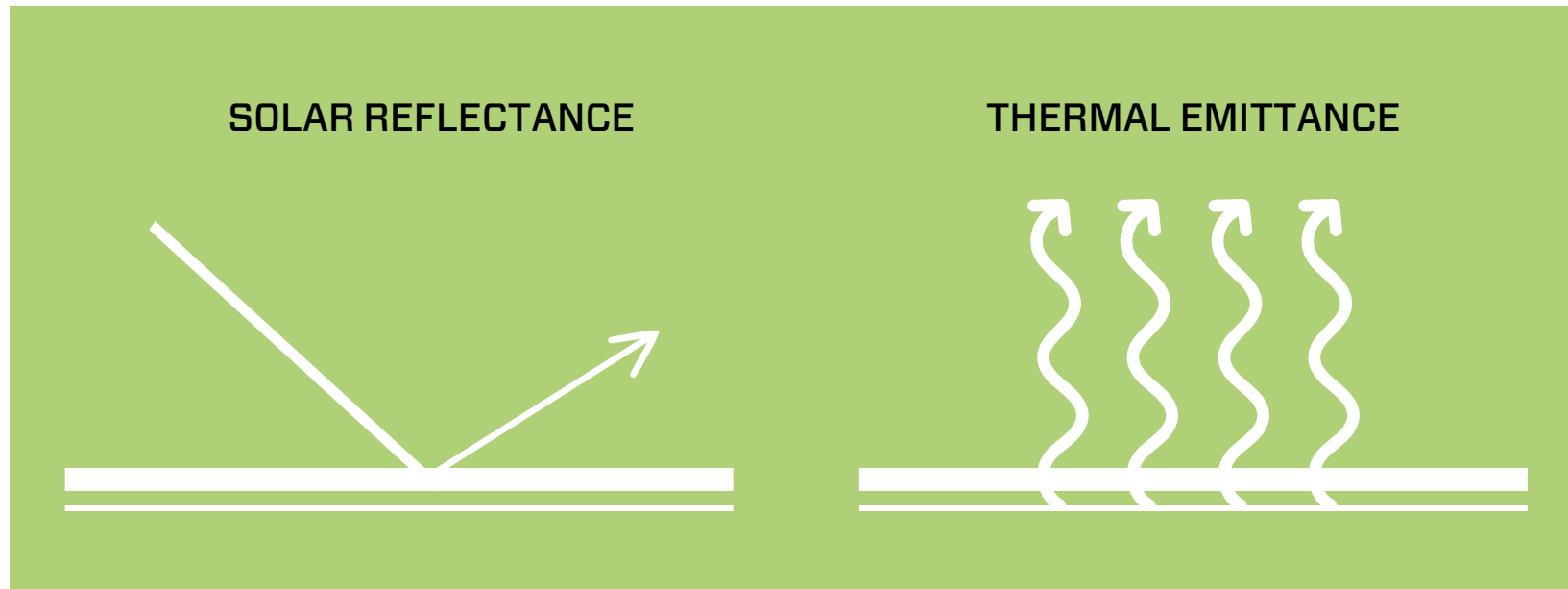
FUNCTION, AESTHETICS AND PERFORMANCE



8.5 Years
Florida
Exposure



SOLAR REFLECTIVE INDEX (SRI)



DEFINITION:

The Solar Reflective Index (SRI) includes:

- Total Solar Reflectance (TSR)
- Thermal Emittance into one value.
- SRI is used by many codes and standards.

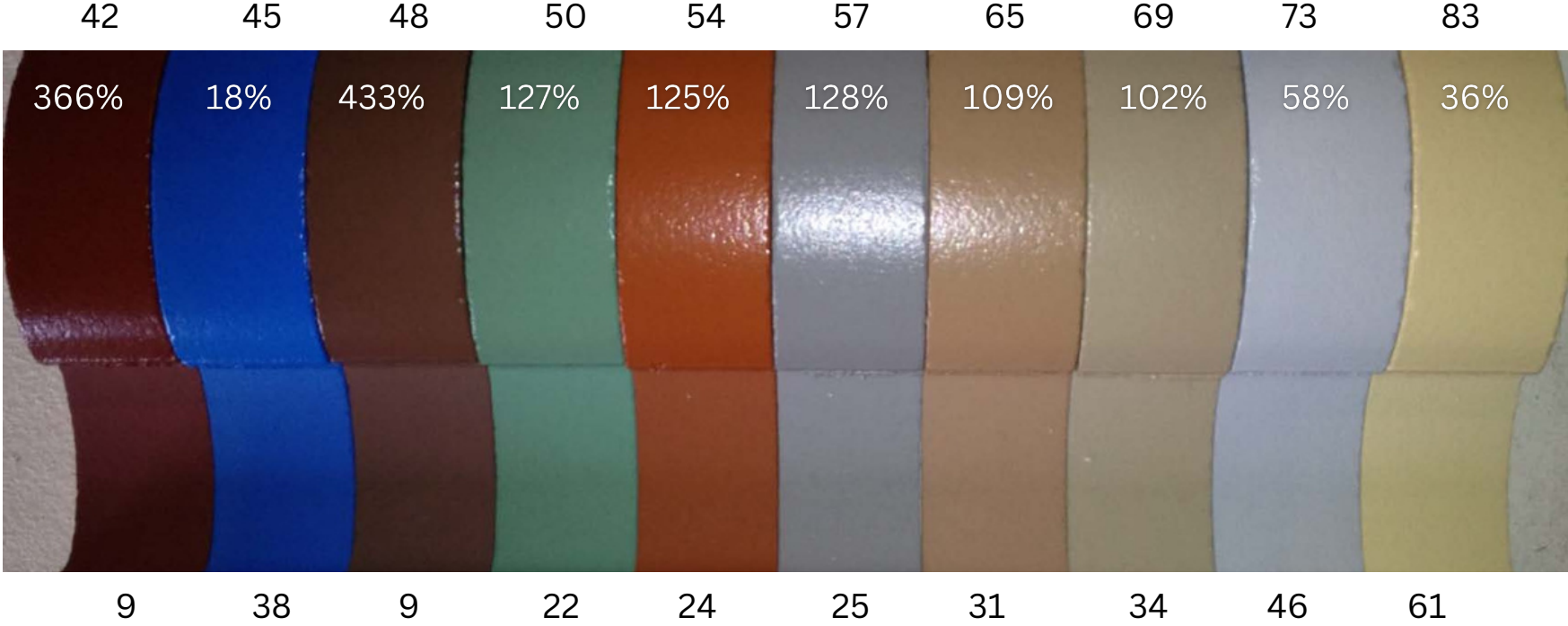
CALCULATING SRI:

Lawrence Berkeley National Laboratory

- Input the Total Solar Reflectance and thermal emittance values.
- www.coolcolors.lbl.gov

SOLAR REFLECTIVE INDEX

IR Heat-Reflective PVDF Coatings



Conventional Paint SRI

ESTIMATED INCREASE IN SRI TOTAL SOLAR REFLECTANCE

IR Heat-Reflective PVDF Coatings Color Family	Estimated Increase In Reflectivity vs. Traditional Paint
Light	> 30%
Medium	> 100%
Dark	> 200%

REDUCE SURFACE TEMPERATURES

IR Heat-Reflective PVDF Coatings can reduce surface temperatures by 50° to 70° Farenheit.

Metal
49.5%
Difference



Tile
76.5%
Difference



Heat lamp demonstrations show surface temperature reductions.

ESTIMATED REDUCTION IN PEAK COOLING LOAD*

IR Heat-Reflective PVDF Coatings Color Family	Estimated Reduction in Peak Cooling Load
Light	20-30% (KWh)
Medium	15-25% (KWh)
Dark	10-20% (KWh)

*Percentage of peak cooling load reductions are based on models generated from the "Roof Savings Calculator" Beta Release v 0.92 Oak Ridge and Lawrence Berkeley National Laboratories when compared to a non-cool roof. Cooling costs savings, percentage of peak cooling load, and surface temperature reductions will vary based on color chosen, geographical location, climate condition, and substrate type. In some climates, there may be a heating penalty.

INFRARED PHOTOGRAPHY

Infrared photography confirms:

- IR heat-reflective coatings provide greater heat reflectivity than traditional paints.
- IR heat-reflective coatings in this instance reduced the surface temperature of the wall by nearly 40 degrees.

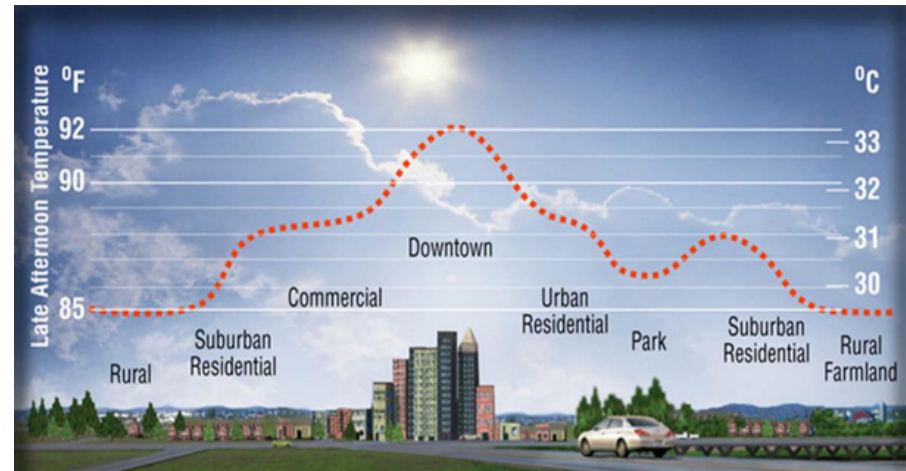


After image captured with Infrared Photography proves the heat-reflective coating's revolutionary qualities with a temperature difference of nearly 40° F.

*Percentage of cooling costs and surface temperature reductions will vary based on color chosen, geographical location, climate condition, and substrate type. In some climates there may be a heating penalty.

U.S. EPA HEAT ISLAND REDUCTION PROGRAM

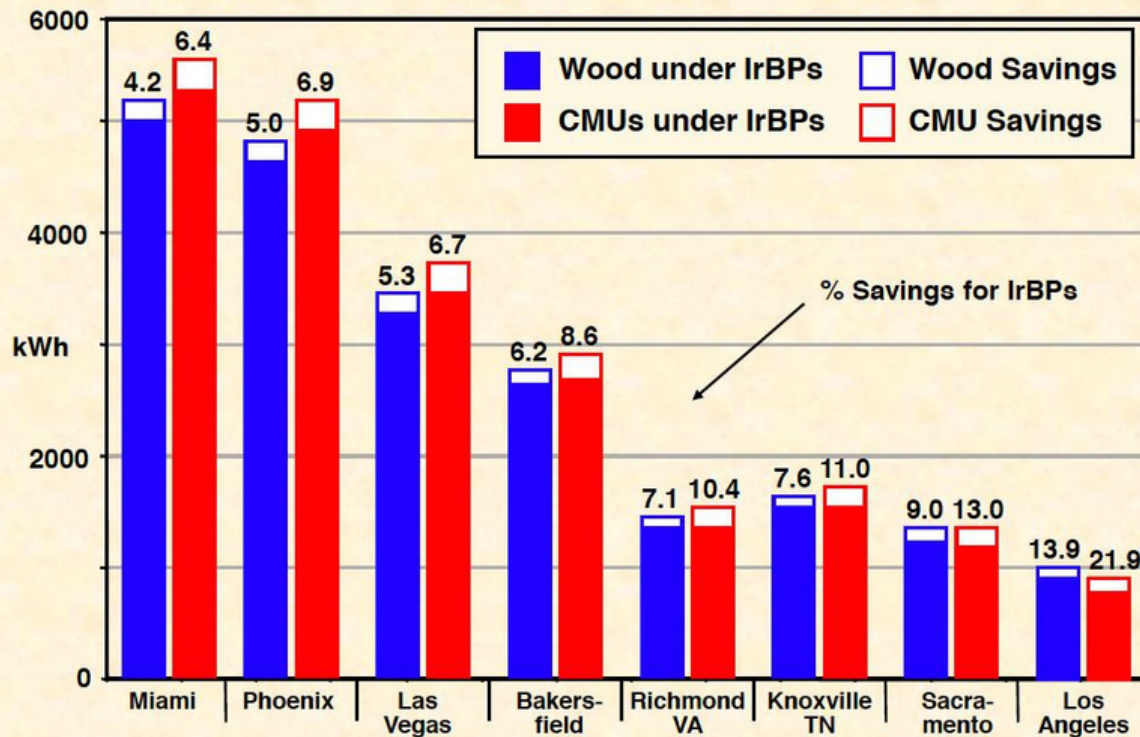
- EPA has funded studies
 - Lawrence Berkeley National Laboratory
 - Oak Ridge National Laboratory
 - Documented the Benefits of Reflective Coatings
- Championed for:
 - Wall Programs
 - Building Code Updates
 - Reduce the Heating of Urban Climates
- Cool Roof Rating Council (CRRC) has now developed a protocol for testing Reflective Wall Coatings.



The Urban Heat Island Effect describes cities being warmer than rural surroundings.

PROGRAM COOL WALL DOE SAVINGS CHART

- Cooling a 1100 ft² ranch house in various climates



OAK RIDGE NATIONAL LABORATORY
U. S. DEPARTMENT OF ENERGY

UT-BATTELLE

23

*(IrBPs) - Infrared Blocking Pigments

CRRC

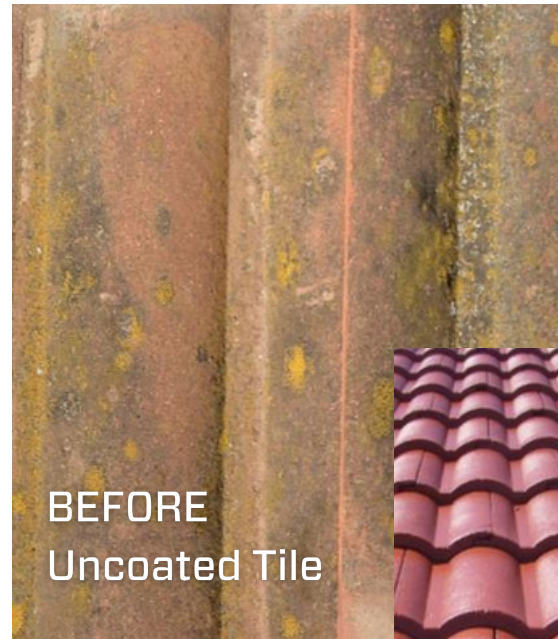
COOL ROOF RATING COUNCIL

- Created in 1998
- Evaluate and label the solar reflectance and thermal emittance of roofing products.
- The CRRC provides a directory of various approved roofing surface products.
- These rated products can be found under the manufacturer's name at www.coolroofs.org

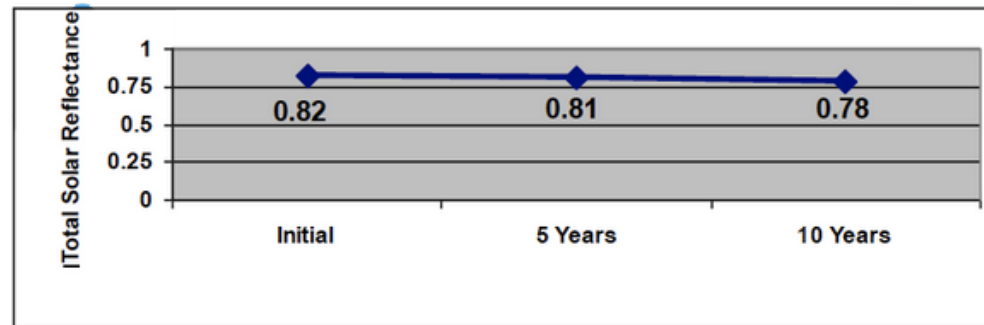


CRRC'S 3-YEAR CONFIRMATION OF PERFORMANCE

- Durability from weathering and continued coating reflectivity is required.
- IR Reflective PVDF coatings exhibit superior resistance to both dirt pickup mold and mildew growth.

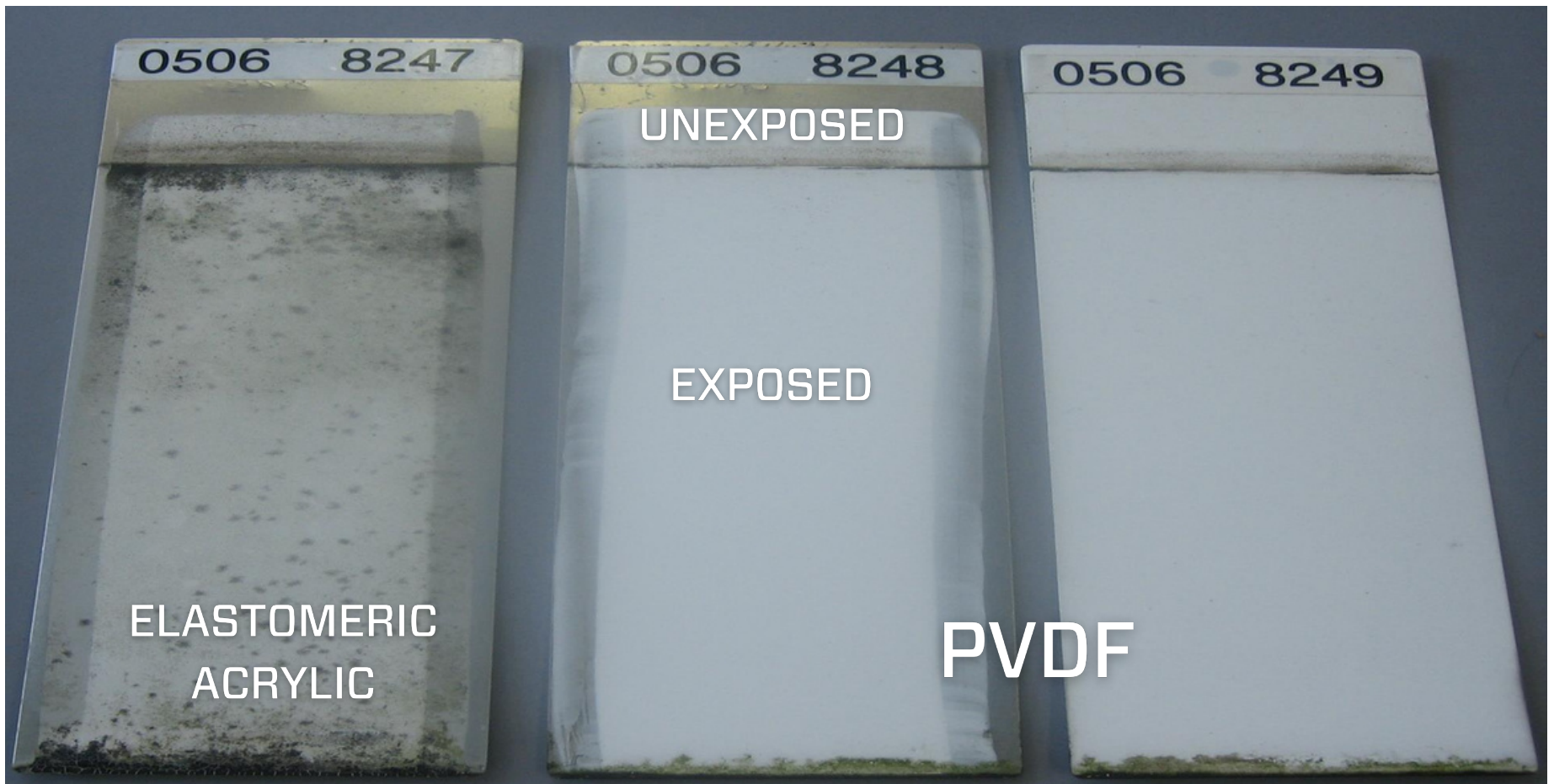


TSR REDUCTIONS



- Standard acrylic and elastomeric coatings experience
 - A reduction in TSR over time
 - Dirt and other contaminants build on the surface
 - Even in White
- Water-based IR Heat-Reflective PVDF Coatings
 - Resist Contaminants
 - Maintain a TSR of 0.78 after 10 years of exposure
- The TSR of typical acrylic and elastomeric white coatings
 - Reduced to 0.55 after 3 years

ALUMINUM PANELS WITH WHITE COATINGS IN FL WITH 10 YEARS WEATHERING

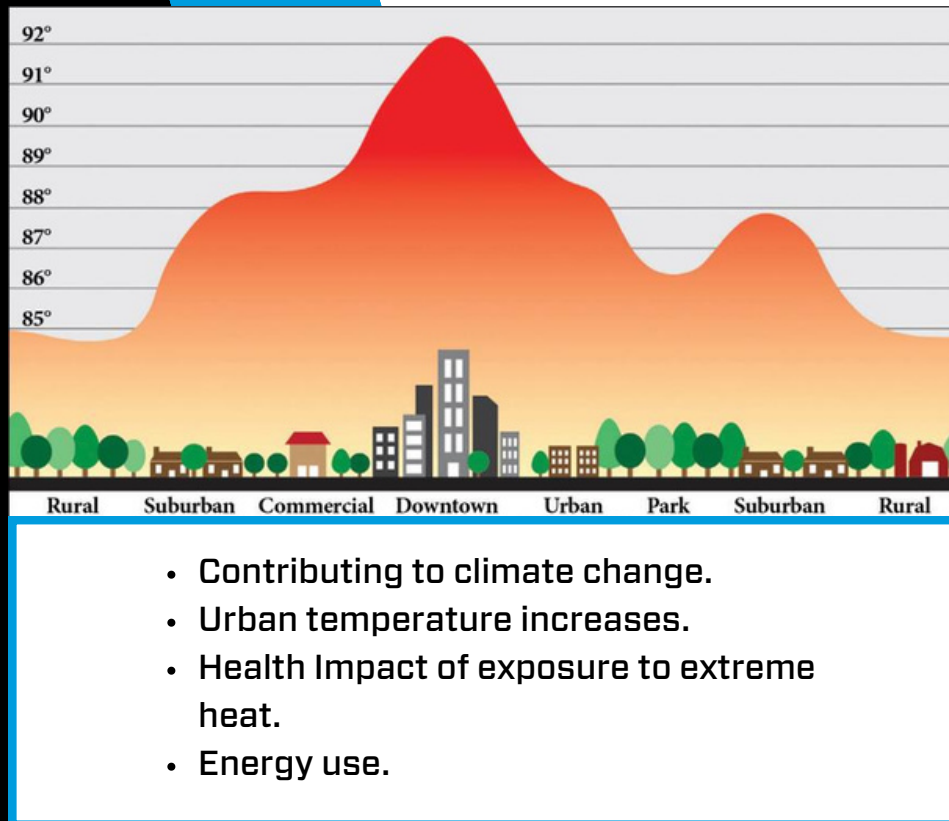


REFLECTIVE COLORS



Bright White TSR: .89 SRI: 113	Golden Wheat TSR: .73 SRI: 90	Island Sand TSR: .58 SRI: 69	Lark Green TSR: .44 SRI: 50
Florida White TSR: .83 SRI: 104	Chalk Beige TSR: .73 SRI: 90	Clay Tone TSR: .55 SRI: 65	Cliff Brown TSR: .42 SRI: 48
Tropic Mist TSR: .76 SRI: 95	Wheat Field TSR: .68 SRI: 83	Castle Gray TSR: .49 SRI: 57	Dynamic Blue TSR: .40 SRI: 45
Tidal Foam TSR: .75 SRI: 93	Flint Gray TSR: .61 SRI: 73	Terracotta TSR: .47 SRI: 54	Rich Red TSR: .38 SRI: 42

INDUSTRY AWARENESS



- **Cool Surfaces**
 - Becoming much more mainstream.
 - Cool Roofs, Cool Pavements, and Cool Walls.
 - Governing bodies and NGO environmental programs are requiring and/or recommending compliance.

COOL SURFACES: MANHATTAN PROJECT

The **Cool Surfaces Manhattan Project** seeks to bridge this gap by making our aging building infrastructure cooler and more heat resilient

Goal:

Dramatically increase the climate-appropriate deployment of cool surfaces across the U.S., with an emphasis on their application to disadvantaged communities.



The Cool Surfaces Manhattan Project:
Accelerating deployment of cool roofs
and walls across the United States



BUILDING TECHNOLOGIES OFFICE
(Sven Munnis, Marc Lafrance)



Cool Surfaces Manhattan Project Stakeholder Workshop
Online • 8 September 2022





40+ Leading NGOs From Key Sectors To Drive Smart Surface Adoption

<p><u>Architecture and Design</u></p>  <p>The American Institute of Architects</p> 	<p><u>Health</u></p>  <p>APHA AMERICAN PUBLIC HEALTH ASSOCIATION <i>For science. For action. For health.</i></p>	<p><u>Planning</u></p>  <p>American Planning Association</p>	<p><u>City Policy</u></p>  <p>NATIONAL LEAGUE OF CITIES CITIES STRONG TOGETHER</p>
<p><u>Downtowns</u></p>  <p>INSPIRED LEADERS SHAPING CITIES</p>	<p><u>Urban Data Analytics</u></p>  <p>WORLD RESOURCES INSTITUTE</p>  <p>THE TRUST FOR PUBLIC LAND</p>  <p>CARNEGIE MELLON UNIVERSITY PITTSBURGH PENNSYLVANIA 15260</p>  <p>Portland State UNIVERSITY College of Urban and Public Affairs</p>		<p><u>Equity/low-income</u></p>  <p>Habitat for Humanity</p>
<p><u>Energy</u></p>  <p>ACEEE American Council for an Energy-Efficient Economy</p>  <p>NASEO National Association of State Energy Officials</p>	<p><u>City & Urban Sustainability</u></p>  <p>USDN urban sustainability directors network</p>  <p>Global Cool Cities Alliance</p>  <p>EcoDistricts</p>		
<p><u>Urban Law</u></p>  <p>Columbia Law School SABIN CENTER FOR CLIMATE CHANGE LAW</p>	<p><u>In India</u></p>  <p>teri The Energy and Resources Institute</p>		

LOS ANGELES URBAN COOLING COLLABORATION

UNCOOL

Baking-Hot Temps!

Dark, Hot Roofs, Pavements & Walls

Higher Energy Demand + Waste Heat (AC)

Most Vulnerable to Heat: Outdoor Workers, Elderly, & Homeless

COOL

Lower Temps

Light Cool Roofs, Pavements & Walls

Trees Provide Shade + Save Energy

Vulnerable Populations Protected

WHAT'S EXTREME HEAT?

Extreme heat occurs when the temperature is much hotter and/or humid than average, which can lead to heat-related illnesses and deaths. Luckily, there are several way to stay safe and cool.

Urban Heat Islands
These are urban areas with little to no tree cover, where air temperatures can be as much as 22°F hotter than less developed regions.

Energy Demand
Urban heat islands raise energy demand, which leads to more air pollution and greenhouse gas emissions.

Who is at Risk?
Heat is the top cause of weather-related deaths every year. Groups most vulnerable to extreme heat are the elderly, outdoor workers, homeless and people with chronic illness. And don't forget about pets!

FOR MORE INFORMATION
www.treepeople.org/urbancooling
www.epa.gov/heat-islands
www.cdc.gov/disasters/extremeheat/index.html
www.lacounty.gov/heat/
www.ladwp.com/rebatesandprograms

Trees
Trees lower surface and air temperatures by providing shade and evaporative cooling. Shaded surfaces may be 20–45°F cooler than the peak temperatures of unshaded materials. LA City residents can get free trees by visiting www.cityplants.org

Cool Roofs, Pavements, and Walls
When a high solar reflectance—or albedo—is used on roofs, pavements, and walls, it can help stay up to 50–60°F cooler than conventional materials. LA Department of Water & Power customers can take advantage of the City's cool roof rebate.

Cooling Tips
Stay hydrated, wear light-colored, loose-fitting clothing, and stay in a cool indoor space. Check on elderly relatives and neighbors, especially those living alone. If you do not have air conditioning, find an air-conditioned public space near you by visiting www.lacounty.gov/heat.

LOS ANGELES URBAN °COOLING COLLABORATIVE

PROGRAMS/REQUIREMENTS



ASHRAE Standard 90.1-2019

Section 5.5.3.2. Applies only to Climate Zone 0 (outside of U.S.)

Modeling Requirements for Calculating Proposed and Baseline Building Performance. Applies to any Climate Zone. A building in Climate Zone 1 or higher (U.S.) can claim a small credit for the installation of a wall product and a thermal emittance that is higher than the baselines of 0.25 and 0.90, respectively.



California Green Building Standards Code

CALGreen currently undergoing 2022 revision. Currently contains a voluntary requirement for the installation of an exterior wall surfacing material with a minimum aged SRI of 25 for 75% of opaque wall areas.



Hawaii State Energy Conservation Code

The code has an insulation trade-off and compliance credit (1 point) for the installation of an exterior wall material with a visible light reflectance of 0.64 or higher on a newly-constructed "Tropical" home.



International Energy Conservation Code

The IECC Commercial Envelope Subcommittee approved the ASHRAE-sponsored proposal includes cool wall provisions in early April 2022. The proposal, submitted by ASHRAE, recommends incorporating the prescriptive requirements in [Addendum S of ASHRAE 90.1](#).

ENVIRONMENTAL PROGRAMS/REQUIREMENTS



International Green Construction Code (IgCC/ASHRAE 189.1)

Section 501.3.5.2 (5.3.5.2) of the IgCC

allows an exception for the above-grade exterior wall requirements if **75% or more of the opaque wall surfaces on the east and west have a minimum SRI of 29.**

ASHRAE is currently proposing to revise the "cool wall" requirements in the standard to align with ASHRAE Standard 90.1 (2022). A draft of the proposal changes is currently out for public review (see [Proposed Addendum j to Standard 189.1-2020](#)) with a comment deadline of October 24, 2021.



Standard for the Calculation and Labeling of the Energy Performance of Dwelling and Sleeping Units using an Energy Rating Index (ANSI/RESNET/ICC 301)

The Standard 301-2019 edition contains minimum solar absorptance emittance requirements for above-grade walls. [Sections 4.2.2 and 4.3.1](#) list the minimum requirements.



Green Building Assessment Protocol for Commercial Buildings (ANSI/GBI 01)

[Section 7.3.4.3](#) states that at least 75% of opaque wall surfaces (by area) on the east, west, and south shall have an SRI of 29 or greater.



LEED Pilot Credit v4.1

The credit is worth 1 possible point under the [Heat Island Reduction Sustainable Sites Credit for the Building Design and Construction \(BD+C\) rating system.](#)

To achieve the credit, at least 75% of the building's gross exterior wall area (including vertical fenestration) must be surfaced with a wall material that has a solar reflectance of at least 0.60 and thermal emittance of at least 0.75.

Earlier this year, the pilot credit was extended for an additional year (April 2023) to collect more user feedback. As of June 2022, five projects have registered

ENVIRONMENTAL PROGRAMS/REQUIREMENTS



Green Seal Standard for Paints, Coatings, Stains, and Sealers (GS-11-2021)

2.7.6 **Solar Reflectance.** The product shall meet the requirements in the following table, as determined by ASTM C1549 or ASTM E1918.

Characteristic	Performance Specification	
	Light Tones ^a	Dark Tones
Solar Reflectance	≥ 0.65	≥ 0.40

2.7.7 **Thermal Emittance.** The product shall have a thermal emittance of 75% or more, as determined by ASTM C1371.



LADWP Rebate

The Los Angeles Department of Water and Power (LADWP) is the largest municipal utility in the United States, serving our four million residents. It has been offering a cool roof rebate since 2010 and is interested in potentially incentivizing solar-reflective walls in its service territory.

NEXT STEPS: After the CRRC Wall Rating Program is launched, LADWP will assess the potential rebate based on products listed on the Rated Wall Products Directory to determine product availability and other important criteria for establishing an appropriate incentive level.



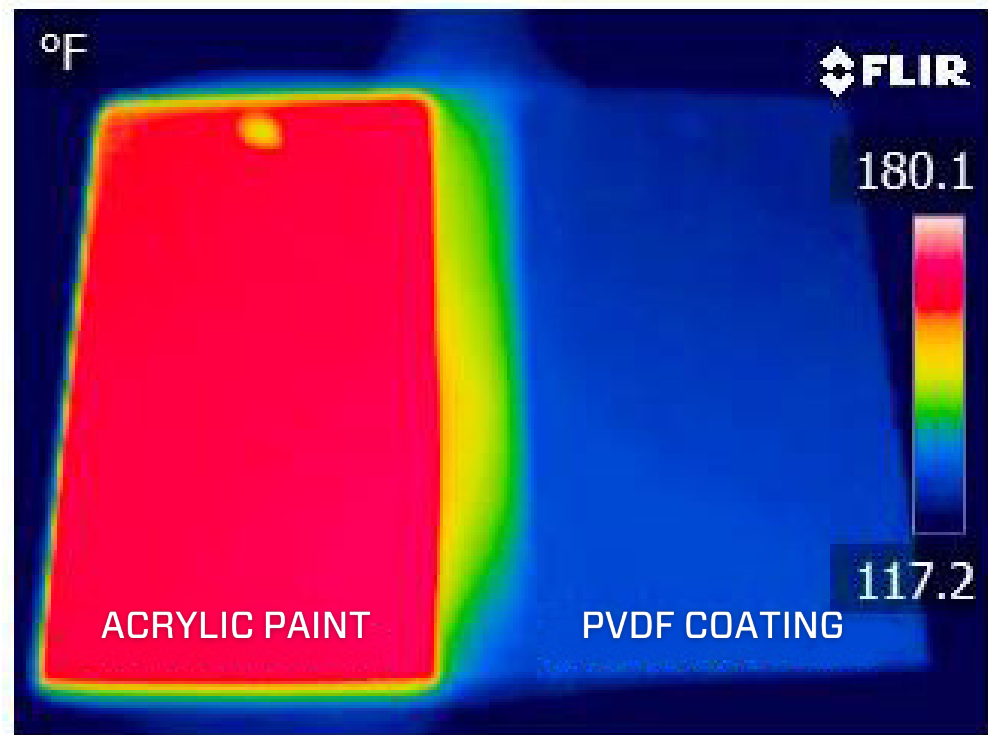
National Green Building Standard (ICC/ASHRAE 700)

Provides architects, builders, and developers with a flexible above-code program to design and construct homes and apartments that are sustainable, cost-effective, and geographically .

Section 701.1.6 allows an option to install an exterior wall material with a solar reflectance of 0.64.

RECAP

- IR heat-reflective coatings can be used on walls and roofs.
- Water-Based, low VOC, PVDF field-applied Coatings offer function and aesthetic value.
- Reduction in urban heat island effect, potential energy savings, and fade-resistance are inherent in cool wall and cool roof Products.
- Significant ongoing interest, and upcoming changes to environmental building programs. and requirements related to Cool Walls.



VIBRANCY...

COLOR MATTERS**



****Did you know there's an entire field of psychology dedicated to the link between colors and their effect on your mood?**



This concludes the American Institute of Architects Continuing Education Systems Program.



TEX-COTE®

KYNAR®



Cooling In All Colors NOT Just White!

If you have any questions regarding this module, contact:
CONTACT: TEX-COTE LLC Continuing Education Services

800-454-0340





THANK YOU

FOR JOINING US TODAY

Any Questions?