Infrared(IR) Heat Reflective
Exterior Wall Coating Systems

An Update for Architects

This program is registered with the AIA/CES for continuing professional education. As such, it does not include content that may be deemed or construed to be an approval or endorsement by the AIA of any material of distribution or dealing in any material or product. Questions related to specific materials, methods and services will be addressed at the conclusion of this presentation.

TEX·COTE®
TEXTURED COATINGS OF AMERICA, INC.

CONTINUING EDUCATION AIA

Infrared(IR) Heat Reflective
Exterior Wall Coating Systems

Objectives

Overview
- What It Can Do
- IR Heat Reflective Coating Features
- Development of IR Heat Reflective Coatings
- Origins of IR Heat Reflective Coatings

Technology and Thermal Properties
- Dark Vs. Light Colors
- Materials and Heat Absorption
- Reflectivity and Emissivity
- Total Solar Reflectance
- Total Solar Absorption
- The Light Spectrum
- Infrared Photography

Benefits
- Green Building initiatives
- Aesthetic and Style Choices
- Energy Savings
- Superior Fade Resistance
- Durability
- Environmental Benefits

Proof of Performance
- Field Test Results
- Description of System Tests
- Reflectivity Results
- Energy Savings Results

LEED® Credit
- LEED® Overview
- LEED® Programs Available
- How It Works
- How IR Heat Reflective Coatings Contribute

Welcome

Infrared (IR) heat reflective coating systems for the exterior walls of a structure are an important technological breakthrough, offering new advantages and opportunities in both residential and commercial applications. This program will provide an overview of this innovative coating technology, as well as an update on key code requirements and energy-saving standards.

What It Can Do

Compared to paint and non-reflective coatings, IR heat reflective coatings can…

- Greatly reduce the amount of heat that is absorbed and retained by a building's exterior wall surfaces.
- Lower exterior wall temperatures by as much as 40 degrees when compared to non-reflective coatings and paints in many colors.
- Provide a "passive" cooling technique that yields energy savings and carbon reductions.
- Reduce the energy required to cool a building by as much as 21.9%. (Percentage of savings are based on DOE study which showed savings ranging from 4.2 – 21.9%)*
- Reduce the urban heat island effect, which contributes to urban smog and causes increased demands on power plants.
- Reduce building fatigue by reducing expansion and contraction due to heating and cooling cycles.
- Help prevent colors from fading due to UV light exposure.

*Percentage of cooling costs and temperature reductions will vary based on color chosen, geographical location, climate condition, and substrate type. In some climates there may be a heating penalty. For more information, visit www.texcote.com

IR Heat Reflective Coating Features

- ***Aesthetic Appeal:*** Offers greater design flexibility through use of dark colors.
- ***Energy Savings:*** Significantly reduces exterior wall temperatures while helping reduce energy consumption.
- ***Durability:*** Prevents moisture penetration, reduces the effects of building fatigue caused by expansion and contraction and effectively extends the life cycle of existing building stock.
- ***Fade Resistance:*** Provides superior resistance to fading as compared to conventional paints – even in dark colors.
- ***Reduced Environmental Impact:*** Exterior coating is formulated with Low Volatile Organic Compounds (VOC) that meet requirements of "green" building rating systems such as LEED® even as an exterior applied coating.

Development of IR Heat Reflective Coatings

Advanced IR coatings technology is unique to other technologies of the past. These coatings are…

- Designed to change the infrared or invisible portion of the light spectrum, helping to reflect heat. Therefore reducing heat absorption, even in dark colors.
- Designed to diffuse heat evenly across the wall surface.
- Tested over a nearly two-year period by the Department of Energy (Oak Ridge National Laboratory) and proven to lower energy use.
- Works without the use of ceramic “spheres” or other non-proven technologies.

Origins of IR Heat Reflective Coatings

Origins of IR heat reflective pigments …

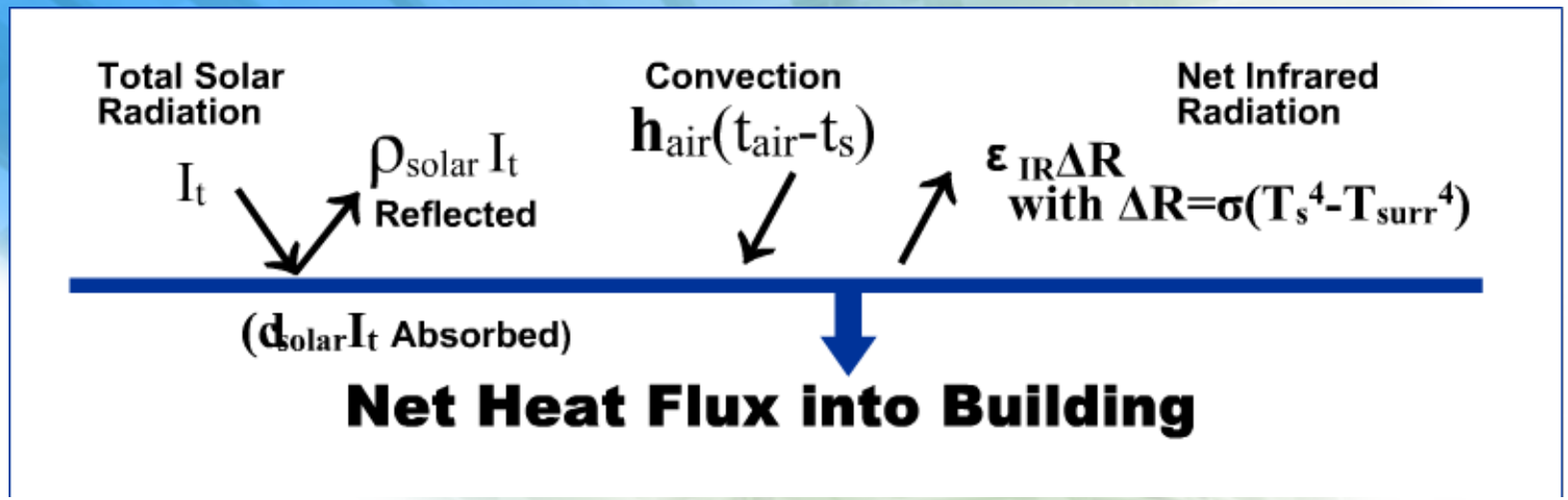
- U.S. Military STEALTH program – diffuses heat to eliminate radar detection.
- "Cool roof" metal roofing also contain similar heat diffusing pigment technology to prevent heat absorption and lower interior room temperatures.

Dark Colors Vs. Light Colors

Anyone who has ever owned a dark colored car in the summertime knows that dark colors absorb more heat from the sun than light colors. That's because a color like black reflects less of the sun's energy than the color white. In fact, black only reflects about 5% of the sun's energy.

IR heat reflective coatings allow even dark colors to act like light colors, reflecting much of the sun's radiant energy… an important advantage to designers, builders and building owners concerned about rising energy costs and global warming.

Materials and Heat Absorption

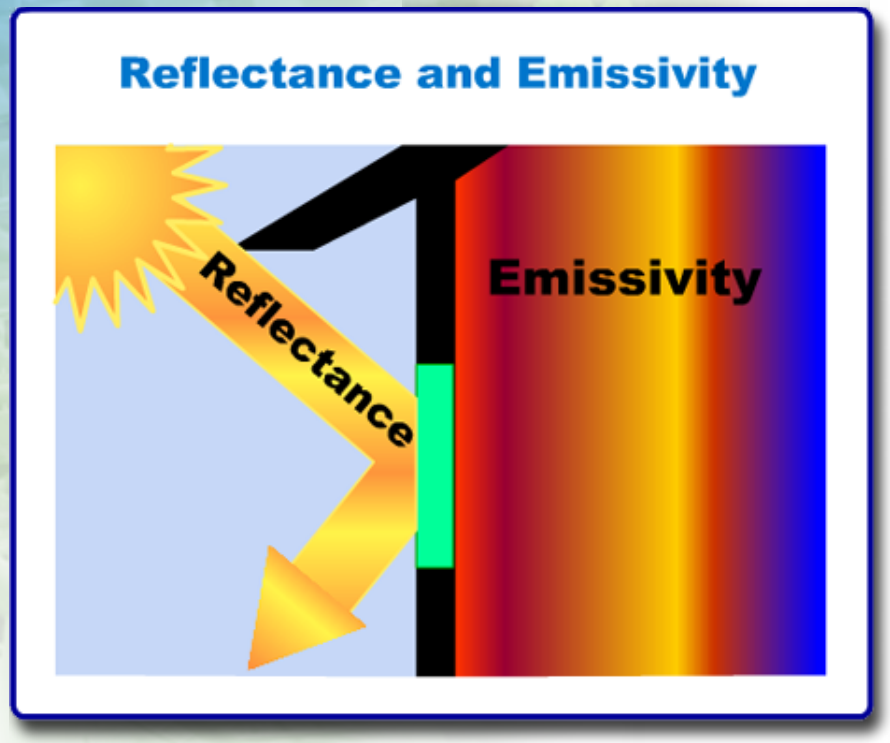


On a hot day, exterior walls can absorb as much as 90% of the radiant energy. Even white walls can absorb significant solar radiation. The wall's absorption of radiant energy makes the inside of the structure hotter and creates greater demand on HVAC systems, thus contributing to carbon emissions.

Tests show that advanced infrared heat reflective coatings are on average 100% more reflective than ordinary paint, even in darker colors. When less heat enters a structure, less energy is required to cool its interior.

Reflectivity and Emissivity

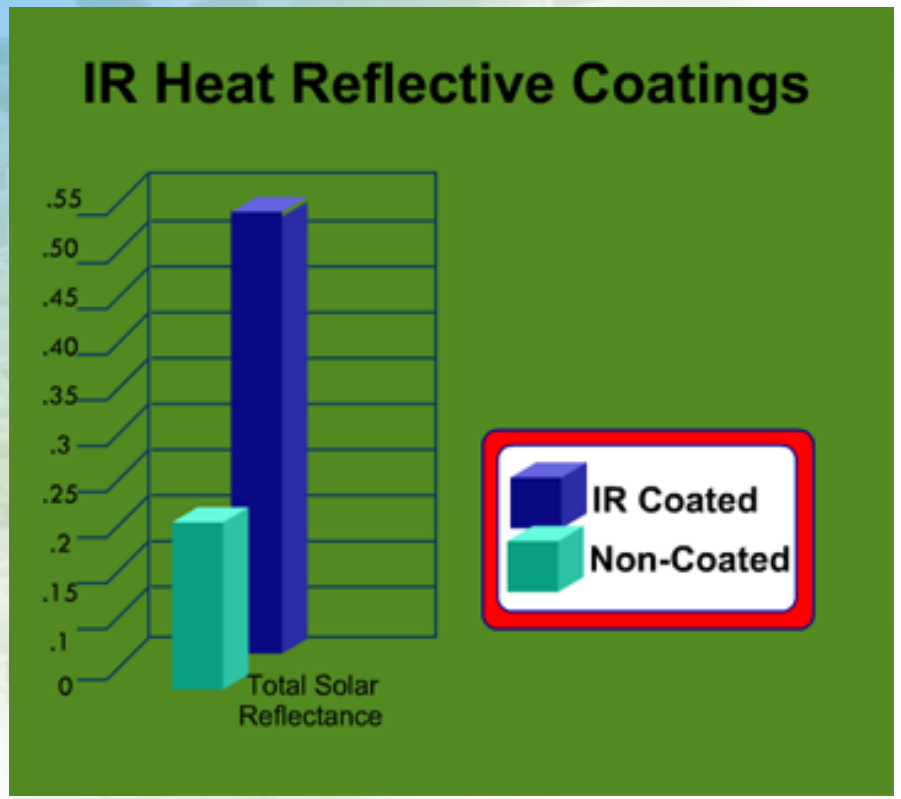
There are two considerations when looking at the energy efficiency of a surface. They include reflectivity and emissivity. Reflectivity is a measure of how well a material rejects solar energy. Emissivity refers to the degree that the material holds that energy.



Total Solar Reflectance

Definition:
The ratio of total solar radiation which is reflected outward by the surface to the amount of total solar radiation falling on the surface.

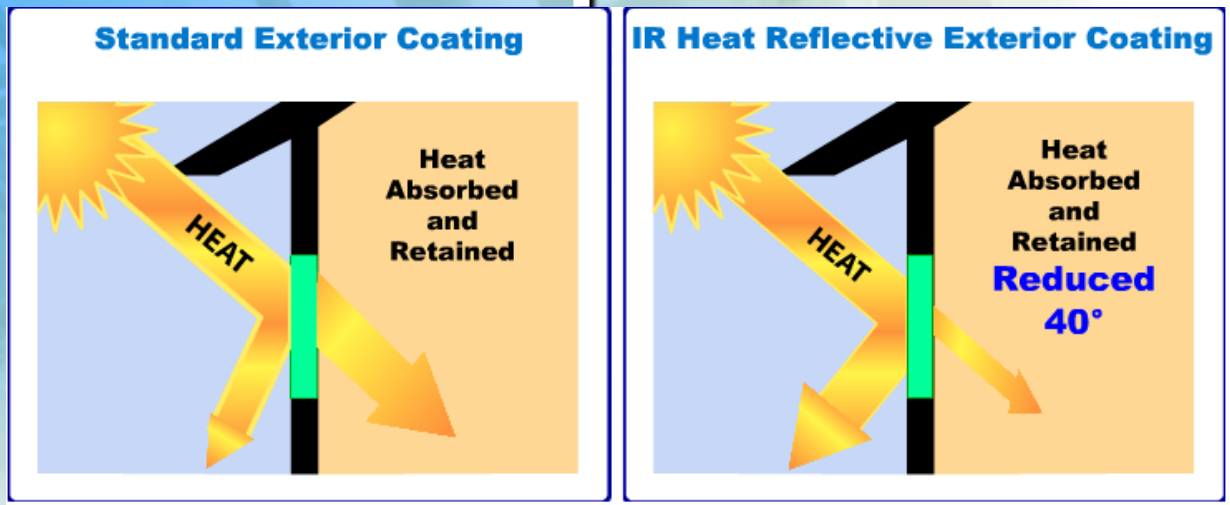
Except in white, traditional paint colors provide limited heat reflective properties. IR heat reflective coatings enable high reflectance, even in dark colors. In fact, IR heat reflective coatings are on average 100% more reflective than traditional paints and coatings in the same color.



Total Solar Absorption

Definition:

The ratio of the amount of total solar radiation absorbed by the surface to the amount of total solar energy falling on the surface. Solar absorption is that portion of total solar radiation neither transmitted nor reflected.



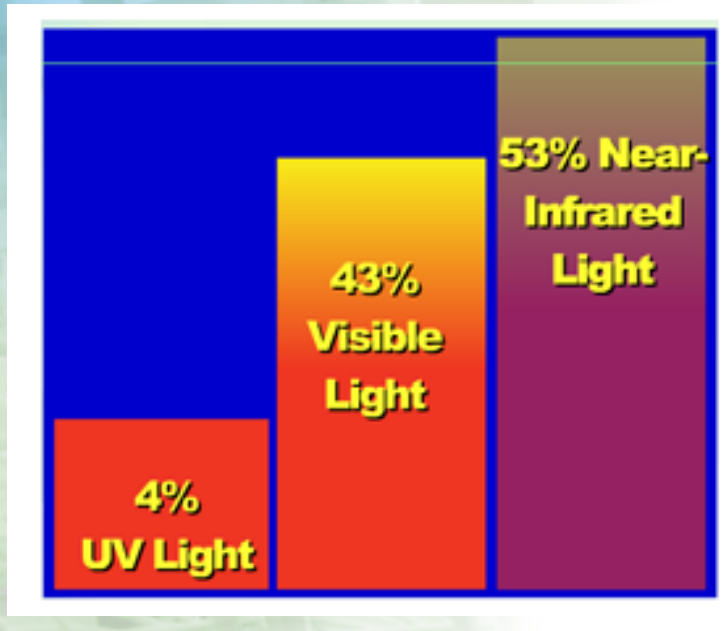
- Because more solar radiation is reflected by IR heat reflective coatings, its emittance value is higher. When less energy is absorbed, the amount of heat entering the interior of a structure is reduced. This reduction in heat means a reduction in the use of HVAC systems to cool the interior.

- According to the Department of Energy, IR heat reflective coatings can save up to 21.9% (Percentage of savings are based on DOE study which showed savings ranging from 4.2 – 21.9%)* of cooling energy depending upon location, substrate and color.

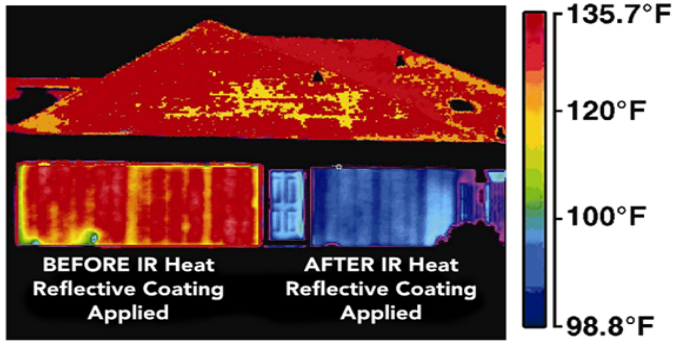
*Percentage of cooling costs and temperature reductions will vary based on color chosen, geographical location, climate condition, and substrate type. In some climates there may be a heating penalty. For more information, visit www.texcote.com

The Light Spectrum

Much of the light spectrum consists of visible light – the light we can actually see. But a large portion of it is invisible to the eye – the near infrared light. IR heat reflective coatings reduce the effect of this largest portion of the light spectrum. By making this portion of the light spectrum highly reflective, darker colors can perform much like lighter colors.



Infrared Photography



After image captured with infrared photography proves the heat reflective coating's revolutionary qualities with a temperature difference of nearly 40°F".

Infrared photography proves that IR heat reflective coatings provide greater heat reflectivity than traditional paints. In fact, IR heat reflective coatings can reduce a wall's surface temperature by nearly 40 degrees when compared to traditional paints in the same color.

Green Building Initiatives

Two events are converging to create the most significant crisis of modern time— the warming of the earth's atmosphere by burning fossil fuels, and the rapid depletion of global petroleum and natural gas reserves. Sustainable design and green building initiatives have gained recent attention because of these events.

Some of the building-related initiatives designed to help reduce the impact of these events can be found by clicking the links below:

- EPA's High Performance Building programs
- Collaborative for High Performance Schools (http://www.chps.net)
- Sustainable Buildings Industry Council's (http://www.psic.org) Building Green Guidelines
- And these are only a few of the programs.
- US Green Building Council's LEED® rating system (www.usgbc.org)

IR heat reflective coatings can play an important role in helping reduce the amount of fossil fuels used to cool homes and buildings, and can provide other benefits as well.

Aesthetic and Style Choices

IR heat reflective coatings offer a wide range of design choices:

- Broad range of heat reflective colors including medium and dark colors.
- Wide selection of trim colors
- Choice of textured and smooth finishes.

Energy Savings

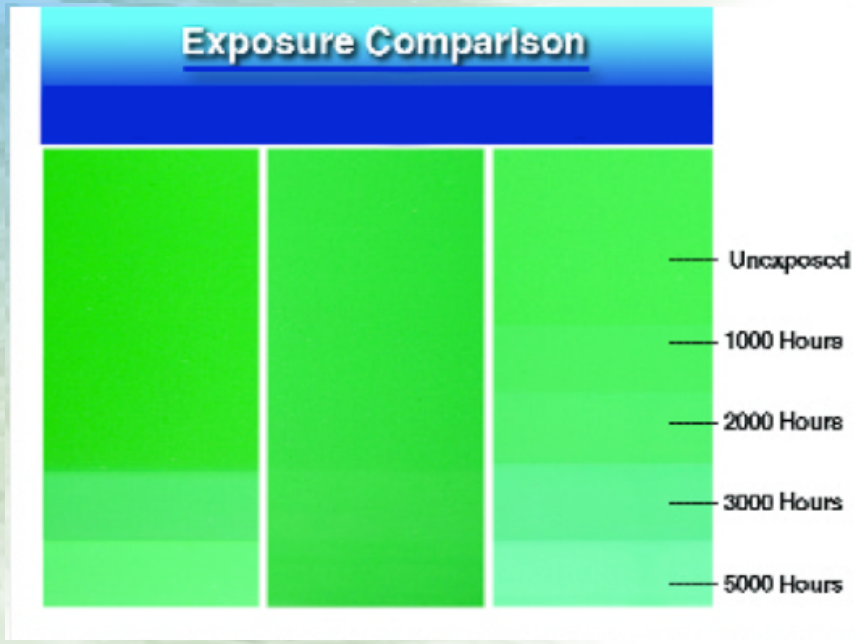
Depending on the climate zone, substrate & other conditions in which a building is located, heat reflective coatings can make a significant contribution to reduce energy use & lower cooling costs. Heat reflective coatings can:

- Lower exterior wall temperatures by as much as 40 degrees when compared to traditional paints in many colors.
- Reduce energy costs related to cooling by up to 21.9%. (Percentage of savings are based on DOE study which showed savings ranging from 4.2 – 21.9%)*
- Create less heat buildup around the building (heat island effect) that can raise interior temperatures.

*Percentage of cooling costs and temperature reductions will vary based on color chosen, geographical location, climate condition, and substrate type. In some climates there may be a heating penalty. For more information, visit www.texcote.com

Superior Fade Resistance

The reflective qualities of these coatings lower surface temperatures and reduce fading even in darker colors. This fade resistance feature provides longer life cycle performance and is ideal for project extended life strategies.



IR Heat Reflective coatings undergo extensive testing for fade resistance. Every 1000 hours of testing is equivalent to approximately one and a half years of exposure 5000 hours is equivalent to 8-10 years.

Durability

Most building materials, including wall surfaces and substrates, are prone to expansion and contraction due to natural heating and cooling. Excessive heat absorption can exacerbate this natural expansion and contraction, placing stress on the substrate and causing building fatigue.

Because of the high reflectance properties of these coatings, the amount of heat absorbed by the substrate is greatly reduced. The result:

- Less expansion and contraction
- Less stress placed on the substrate
- Increased life cycle performance

And since heat reflective coatings don't deteriorate like paint, they can cost much less to maintain over the life of the building.

Environmental Benefits

Energy Savings:

- Heat reflective coatings reduce the amount of heat entering the interior space of a building, which means less energy is required for cooling.

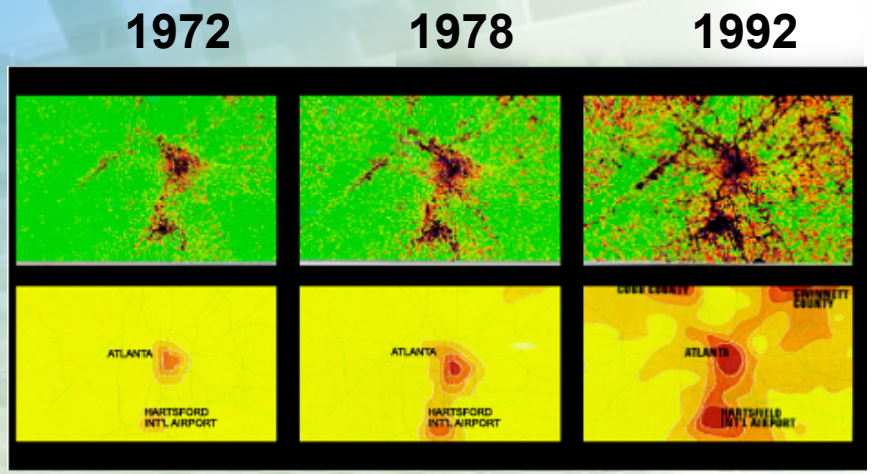
Conservation of Resources:

- No impact on landfill is realized.

Air Quality:

- The highly reflective coating systems reduce the urban heat island effect. The result is improved air quality and lower levels of urban smog – as well as decreased demand on electrical utilities' power plants, most of which burn fossil fuels to generate electricity.

- This chart shows how the heat island effect has grown within the city of Atlanta since 1972.



This image, captured with both satellite and thermal imaging, shows the increase of heat around the city of Atlanta over 21 years. IR heat reflective coatings can help change the urban footprint by reducing the heat island effect commonly found in urban areas.

Description of System Tests

Oak Ridge National Laboratory monitored energy savings in two residential homes. One was located in Phoenix, AZ and the other in Jacksonville, FL. The substrate on the home in Arizona was stucco. The substrate on the home in Florida was wood. Heat sensors were attached on both the exteriors and interiors of the homes. The reflective properties and thermal performance between paint and heat reflective coatings were studied.

In addition, a test site was set up at the Oak Ridge National Laboratory where a stucco test panel was studied.

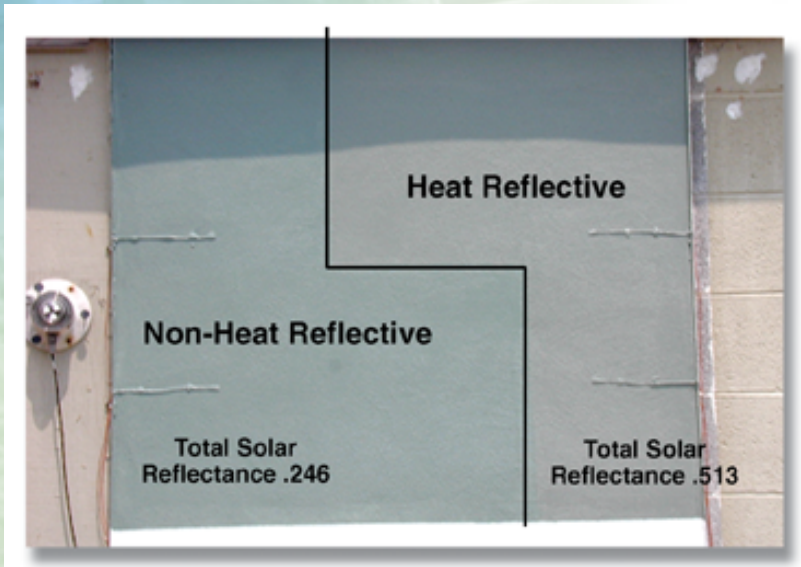

Phoenix, AZ


Jacksonville, FL

Reflectivity Results

Results of the test wall from each site showed that on average heat reflective coatings were 100% more reflective than non-reflective systems.

Wood Substrate	Reflectivity results
IR Reflective coating	0.40
Non-reflective	0.24
Stucco Substrate	**Reflectivity results**
IR Reflective coating	0.50
Non-reflective	0.24



Independent testing also confirmed similar results for “Big Box” structures.

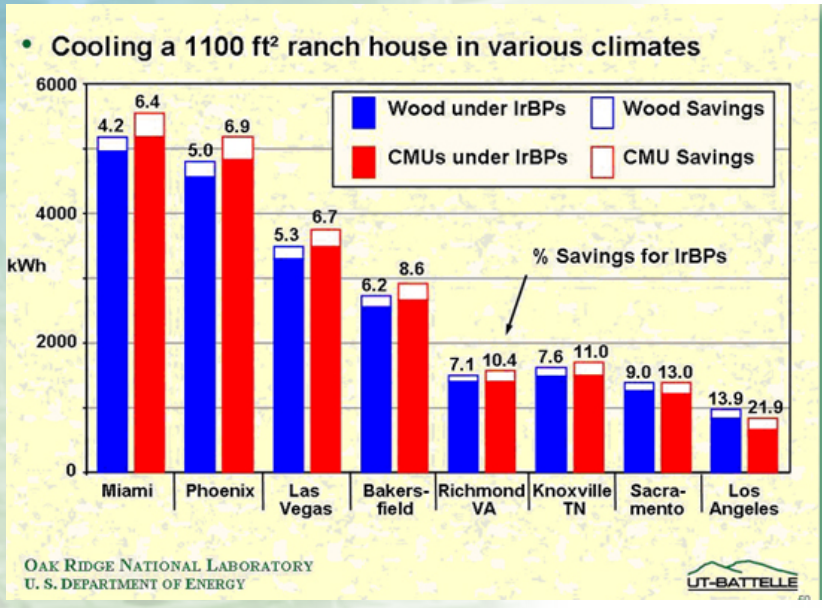
Energy Savings Results

Energy savings were calculated from results obtained through the Department of Energy study. The energy savings were based on an 1100 sq. ft. house.

The results show that heat reflective coatings:

- result in lower energy use than conventional paints
- reduce carbon emissions into the atmosphere
- save up to 21.9% on cooling costs (percentage of savings are based on DOE study which showed savings ranging from 4.2 – 21.9%)*

  An independent study confirmed similar results on "Big Box" structures. (Percentage of savings are based on the Architectural Energy Corporation study which showed savings ranging from 3.8 – 8.3%)*.



**Percentage of cooling costs and surface temperature reductions will vary based on color chosen, geographical location, climate conditions, and substrate type. In some climates there may be a heating penalty. For more information visit www.texcote.com*

LEED® – Overview

LEED® (Leadership in Energy & Environmental Design) is a voluntary, consensus-based "green building" specification introduced by the US Green Building Council in 2000. In recent years, LEED® qualification has gained increasing popularity as a required standard for new construction contracts for government buildings.

January 2006 White House Summit on Federal Sustainable Buildings:

- LEED® memorandum of understanding signed by 17 federal agencies, representing…
- 75% of government's 500,000 buildings
- 3.4 billion square feet of space

Recent Uses of LEED ®:

- Department of Defense: 254 of 867 projects in 2005
- General Services Administration: LEED ® "Silver" qualification required for all new construction
- NASA: LEED ® "Silver" required for all projects over $500,000
- Department of the Interior: LEED ® "Silver" required for Department of Indian Affairs school projects

Programs Available

IR heat reflective coatings can help LEED projects qualify for various credits. These products can be specified individually or together as part of an overall "green" building system.

The LEED® programs currently available include:

- LEED®-NC: New commercial construction and major renovation projects
- LEED®-EB: Existing building operations
- LEED®-CI: Commercial interiors projects
- LEED®-CS: Core and shell projects
- LEED®-H: Homes
- LEED®-ND: Neighborhood development
- LEED® Application Guides: Retail (currently in pilot), Multiple Buildings/Campuses, Schools, Healthcare, Laboratories, Lodging

How It Works

Platinum Level 80 points & above
Gold Level 60 - 79 points
Silver Level 50 - 59 points
Certified Level 40 - 49 points

LEED® provides a complete framework for assessing building performance and meeting sustainability goals. Based on a system of prerequisites and credits, LEED® projects earn points during the certification process and then are awarded one of the four certification levels: Certified, Silver, Gold, and Platinum.

IR Heat Reflective Coatings Contribute

IR heat reflective coatings may contribute to as many as three of the six LEED® categories including:

Category	Credit	Points
Sustainable Sites	Credit 7.1: Heat Island Effect: Non-roof	1
Materials and Resource	Credit 4.1 = Recycled Content: 10% Post-consumer	1
Innovation and Design Process	Credit 1.1, 1.2, 1.3,1.4: Innovation in Design	1-4

Infrared(IR) Heat Reflective
Exterior Wall Coating Systems

Thank You For Your Time!

**Click Here to Take a Short Quiz on IR Heat-Reflective Exterior Wall Coating Systems. (Required for AIA LU Credit Registration)

Questions?

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

TEX·COTE®
TEXTURED COATINGS OF AMERICA, INC.

If you have any questions regarding this module contact:

Textured Coatings of America:
Continuing Education Services **800-454-0340**

www.texcote.com