Harnessing the Power of Cool Exterior Walls to Enhance Heat Resilience

NIBS Educational Webinar
August 5, 2025

1 AIA LU | 0.1 ICC CEU

CRRC
COOL ROOF
RATING COUNCIL ®

Learning Objectives

1. Explain how cool exterior walls can reduce a building's solar heat gain and lower temperatures of buildings and surrounding communities.
2. Describe the surface radiative properties solar reflectance and thermal emittance, which influence the coolness of building exteriors.
3. Estimate building-specific cool exterior wall HVAC energy cost savings using Lawrence Berkeley National Laboratory's Cool Surface Savings Explorer and local electricity cost data.
4. Compare the radiative properties of exterior wall materials and understand which materials will meet project requirements using a third-party database of rated products.

Speaker Introduction

Audrey McGarrell
Communications Manager
Cool Roof Rating Council

CRRC is a 501(c)(3) nonprofit organization

Our mission is to bring objective, scientific information related to cool surfaces to critical discussions and informed decisions about the impacts of heat islands, extreme heat, and energy use in the built environment.

Ratings of the radiative properties of roofing and exterior wall products

Research to support scientific rigor of rating programs

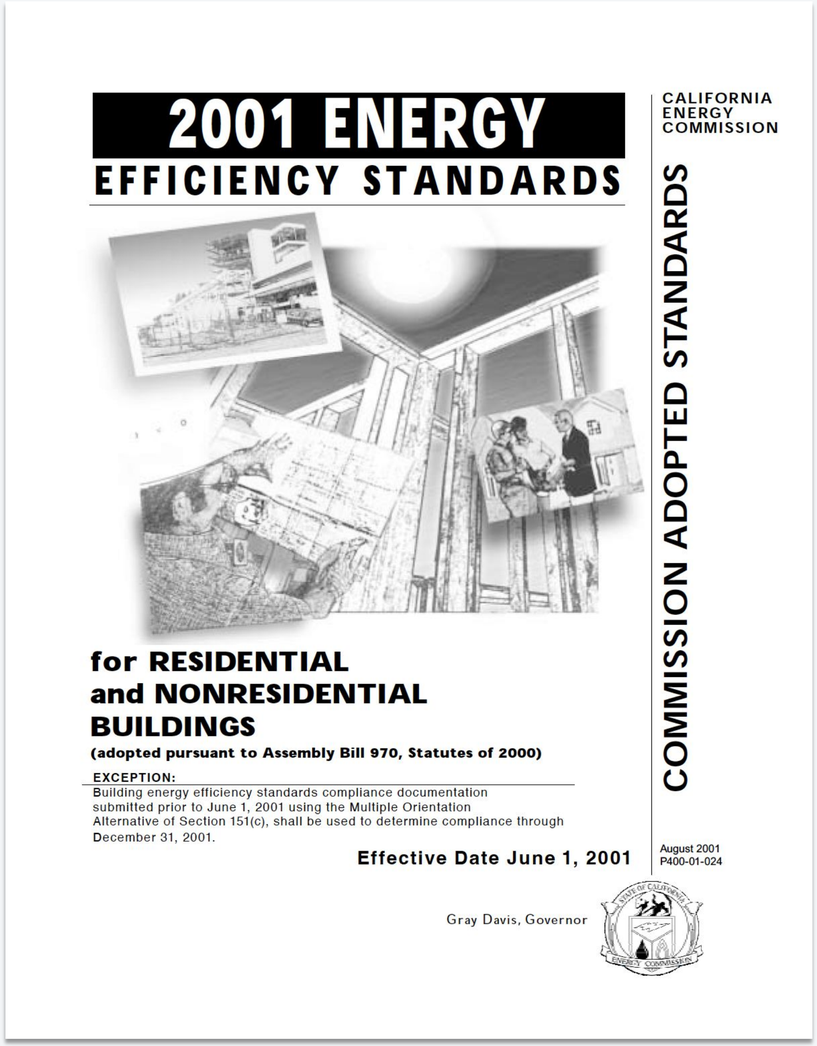
Education to raise awareness of the impacts of cool surfaces

CRRC History

- Established in 1998
- Collaboration between industry, government, utilities, national labs, and nonprofit organizations
- Third-party ratings for California's cool roof code provisions in Title 24, Parts 6 & 11
- Scope expansion

  Walls in 2019

  Pavements in 2024



The Heat Problem

Temperatures Rising: NASA Confirms 2024 Warmest Year on Record

[NASA]

2024 Brought the World to a Dangerous Warming Threshold. Now What?

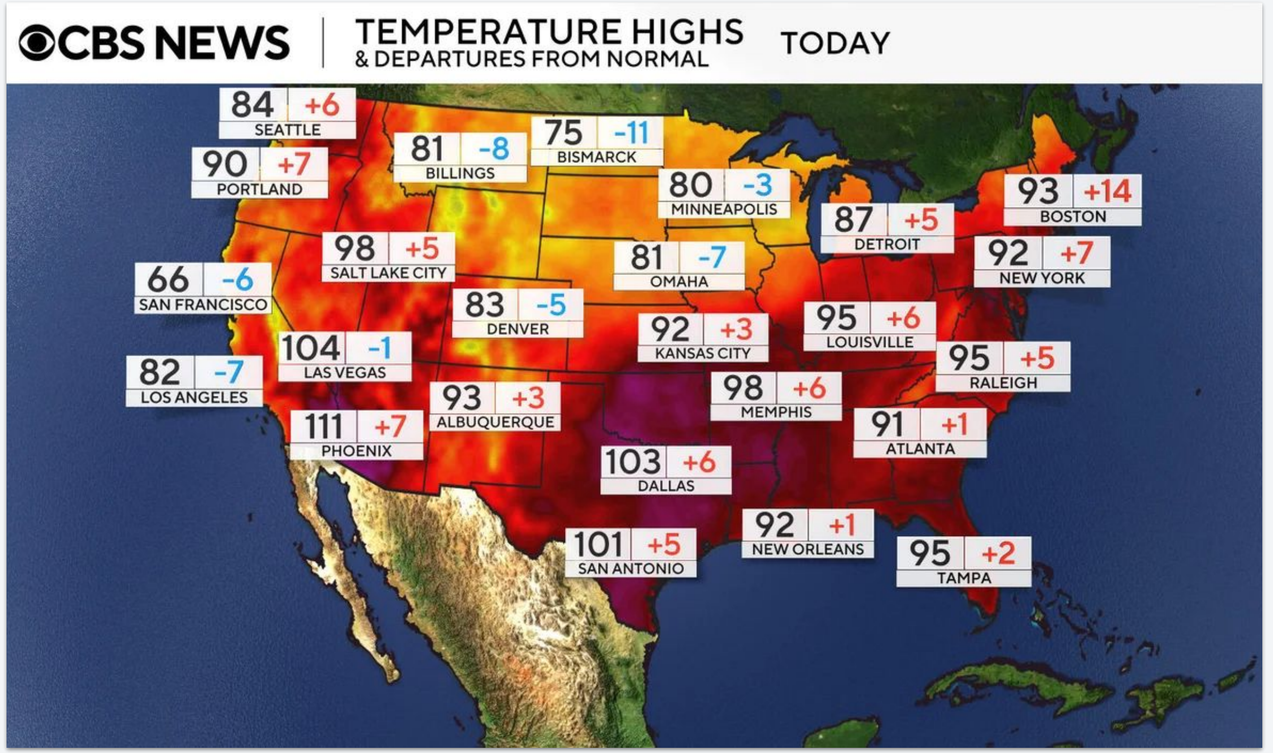
Global temperatures last year crept past a key goal, raising questions about how much nations can stop the planet from heating up further.

[New York Times]

Late July's oppressive heat forecast isn't normal

A punishing heat wave will bring hot temperatures to eastern US and linger for several days, underscoring how climate change heats things up.

[USA Today]



[CBS News - July 30, 2025]

Summer nights are getting warmer due to climate change, sparking health concerns

Extreme heat is the leading weather-related killer in the United States.

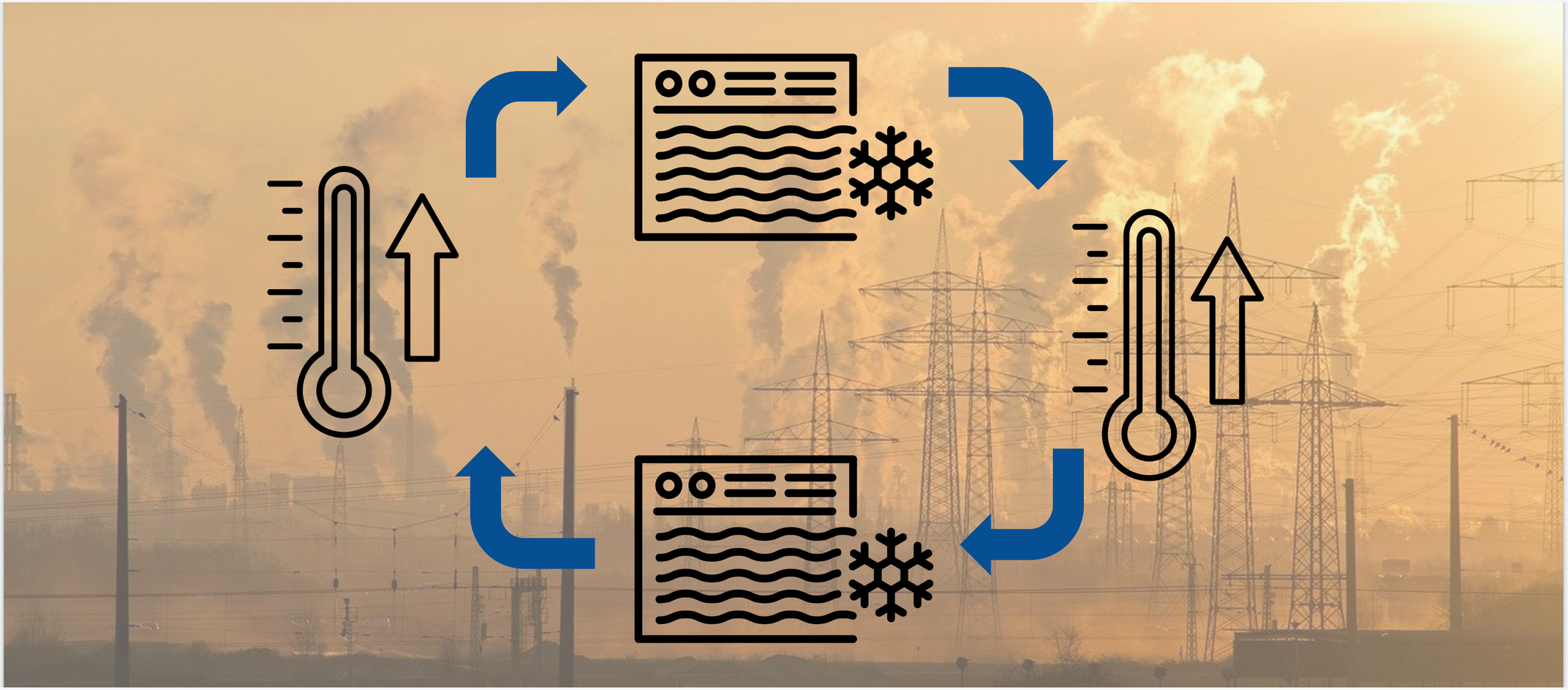
[ABC News]

Impacts of heat are wide reaching

Image Credit: iStock

Heat also impacts energy use and air quality

A/C use creates a positive feedback



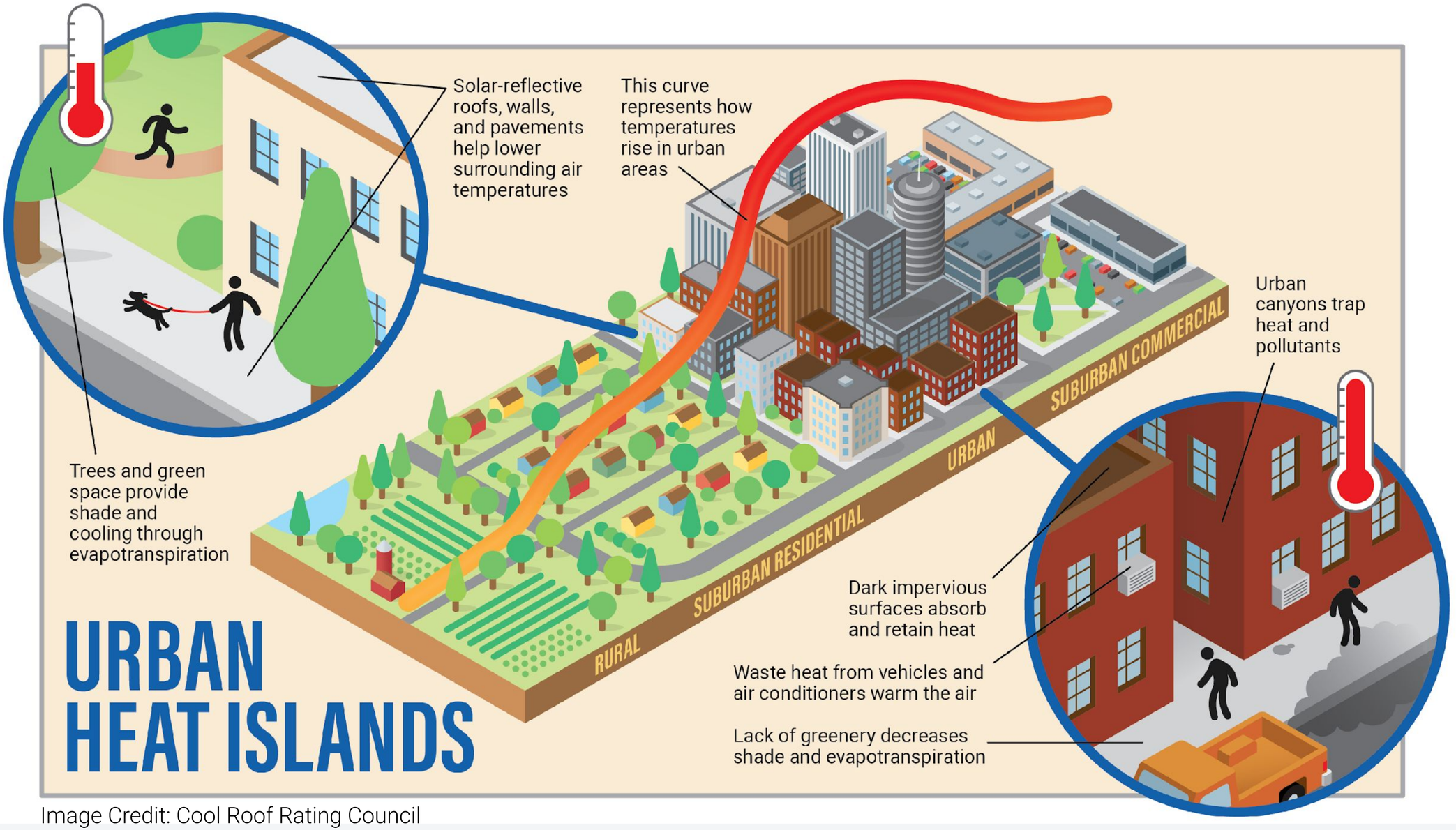


Image Credit: Cool Roof Rating Council

Cool Roofs and Walls Reduce Solar Heat Gain

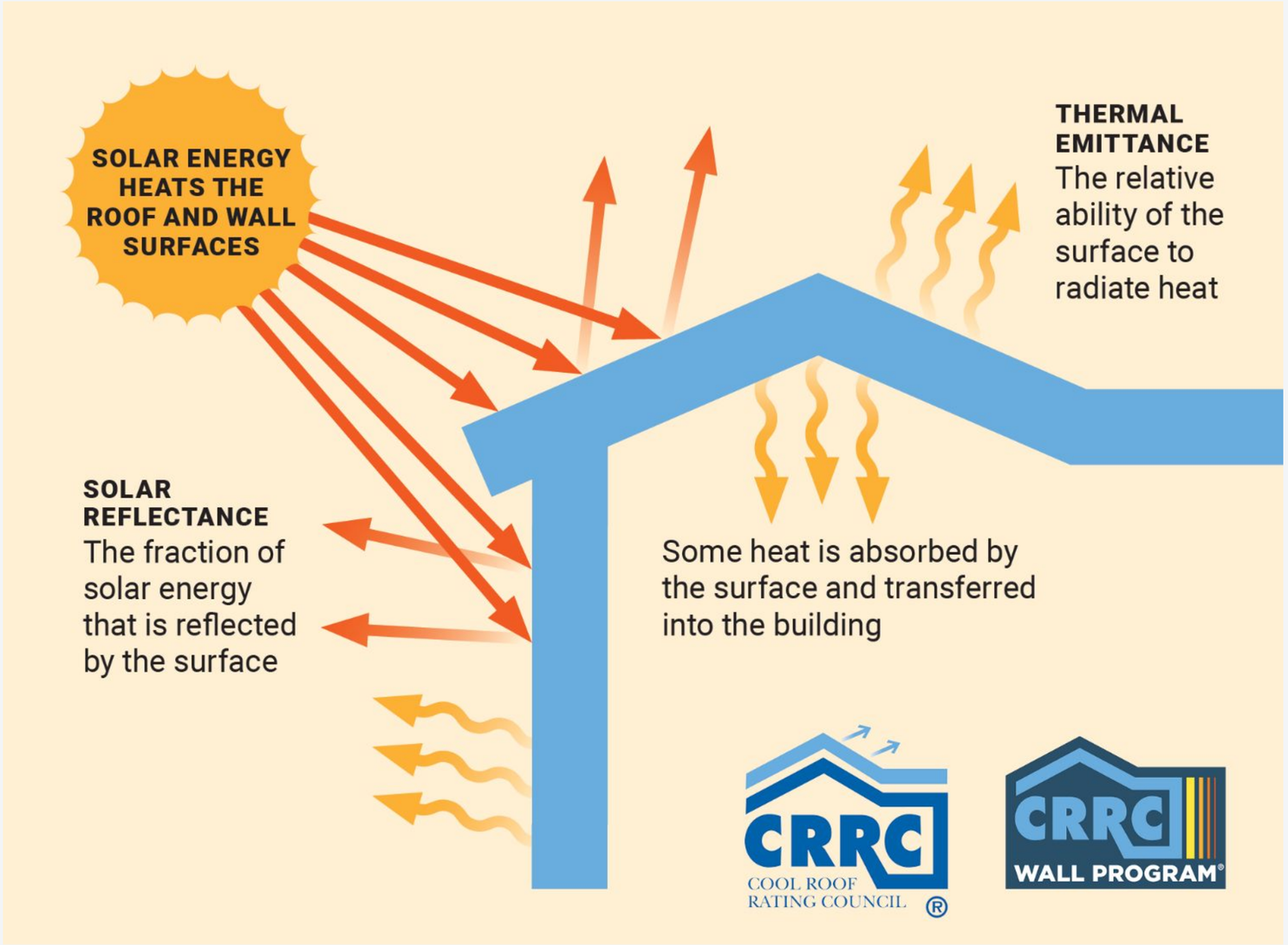


Image Credit: Cool Roof Rating Council

Cool surface impacts at multiple scales

Individual

- Comfort
- Health
- Safety
- Learning
- Productivity

Building

- Energy
- Utility bills
- Equipment
- & envelope durability

Community

- Temperature
- Air quality
- Peak demand
- Grid stability

Global

- GHGs
- Atmospheric cooling

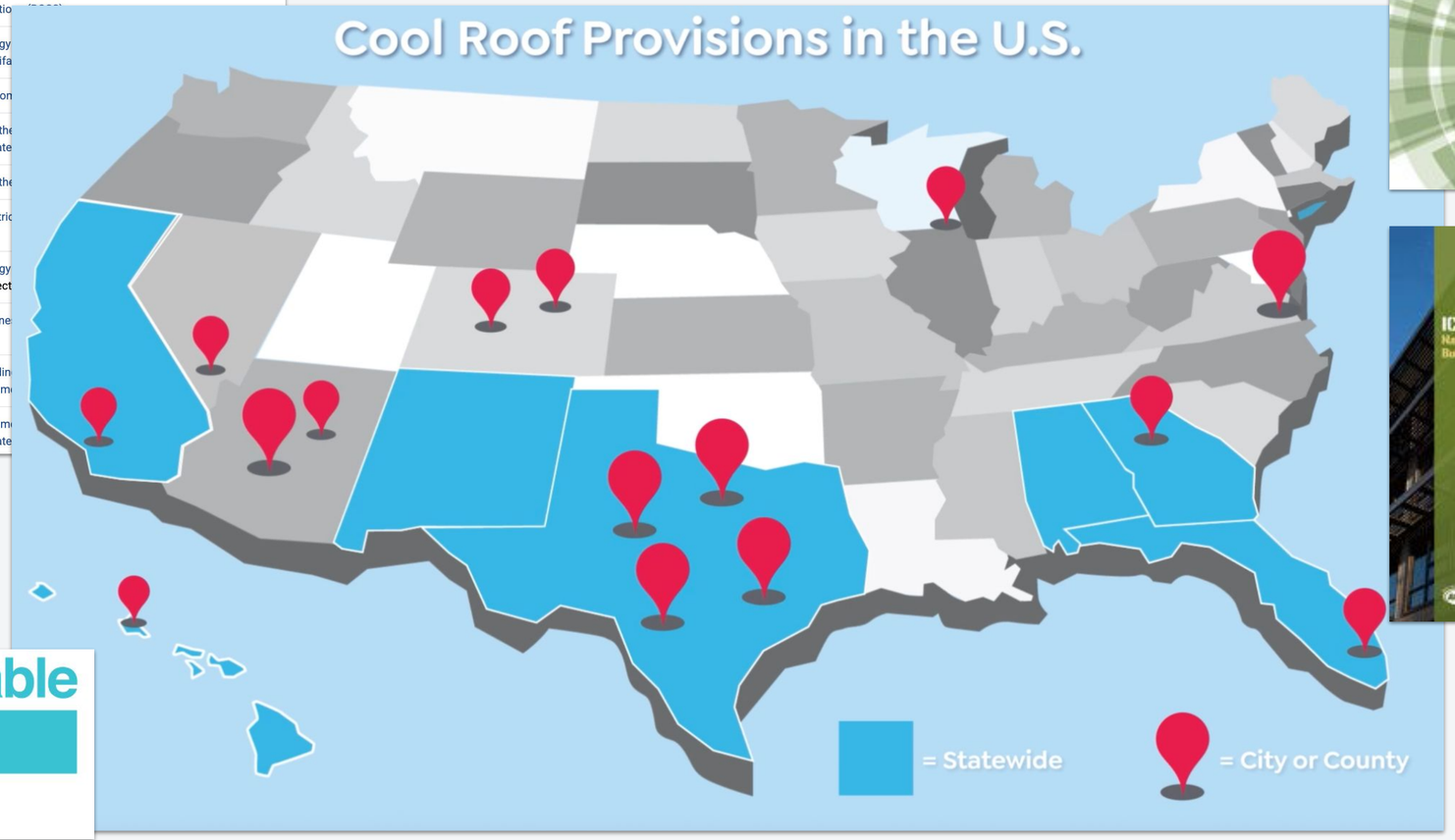
Impacts are more significant in older buildings with little to no insulation or mechanical cooling

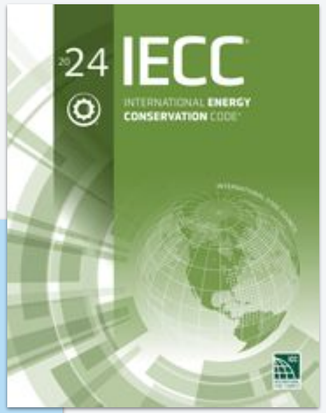
Cool roofs are widely embraced in codes, programs, & standards

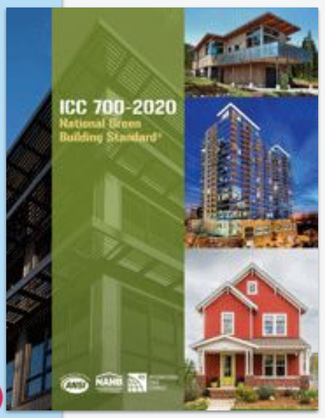
Rebates

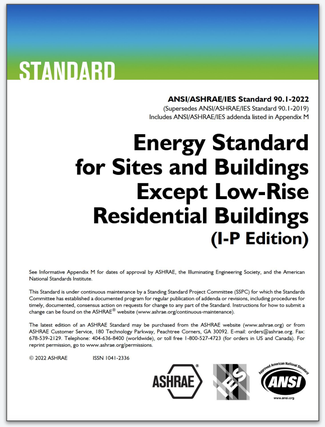
Last Updated December 30, 2024

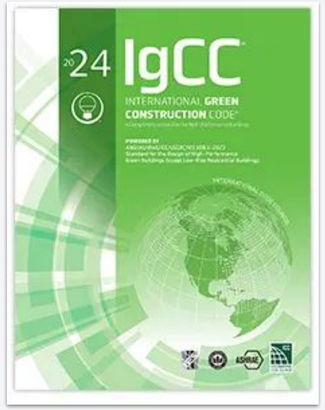
STATE	LOCATION	AGENCY	PROGRAM NAME	PROGRAM TYPE
Arizona		Salt River Project (SRP)	SRP Cool Roof Rebate™	Residential
Arkansas		Southwestern Electric Power Company	AEP SWEPCO - Commercial and Industrial Energy Efficiency Rebate Programs	Commercial
California	Anaheim	Anaheim Public Utilities	Customized Energy Incentives	Business
California	Anaheim	Anaheim Public Utilities	New Construction Incentives Program	Business
California	Los Angeles	Los Angeles Department of Water and Power	Consumer Rebate Program	Residential
California	Los Angeles	Los Angeles Department of Water and Power	Business Offerings for Sustainable Solutio	Commercial
California	Northern and Central CA	Pacific Gas & Electric	Energy Multifa	
California	Northern and Central CA	Pacific Gas & Electric	Custon	
California	Riverside	Riverside Public Utilities	Weathe Rebate	
California	Riverside	Riverside Public Utilities	Weathe	
Colorado	Estes Park, Fort Collins, Longmont, Loveland	Efficiency Works	Electric	
Florida		Clay Electric Cooperative	Energy Reflect	
Florida	Orlando	Orlando Utilities Commission (OUC)	Busine	
Idaho		Idaho Power	Buildin Comm	
Idaho		Idaho Power	Comm Rebate	

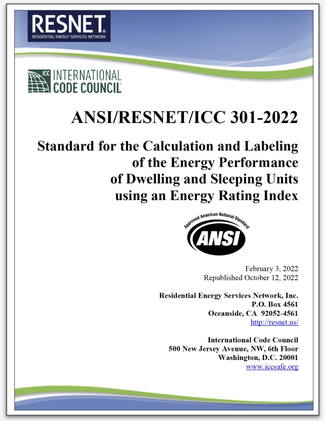












LEED®

THE Sustainable SITES Initiative®

Cool exterior wall adoption has grown in recent years

Jurisdictional Codes

CITY AND COUNTY OF HONOLULU

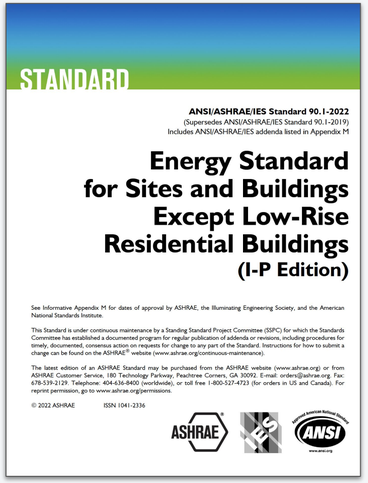
Voluntary Programs

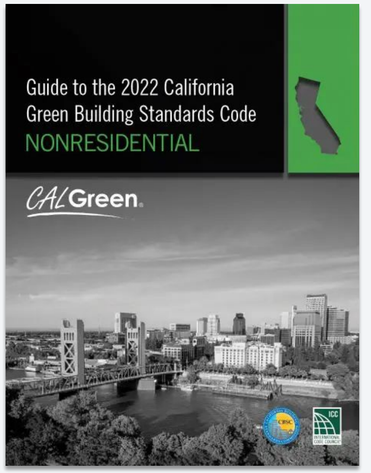
LEED®

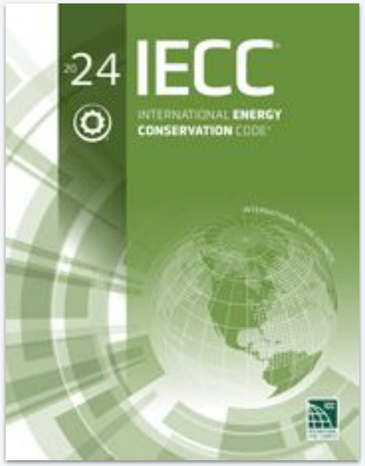
GREEN SEAL™

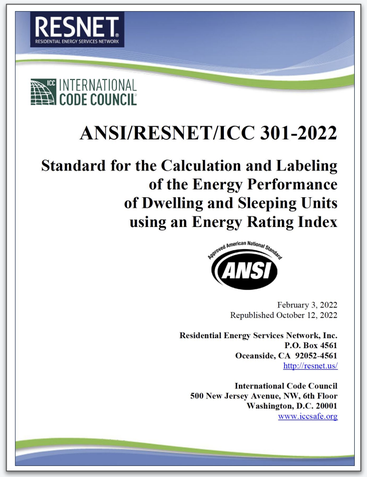
GREEN GLOBES® BUILDING CERTIFICATION

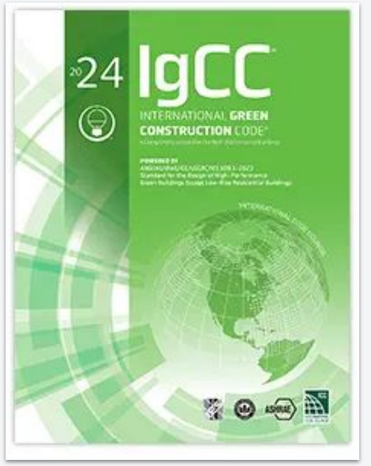
Model Codes and Standards

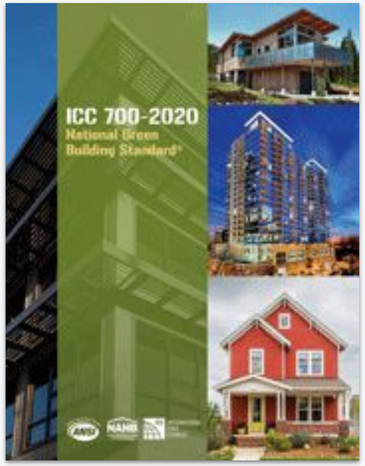












How are cool exterior walls addressed in model codes, standards, and programs?

2024 IECC

- Section C402.3 requirement for commercial buildings in CZ0, above-grade east-, south-, and west-oriented walls
  - 75% of opaque wall surface **initial SR ≥ 0.30, thermal emittance ≥ 0.75**
  - Or comply through shading; exception for low-energy buildings, greenhouses, and equipment buildings

See code language for full details and requirements

2022 ASHRAE Standard 90.1

- Section 5.5.3.2.2 requirement for CZ 0, above-grade east-, south-, and west-oriented walls
  - 75% of opaque wall surface **initial SR ≥ 0.30, thermal emittance ≥ 0.75**
  - Or comply through shading; exception for semiheated spaces.
- Small compliance credit in CZ 1 and above for wall SR > 0.25

See standard language for full details and requirements

LEED v4.1

- SSpc154 Pilot Credit: Heat Island Mitigation with Cool Walls
  - 60% of gross exterior wall area (inc. vertical fenestration) **initial SR ≥ 0.60, thermal emittance ≥ 0.75**

See pilot credit language for full details and requirements

The Science of Cool Exterior Walls

Two properties influence “coolness”

- ★ Solar reflectance (SR) (albedo)
- ★ Thermal emittance (TE)

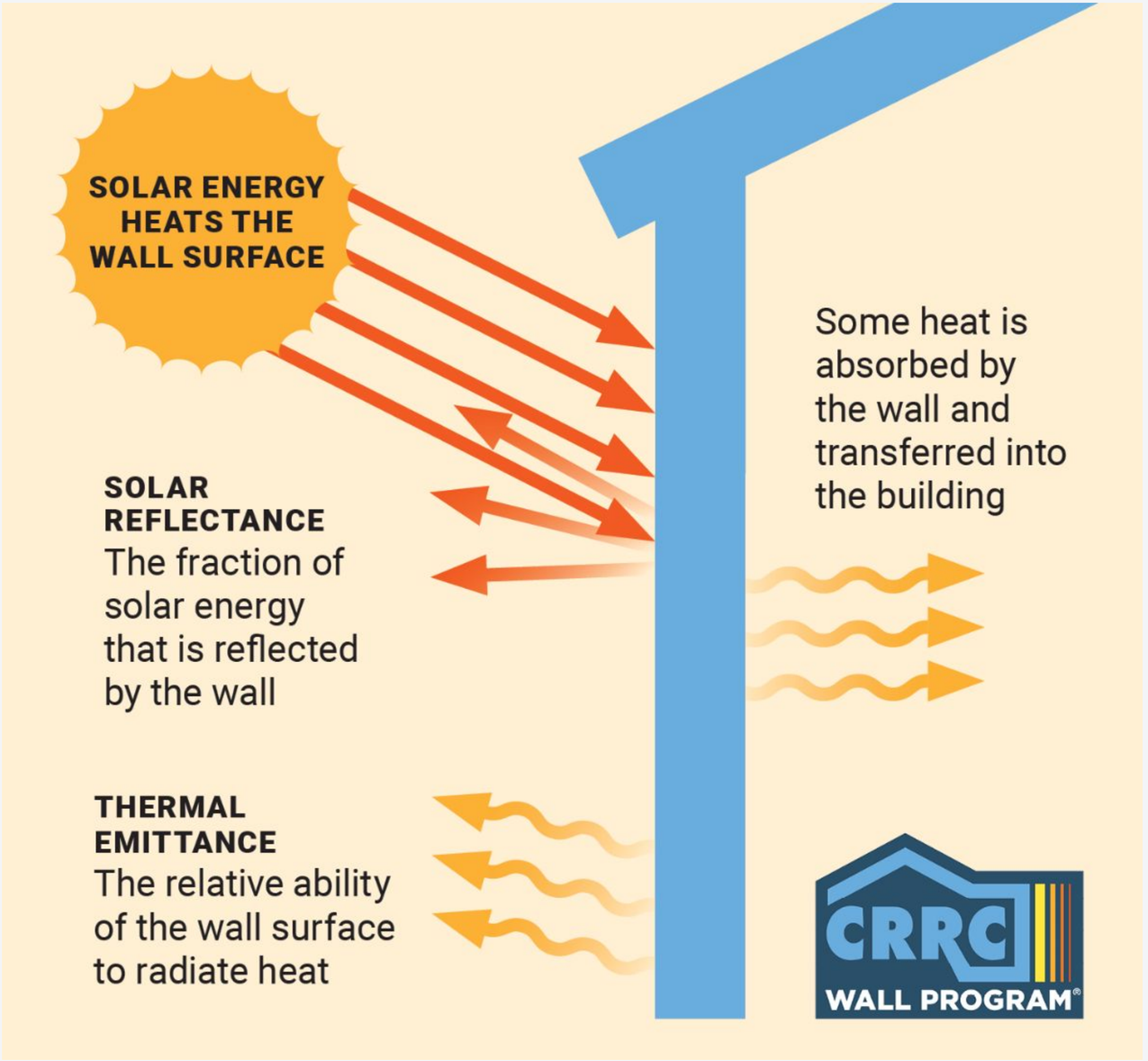
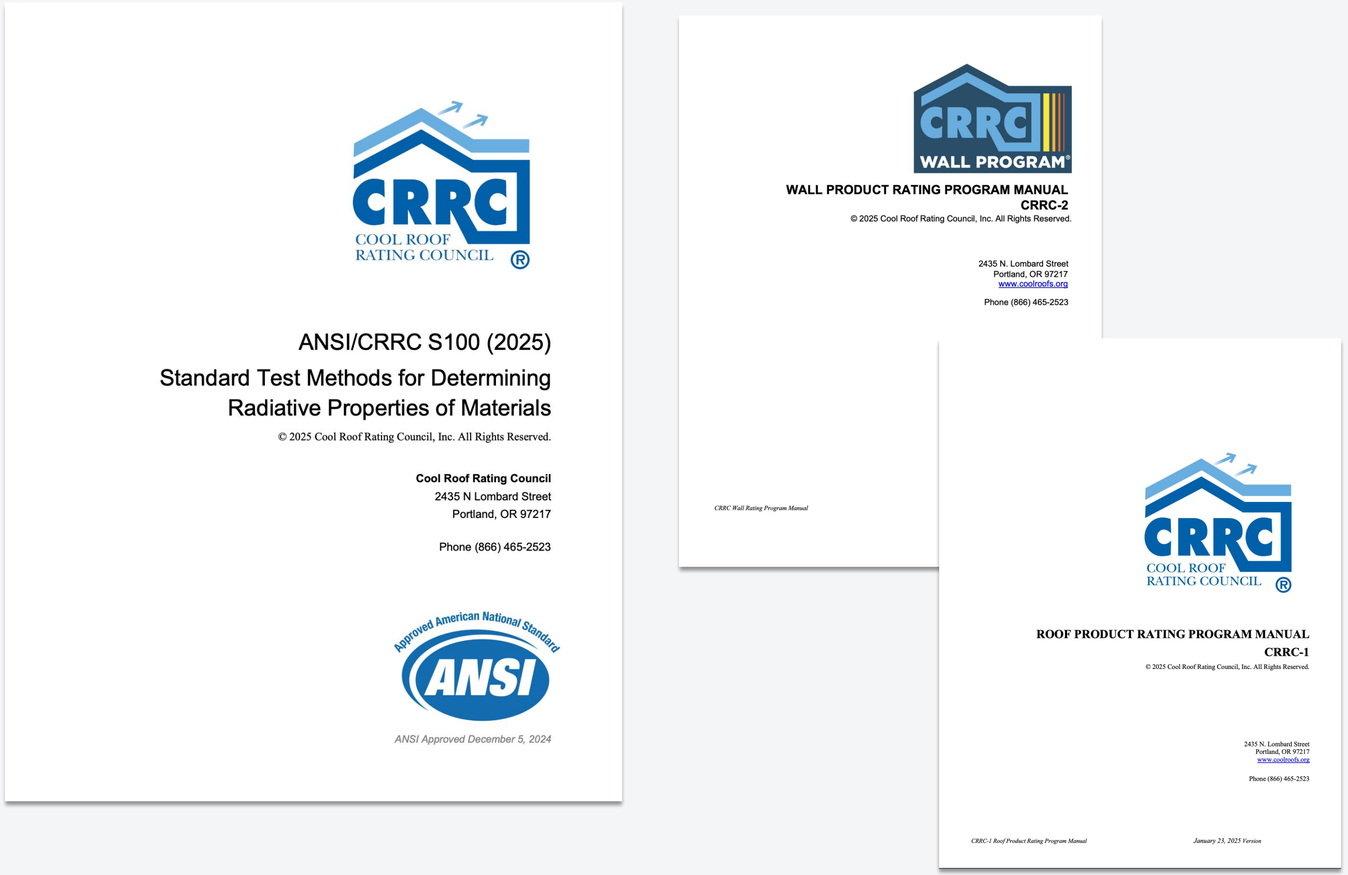


Image Credit: Cool Roof Rating Council

Testing Radiative Properties



- Surface radiative properties measured by accredited independent testing laboratories
- Testing requirements located in ANSI/CRRC S100 and CRRC Product Rating Program Manuals

Common Methods and Instruments

Solar Reflectance

Solar Spectrum Reflectometer (SSR)

Image credit: Cool Roof Rating Council

410-Solar Reflectometer

Image courtesy of Surface Optics Corp.

- ASTM C1549 (SSR)
- ASTM E903 (spectrophotometer)
- ASTM E1918 (albedometer or pyranometer)
- 410-Solar Test Method (410-Solar)

Thermal Emittance

Emissometer

- ASTM C1371 (Emissometer)
- Slide Method (Emissometer)

Product Weathering

Natural weathering is crucial for understanding radiative performance over time

Three years undisturbed

Three U.S. climates

- Hot/Arid
- Cool/Temperate
- Hot/Humid

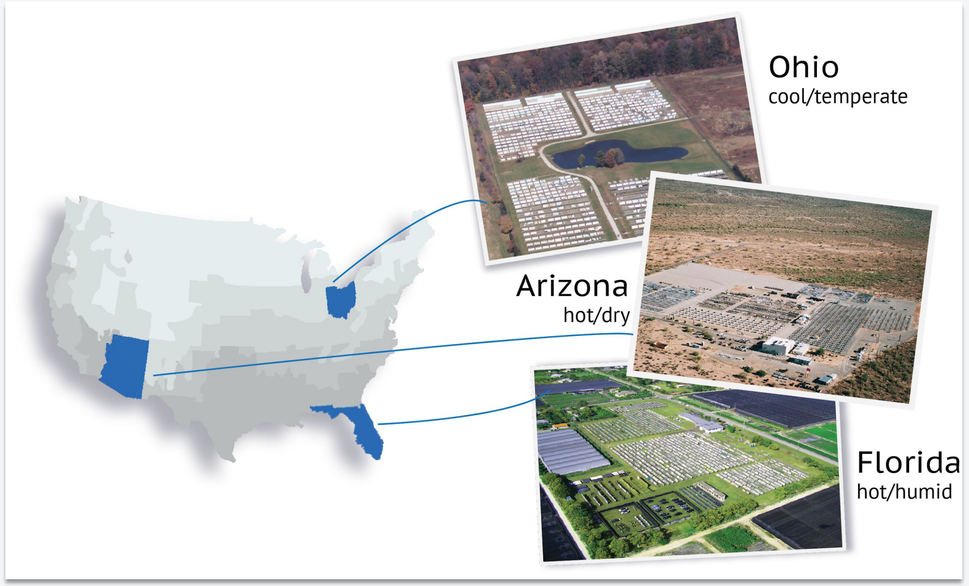


Image credit: Atlas Weathering Services

Image credit: Lawrence Berkeley National Laboratory

SRI not appropriate metric for walls

Solar Reflectance Index (SRI) is a calculated value commonly used to indicate overall coolness of roofing materials.

The equation to calculate SRI, found in ASTM E1980, relies on certain assumptions that are not applicable for vertical surfaces (walls).

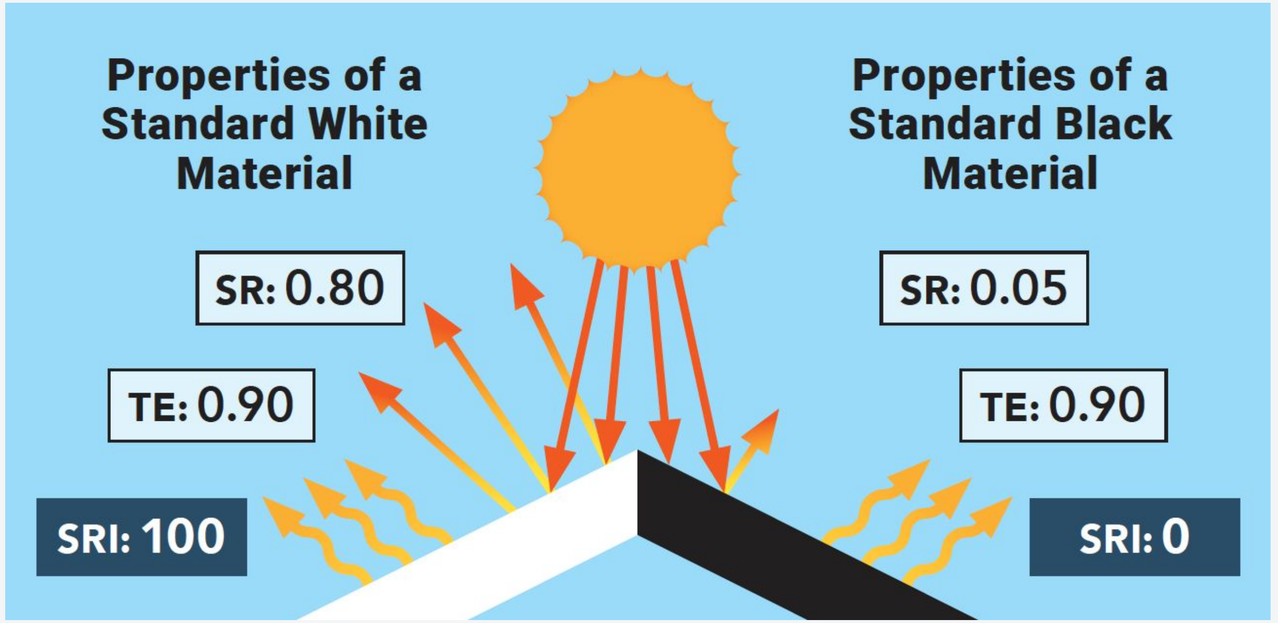


Image credit: Cool Roof Rating Council

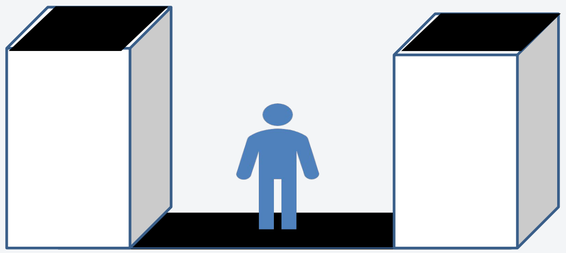
Measured SR and TE, not SRI, should be used to compare wall products

When an exterior wall highly reflects solar radiation, it lowers the surface temperature of the wall material

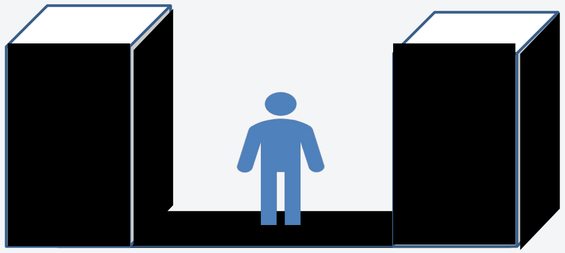
Image Source: Cool Roof Rating Council

Cool exterior walls are a viable UHI mitigation mechanism

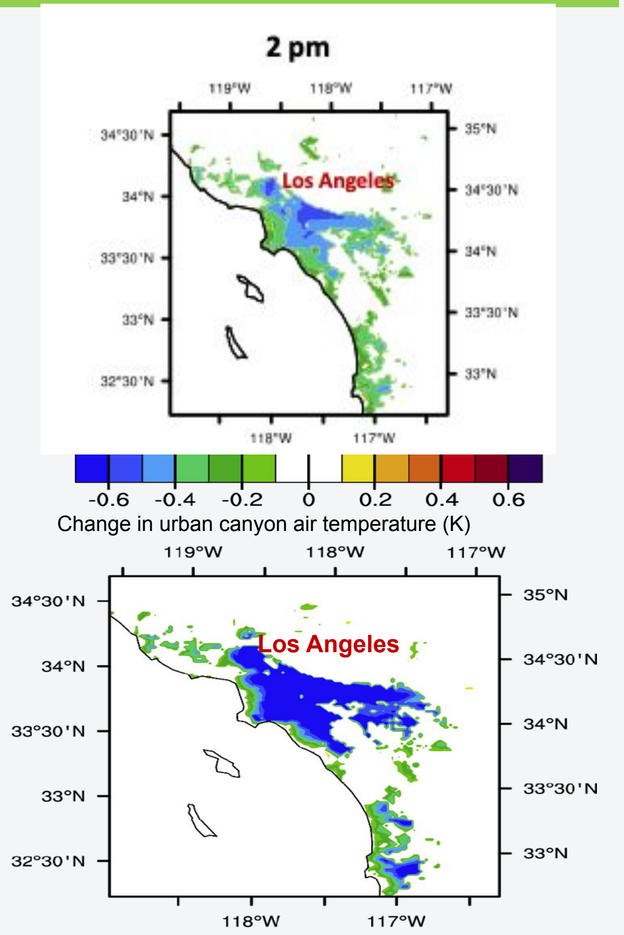
Cool Walls



Cool Roofs



44% less cooling at 2 pm



6% more cooling at 8 pm

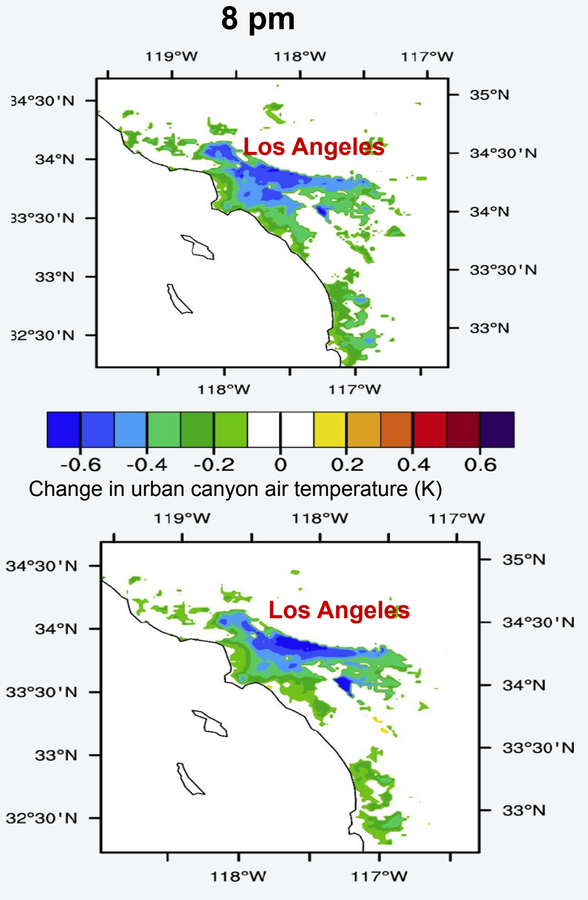


Image Source: Ronnen Levinson, Lawrence Berkeley National Laboratory

Zhang, J., Mohegh, A., Li, Y., Levinson, R., and Ban-Weiss, G. (2018). Systematic comparison of the influence of cool wall versus cool roof adoption on urban climate in the Los Angeles Basin. *Environmental Science and Technology,* 52 (19): 11188-11197. https://doi.org/10.1021/acs.est.8b00732

Cool exterior walls save energy in all 16 CA climate zones & U.S. climate zones 1–4

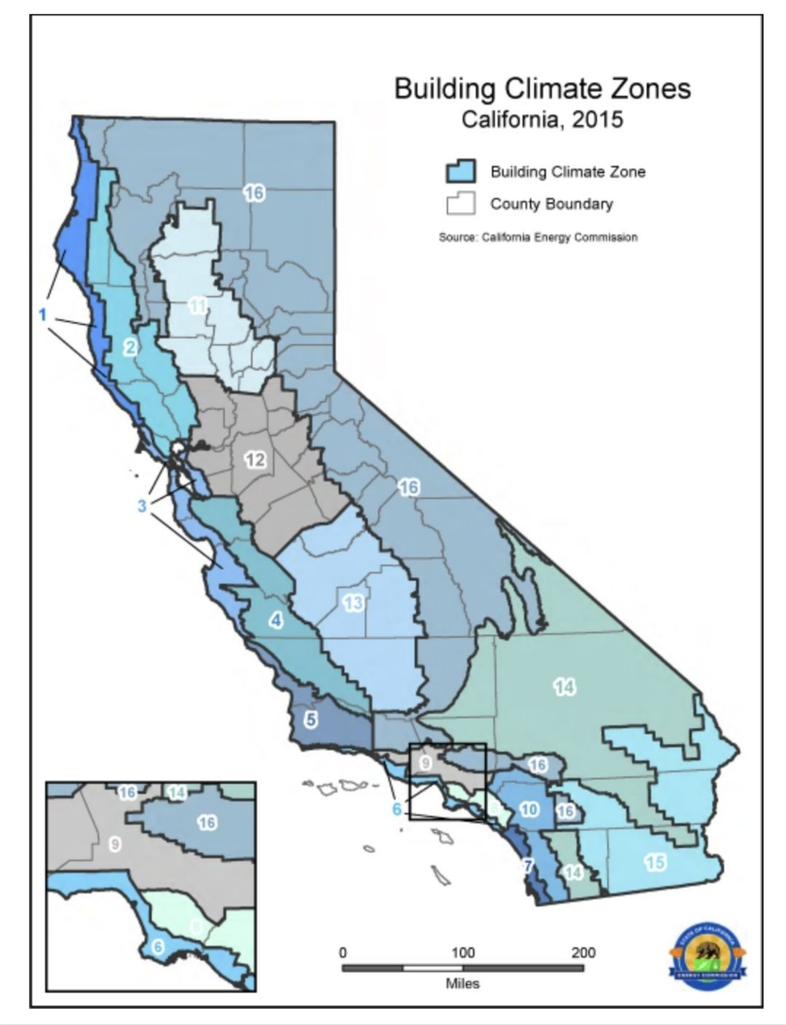


Image Source: CEC

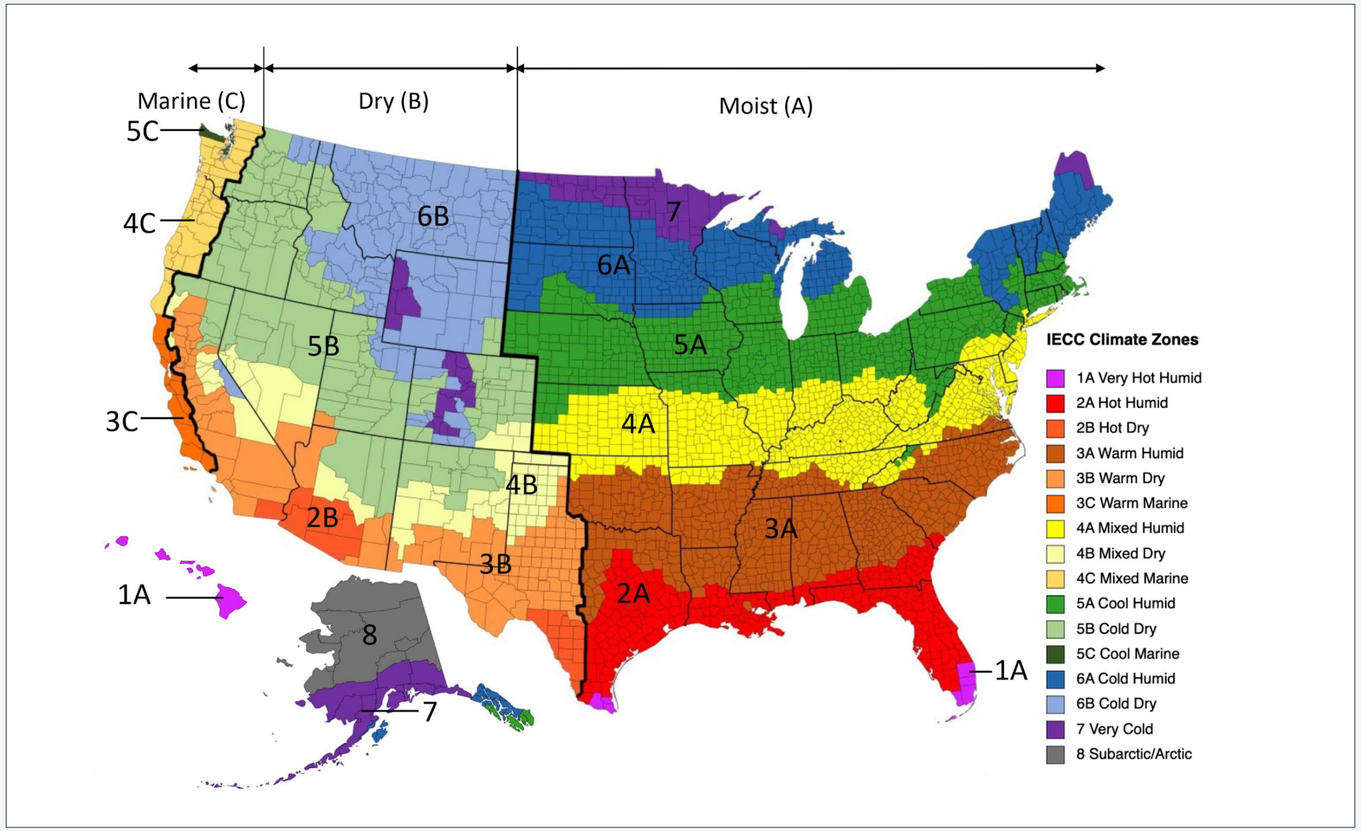
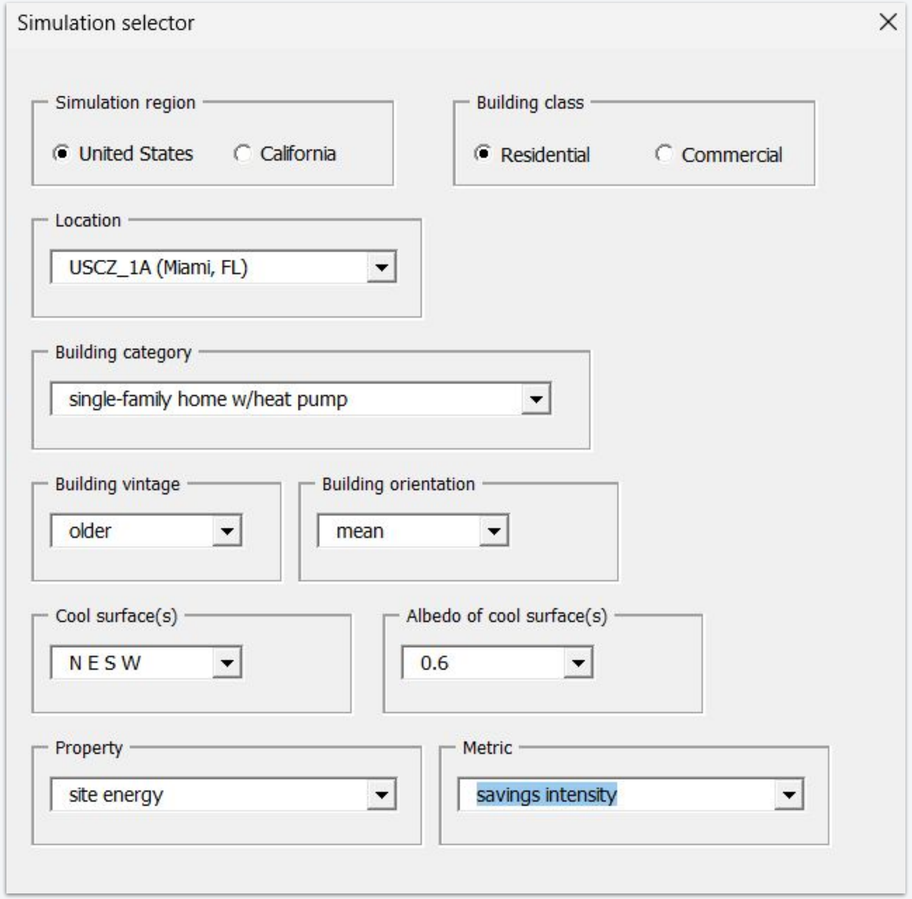


Image Source: ICC

Rosado, P. J., et al. (2019). Potential benefits of cool walls on residential and commercial buildings across California and the United States: Conserving energy, saving money, and reducing emission of greenhouse gases and air pollutants. *Energy and Buildings*, 199, 588–607. https://doi.org/10.1016/j.enbuild.2019.02.028

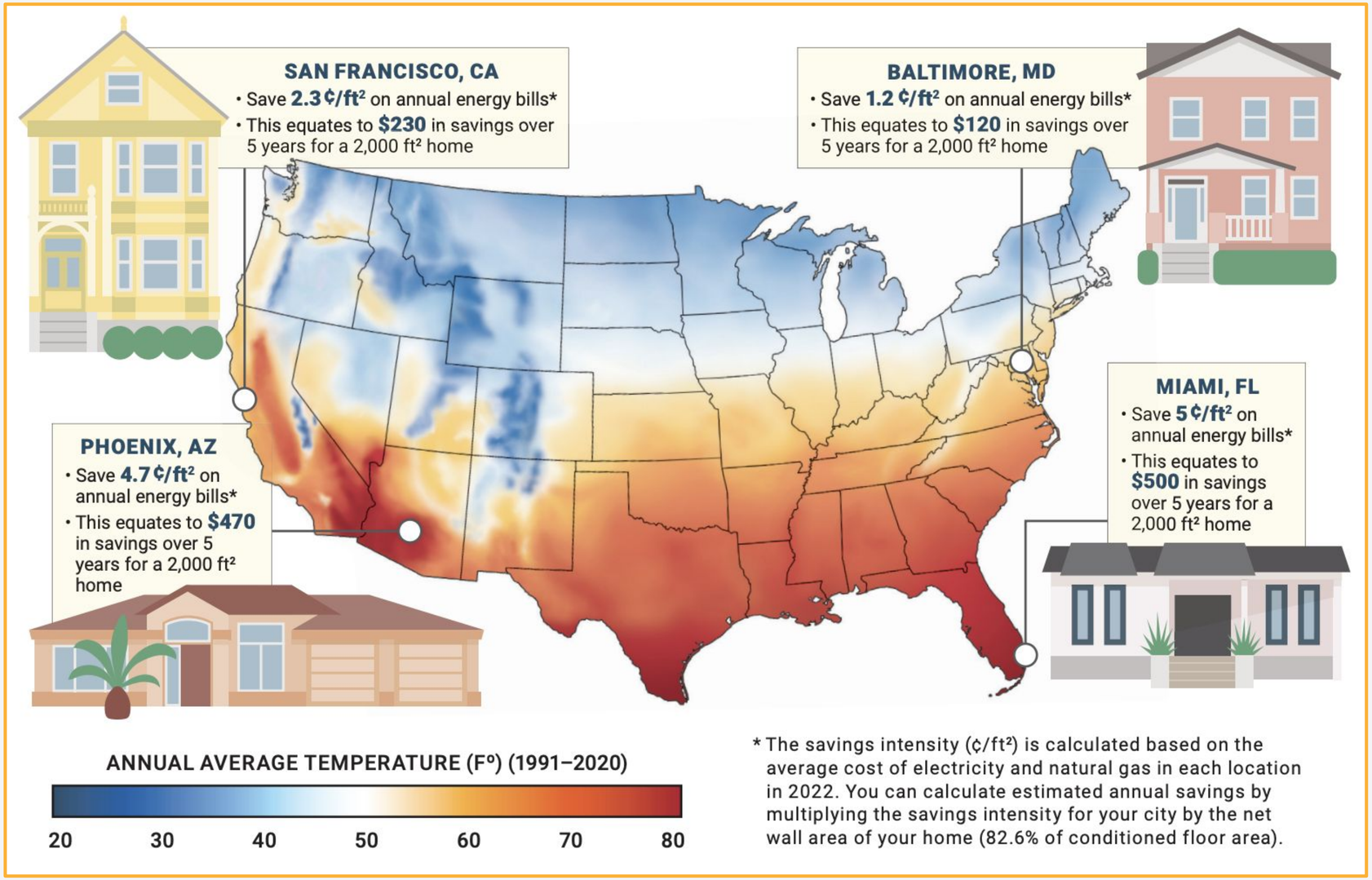
Cool Surfaces Savings Explorer



Parameters	
Climate zone	USCZ_1A
City	Miami
State	Florida
Vintage year	1989
Vintage group	older
Building category	single-family home hp
Building orientation	mean
Modified surface(s)	N E S W
Base wall albedo	0.25
Albedo of modified wall(s)	0.6
Base roof albedo	0.1
Albedo of modified roof	NA

Results	
Annual cooling site energy absolute savings intensity [kWh/m2]	4.117
Annual gas heating site energy absolute savings intensity [therms/m2]	0
Annual electric heating site energy absolute savings intensity [kWh/m2]	-0.079
Annual fan site energy absolute savings intensity [kWh/m2]	0.788

Example savings in different climates



Estimate Details:

- Single-family home with 2,000 ft^2 of conditioned floor area (equates to 1,652 ft^2 of net wall area)
- 1989 vintage
- Gas furnace
- SR of all 4 walls raised from 0.25 to 0.60
- Savings over 5 years

Example savings for different vintages

1,164 Sq. Foot Home in Hawaii with Cool Exterior Walls (SR = 0.6)

Vintage year: 2012
Estimated Savings: $180.45/year

Vintage year: 1989
Estimated Savings: $224.56/year

Vintage year: Pre-1980
Estimated Savings: $363.05/year

Cool walls could save households between $180 to $363 per year

Using the LBNL Savings Explorer

- Customizable for building class (residential vs. commercial), ASHRAE climate zone, category, vintage, orientation, cool surfaces type, and surface SR
- Savings properties include energy cost, source energy, site energy, site peak power demand, CO^2, CO^2e, NOx, and SO^2
- Metrics include savings intensity, whole-building absolute savings, whole-building fractional savings, and base value
- Follow CRRC's supplemental instructions to calculate potential energy cost savings based on local electricity and gas prices

Cool Surfaces Savings Explorer

CEC Report Appendix P

Local Energy Cost Calculation Instructions

Factors that affect savings

- Climate
- Local environment
- Building vintage
- Building type/function
- Building orientation
- Type of heating and cooling equipment used in the building
- Wall assembly design
- Insulation
- Façade/cladding/material type
- Thermal mass
- Fenestration
- Shading from trees and neighboring buildings

Range of Wall Solar Reflectance Values

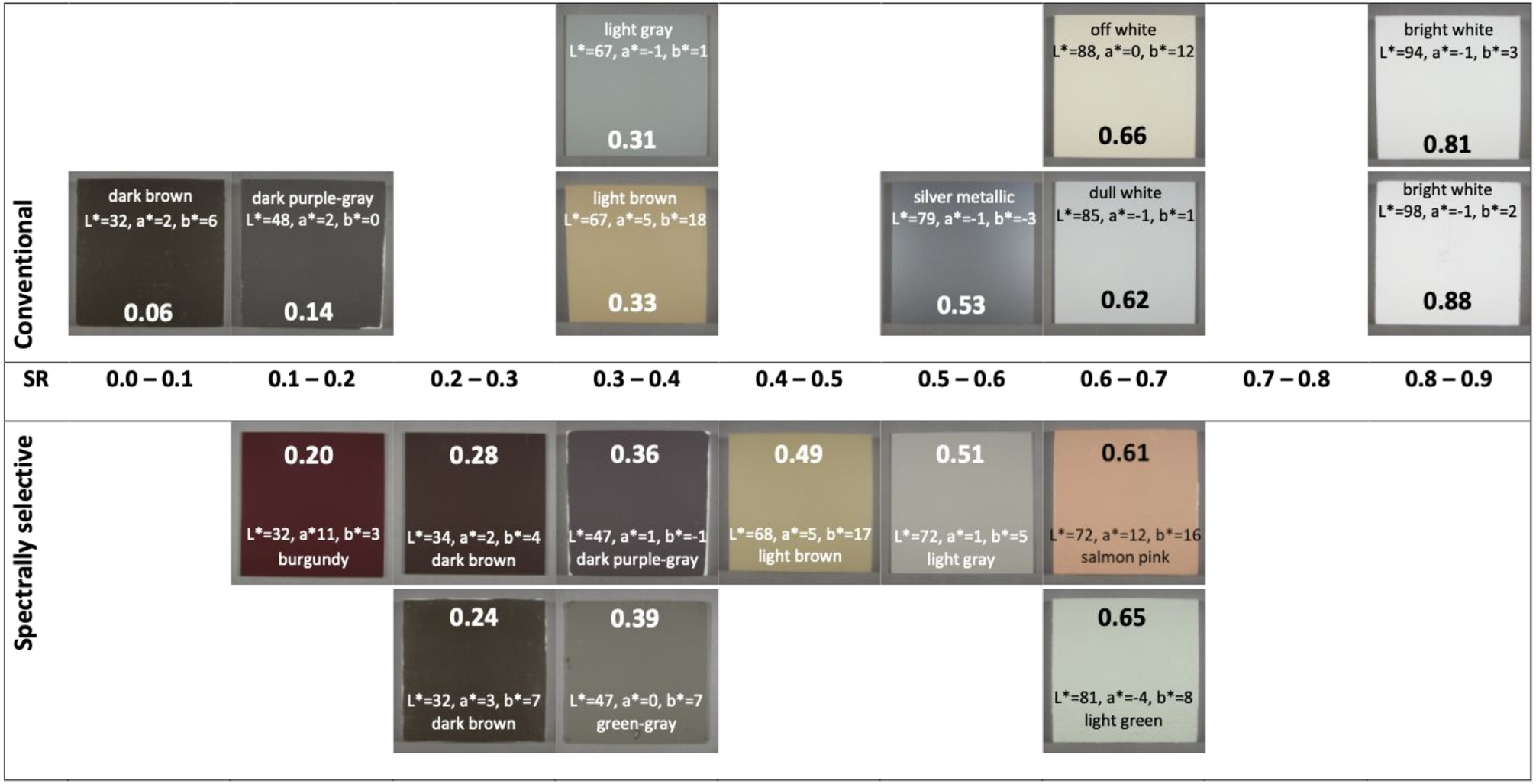


Image Source: Heat Island Group, Lawrence Berkeley National Laboratory

Cool Surface Art

“Beat the Heat”

Photo Credit: Kristy Sandoval
https://www.pacoimabeautiful.org/programs/beat-heat-mural

“Blue Zeus"

Image Source: UCLA Luskin Center
https://innovation.luskin.ucla.edu/2019/10/22/street-art-meets-climate-science-in-the-big-blue-face-of-zeus/

Using the CRRC Rated Wall Products Directory

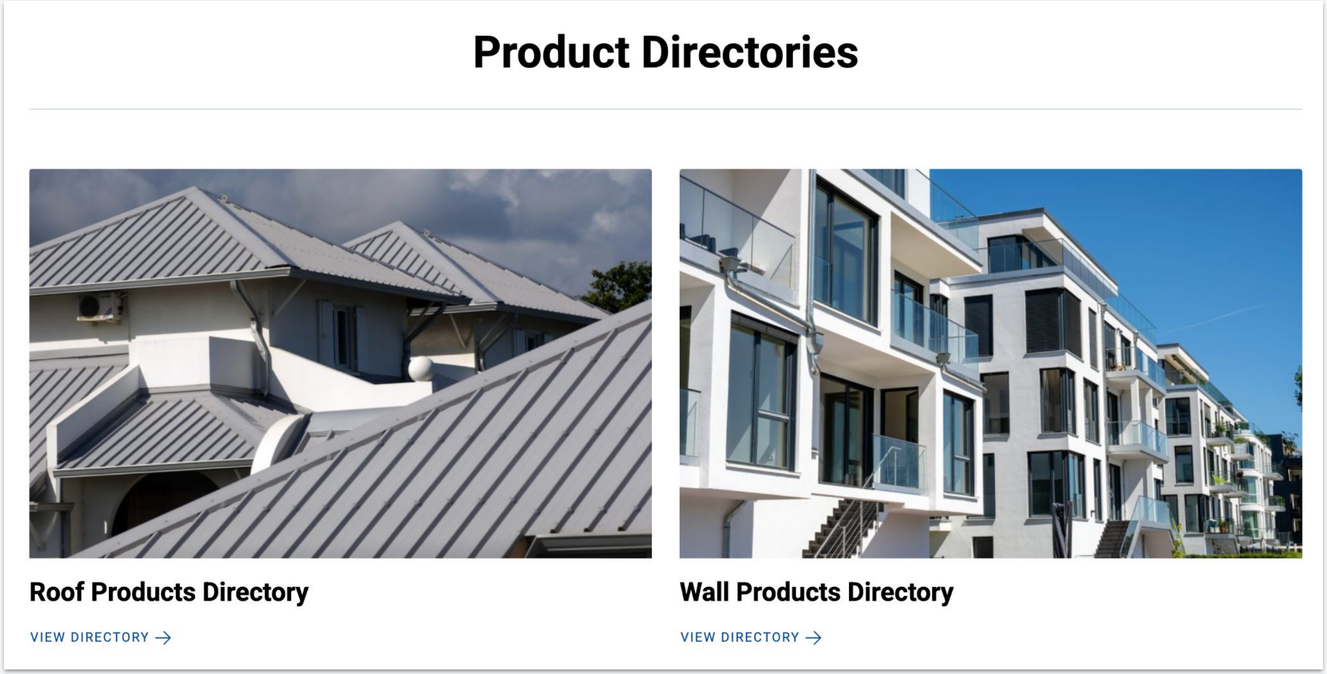
Third-party ratings play an important role

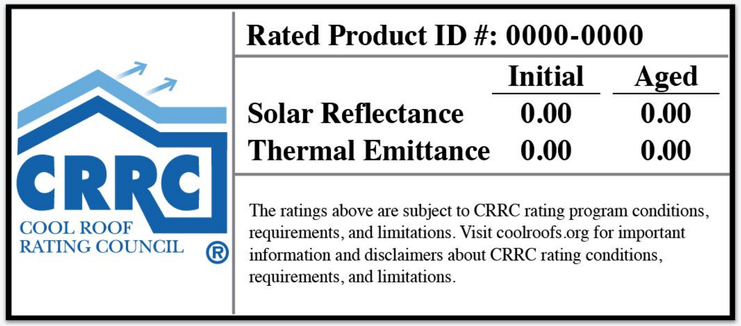
- Inform consumers about product's ability to reduce solar heat gain
- Help consumers ID compliant products
- Give assurance of unbiased and verified data
- Provide validity to marketing claims
- Support programs and policies
  - Development
  - Compliance & enforcement

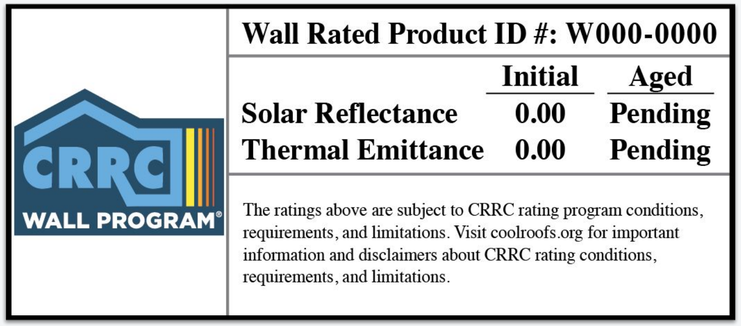
Available Radiative Property Data

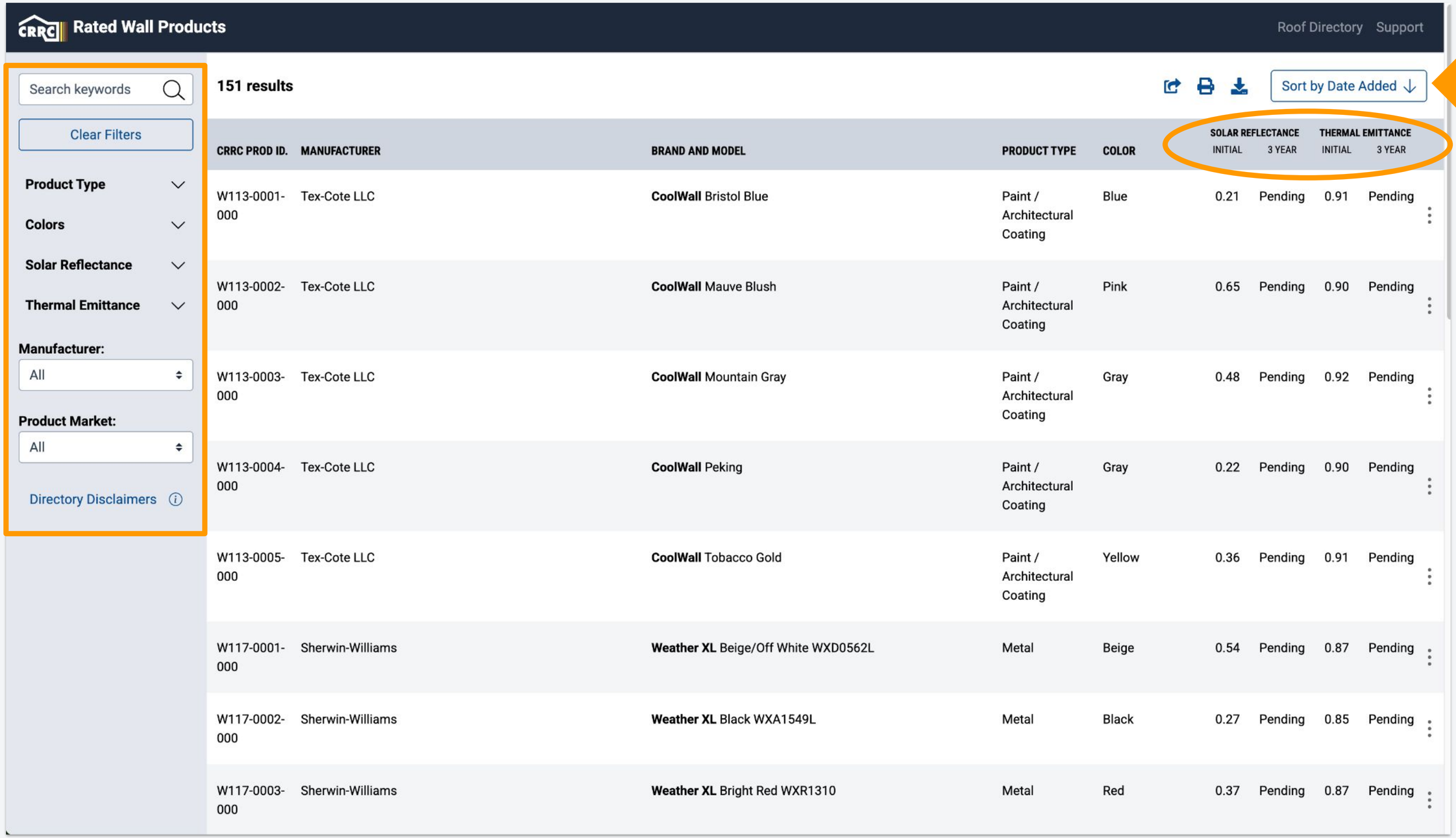
- Two online product directories
- Free to access
- Updated in real time
- CRRC Labels
- Wide range of ratings (not just California compliant)

https://coolroofs.org/directory



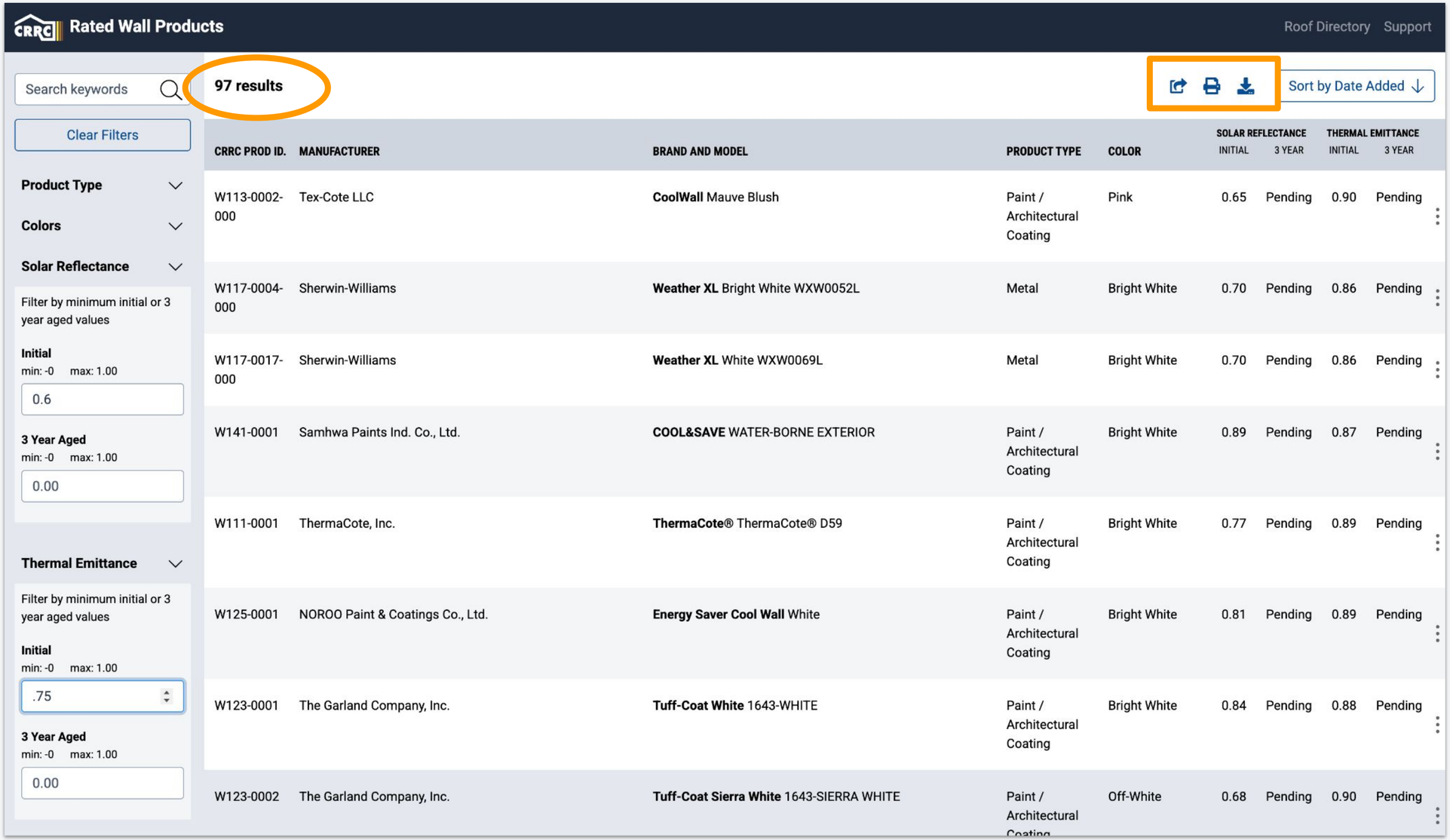





Rated Wall Products
Roof Directory
Support
Search keywords
Clear Filters
Product Type
Colors
Solar Reflectance
Thermal Emittance
Manufacturer:
All
Product Market:
All
Directory Disclaimers
151 results
Sort by Date Added
CRRC PROD ID.
MANUFACTURER
BRAND AND MODEL
PRODUCT TYPE
COLOR
SOLAR REFLECTANCE
INITIAL
3 YEAR
THERMAL EMITTANCE
INITIAL
3 YEAR
W113-0001-000 Tex-Cote LLC CoolWall Bristol Blue Paint / Architectural Coating Blue 0.21 Pending 0.91 Pending
W113-0002-000 Tex-Cote LLC CoolWall Mauve Blush Paint / Architectural Coating Pink 0.65 Pending 0.90 Pending
W113-0003-000 Tex-Cote LLC CoolWall Mountain Gray Paint / Architectural Coating Gray 0.48 Pending 0.92 Pending
W113-0004-000 Tex-Cote LLC CoolWall Peking Paint / Architectural Coating Gray 0.22 Pending 0.90 Pending
W113-0005-000 Tex-Cote LLC CoolWall Tobacco Gold Paint / Architectural Coating Yellow 0.36 Pending 0.91 Pending
W117-0001-000 Sherwin-Williams Weather XL Beige/Off White WXD0562L Metal Beige 0.54 Pending 0.87 Pending
W117-0002-000 Sherwin-Williams Weather XL Black WXA1549L Metal Black 0.27 Pending 0.85 Pending
W117-0003-000 Sherwin-Williams Weather XL Bright Red WXR1310 Metal Red 0.37 Pending 0.87 Pending

LEED v4.1 Heat Island Mitigation with Cool Walls Pilot Credit

➔ **SR ≥ 0.60**
➔ **TE ≥ 0.75**



Demonstration

Wall Products Directory

https://coolroofs.org/directory/wall

Roof Products Directory

https://coolroofs.org/directory/roof

More Educational Resources

Cool Roof Rating Council | Rating Programs | Membership | Resources | About CRRC | Product Directories

Resources

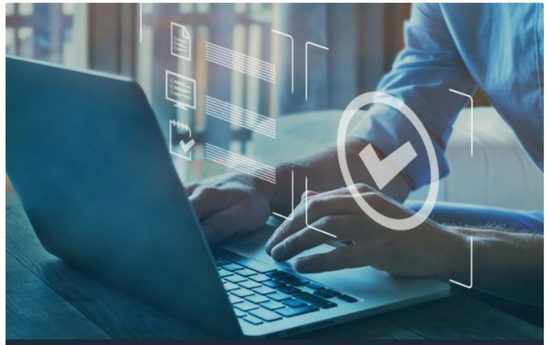
Find answers to your questions about cool roofing and solar-reflective exterior wall products.

What is a Cool Roof?

LEARN MORE →

What is a Cool Exterior Wall?

LEARN MORE →



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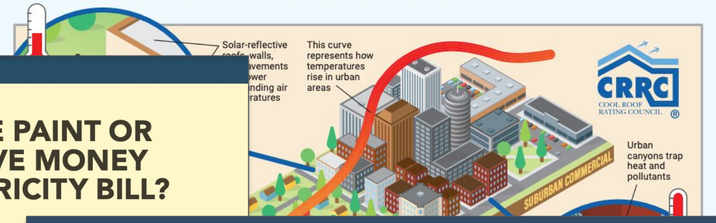
HEAT EQUITY AND RESILIENCE

A MEDIA PRIMER ON HEAT-VULNERABLE COMMUNITIES AND "COOL" BUILDING SOLUTIONS

This document provides scientifically supported information to assist media and public relations professionals with reporting about heat-vulnerable communities and passive cooling solutions, such as solar-reflective "cool" roofs and exterior walls.

WHAT IS A HEAT-VULNERABLE COMMUNITY?

Heat-vulnerable

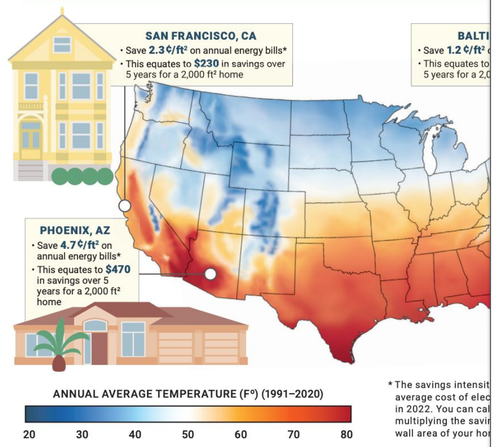


CRRC WALL PROGRAM

CAN REFLECTIVE PAINT OR SIDING HELP SAVE MONEY ON YOUR ELECTRICITY BILL?

AS SUMMER HEAT WAVES BECOME WORSE, households across the U.S. are running their air conditioners more. Cool exterior walls, or walls that efficiently reflect sunlight (solar reflectance) and emit absorbed heat (thermal emittance), are one easy modification that can help lower energy bills, especially for older homes in warmer climates. Highly reflective walls can be light in color, like the exampl below, or they can us appear darker but eff

The example savin family home with 2,0 area (equating to 1,65 five (5) years. Many p lifespan much longer result in many more y



* The savings intensit average cost of elec in 2022. You can cal multiplying the savi wall area of your hot

This information is based on a simulation study published by the California Ene Savings for individual buildings depend on many factors. The examples in this d family homes (built in 1989) with gas furnaces where the solar reflectance of all 0.25 to 0.60. To find simulated data for homes with different characteristics, do

PUBLISHED JULY 2024

COOLING BEYOND THE BUILDING:

THE POTENTIAL FOR REFLECTIVE SURFACES TO COUNTER GLOBAL WARMING

It is well known that reflective surfaces help keep buildings cooler and reduce the costs and greenhouse gas (GHG) emissions from air conditioning, but is your cool roof also contributing to a cooler planet? A growing body of research highlights the ability of cool surfaces to reflect more sunlight, rather than absorb it, which means these surfaces return more of the sunlight back through the atmosphere and out into space, starting from the moment the surfaces are installed.

WHAT IS ATMOSPHERIC COOLING?

The Earth gets energy from the sun in the form of sunlight, also known as solar radiation. Increasing the fraction of solar energy that is reflected from the Earth's surface cools the planet's surface and the atmosphere. We can do so by replacing dark, more solar-absorptive surfaces with lighter, more solar-reflective surfaces, such as cool roofs.

In addition to potentially reducing new GHG emissions via energy efficiency, cool roofs could offset the warming effect of GHGs already in the atmosphere. Scientists have tried to quantify the global cooling effect in terms of offsetting GHG emissions since much of our climate policy and finance is based on GHG mitigation.

HOW MUCH ATMOSPHERIC COOLING IS POSSIBLE FROM COOL ROOFS?

It turns out, quite a lot. Efforts to quantify this effect concluded that the use of more solar-reflective surfaces in cities around the world could cancel the warming effect of 44–57 billion metric tons of emitted carbon dioxide—up to 55% more than the annual global emissions of carbon dioxide in 2022. At a building scale, that means that increasing the reflectivity of 1,000 ft² (93 m²) of roof area could offset the warming effect of 10 tons of CO_2 emissions [1,2].

If all dark roofs were replaced with more solar-reflective roofs, the planet would immediately reflect more sunlight to space, cooling the atmosphere in a manner that is equivalent to removing

GHGs from the air. The roof's reflectance would need to continue to exceed that of the original dark surface to maintain the atmospheric cooling benefit over time.[1]

1. How to properly calculate and value albedo modification is an ongoing discussion amongst the scientific and finance communities.

Akbari, Menon, and Rosenfeld [1] found that even a modest increase in the solar reflectance of a roof surface can have a positive impact on reducing GHG emissions by lowering the building's cooling demand by reducing its solar heat gain, reducing peak demand, and increasing the community's albedo (solar reflectance).

Complex atmospheric dynamics may prevent highly reflective roofs from realizing the full global cooling potential attributed to them, but the fundamentals remain unchanged—cool roofs absorb less of the sun's energy, decreasing the amount of heat that gets trapped in the atmosphere, and help to cool the world and our homes.

REFERENCES

[1] H. Akbari, S. Menon, A. Rosenfeld, Global cooling: Increasing world-wide urban albedos to offset CO2, Climatic Change 94 (2009) 275–286. https://doi.org/10.1007/s10584-008-9515-9.

[2] S. Menon, H. Akbari, S. Mahanama, I. Sednev, R. Levinson, Radiative forcing and temperature response to changes in urban albedos and associated CO2 offsets, Environmental Research Letters 5 (2010). https://doi.org/10.1088/1748-9326/5/1/014005.

LEARN MORE

- WHAT IS A COOL ROOF?
- CRRC RATED ROOF PRODUCTS DIRECTORY

For more information and resources about cool roofs, visit **coolroofs.org**.

CRRC COOL ROOF RATING COUNCIL

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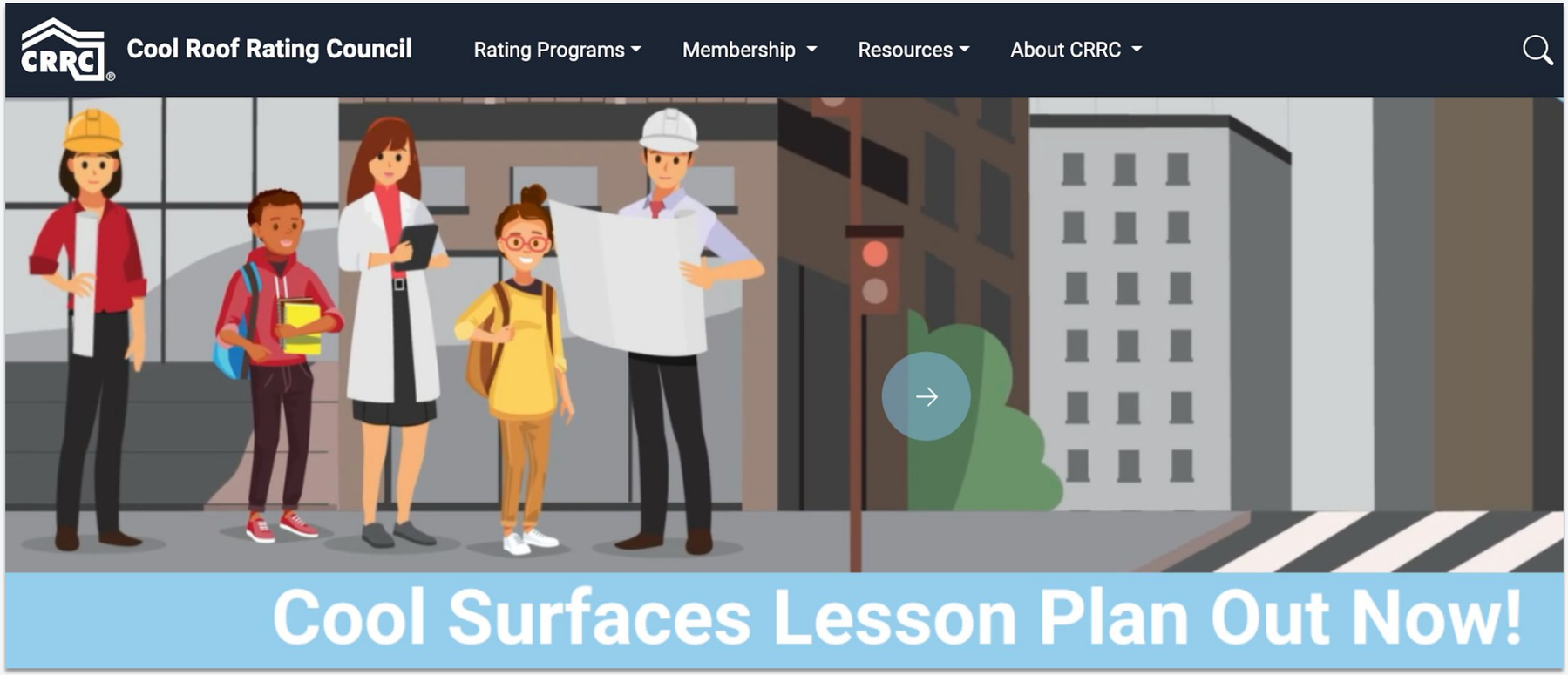
Cool Surfaces Lesson Plan



https://coolroofs.org/resources/cool-surfaces-lesson-plan#about-the-cool-surfaces-lesson-plan

Video: https://www.youtube.com/watch?v=Lb0O5mrhizY

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Thank you!

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