

Cool Roofing Memo

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Cool Roofing Memo

Cool Roofing Memo

The Cool Roofing Memo attached to the end of this POM explains the cool roofing terms, organizations, and codes.

The attached memo can be sent separately from this POM to customers requesting this information.

Background:

The metal roofing industry is deeply involved in environmental and energy efficiency issues surrounding roofing systems. The intent is to reduce energy consumption and urban heat island effects. It is theorized that if one can increase a roof's ability to reflect the sun's energy (reflectivity) and/or quickly emit the energy that it does absorb (emissivity) they can greatly reduce cooling costs and expand a roof's life. They refer to roofs that can do this as 'cool roofs'.

Design professionals and regulatory groups are incorporating cool roof concepts into building projects. Legislators in certain energy conscious districts are including cool roof requirements in their energy conservation programs. Some of those requirements are voluntary, others are mandatory. Some programs offer tax credits and financial incentives for utilizing cool roof materials. Cool roof programs are a reality and must become an integral part of our understanding and vocabulary.

The cool roofing trend is introducing new and unfamiliar terms, organizations, and codes that we all must get to know. A brief explanation of some of these is as follows:

Definitions:

Reflectivity:

Roof materials are significantly heated by sunlight (solar energy) more so than by surrounding ambient air temperature. A roof's ability to reflect that energy greatly reduces the amount of heat being transferred to a building's interior and likewise reduces energy costs for conditioning and cooling. A roof's ability to reflect solar energy is called its reflectivity. Reflectivity is reported as a decimal number less than one and represents the percentage of solar energy reflected off the roof.

Emissivity:

Recognizing that roof materials can't reflect all the solar energy and that they will be heated, it's important to look at a roof's ability to radiate back or emit absorbed energy back into its surroundings. A roof's ability to emit absorbed energy is called its emissivity. It also is reported as a decimal number less than one and represents the percentage of absorbed energy it will release to its surroundings.

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Solar Reflective Index (SRI):

Engineers have long recognized that the actual “operating” temperature of any roof surface is dependant not only on its ability to reflect solar energy and emit absorbed energy, but also upon a composite of conductive properties including existing climatic conditions. This “operating” temperature can be calculated mathematically in accordance with ASTM E 1980, “Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces”. It can then be stated numerically as a Solar Reflective Index or SRI. This Index will vary from a high of 100 to a low of 0. Materials with a high SRI are the coolest and therefore most desirable for a cool roof application. It is fast becoming common to define minimum code requirements in terms of SRI values since they are more realistic for real-world applications than just using reflectivity and emissivity values alone. Currently, LEED uses SRI values exclusively for its certification purposes and Energy Star is proposing to allow SRI as an acceptable alternative value for its certification.

Cool Roofing Organizations, Codes, etc.:

Energy Star:

In 1992, the Environmental Protection Agency (EPA) and Department of Energy (DOE) teamed up and launched a program to promote the use of various energy efficient products. They named that program Energy Star. In 1999, the list of Energy Star Products was expanded to include roofing products. Today, Energy Star is solely administered by the EPA, and the EPA has set strict requirements for a roofing product to be listed and labeled as being Energy Star compliant. The EPA allows partners to self-test roofing products. Self-testing is a cost effective, and efficient way for partners to test and qualify products.

The current requirements for all roofing products are:

Characteristic	Performance Specification
Low Slope ($\leq 2:12$)	
<i>Energy Efficiency Levels</i>	
Initial Reflectance	≥ 0.65
3-Year Reflectance	≥ 0.50
Steep Slope ($> 2:12$)	
<i>Energy Efficiency Levels</i>	
Initial Reflectance	≥ 0.25
3-Year Reflectance	≥ 0.15

Please note that Energy Star does not currently set any requirements for *emissivity* (ability to release or emit absorbed energy). However the EPA posts emissivity values for all products on the ENERGY STAR Qualified Products List to assist consumers in their purchasing decision. Longer term, EPA plans to revisit the possibility of adding an emissivity component to the ENERGY STAR specification.

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Effective August 2009, ENERGY STAR Version 2.1 Specification for Roof Products serves as an amendment to the previous ENERGY STAR Version 2.0. The only substantive change is that ENERGY STAR now allows products to qualify for ENERGY STAR certification using the CRRC Color Family Groups in accordance with the CRRC Product Rating Program Manual CRRC-1.

For more and current information, visit www.energystar.gov

LEED V3:

LEED is an acronym for **L**eadership in **E**nergy and **E**nvironmental **D**esign. It is a program of the U.S. Green Building Council. It is a voluntary rating system intended to rate a building's performance and long term sustainability. LEED rates an entire project on an overall scale. It assigns credits or points for achievement in a wide variety of categories. Metal roofs can contribute up to 3 points or more depending on the situation. Roofing is just one component of this assessment. Available credits (points) for roofing are:

LEED Credits:	Max points available:	ASC Profiles Support
SS Credit 7.2 – Heat Island Effect (Roof)	1	All ASC coatings that meet minimum SRI values (full LEED credit).
MR Credit 4.1 & 4.2 – Recycled Content. 10% and 20% respectively.	2	ASC supplied steel roofing and trims have 25.5% post consumer recycled content and 6.8% pre consumer recycled content (partial LEED credit based on all materials used on the project).

Below is an explanation of each of these credits and how to respond to LEED questions proposed by customers.

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LEED V3 (cont):

SS Credit 7.2 – Heat Island Effect: Roof

Intent

Reduce heat islands (thermal gradient differences between developed and undeveloped areas) to minimize impact on microclimate and human and wildlife habitat

Requirements

Use roofing materials having a Solar Reflectance Index (SRI) equal to or greater than the valued in the table below for a minimum of 75% of the roof surface.

OR

Install high albedo and vegetated roof surfaces that, in combination, meet the following criteria:
(Area or SRI Roof/0.75) + (Area of vegetated roof/0.5) >= Total Roof Area

Roof Type	Slope	SRI
Low-Sloped Roof	≤ 2:12	78
Steep-Sloped Roof	> 2:12	29

EXCEPTION TO THE RULE

(Submitted July 2, 2008)

LEED Credit Interpretive Ruling (CIR)

Can a project use a weighted average calculation to show credit compliance?

Yes, projects may use a weighted average calculation to achieve compliance equivalent to the required 75% threshold. As noted in v2.2 SSc7.2 CIR Ruling dated 6/19/2008, if the project applies for this credit under v2.2, the project may use the following formula to calculate credit compliance for multiple materials:

$$[(\text{Area of Roof A} * (\text{SRI of Roof A} / \text{Required SRI})) + (\text{Area of Roof B} * (\text{SRI of Roof B} / \text{Required SRI}))] / 0.75 + [\text{Area of Vegetated Roof} / 0.5] \geq \text{Total Roof Area}$$

Example:

A 20,000 sqft building has 10,000 sqft of low slope (≤ 2:12) roof and 10,000 sqft of steep slope (> 2:12) roof. The architect would like to use Cool Metallic Copper (SRV = 43.1 ; SRI = 47) on the entire roof.

$$[10,000 * 47 / 78 + 10,000 * 47 / 29] / .75 = 34,630$$
 which is greater than 20,000

Therefore the architect may use Cool Metallic Copper on the entire roof and get the full 1 point credit for SS Credit 7.2 – Heat Island Effect

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LEED V3 (cont):

MR Credit 4.1 / 4.2 : Recycled Content: 10% / 20% (post-consumer + 1/2 pre-consumer)

Intent

Increase demand for building products that incorporate recycled content materials, thereby reducing impacts resulting from extraction and processing of virgin materials.

Requirements

Use materials with recycled content such that the sum of post-consumer recycled content plus one-half of the pre-consumer content constitutes at least 10% (1 pt) and/or 20% (1 pt) (based on cost) of the total value of the materials in the project.

The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.

Post-consumer material is defined as waste material generated by households or by commercial, industrial and institutional facilities in their role as end-users of the product, which can no longer be used for its intended purpose.

Pre-consumer material is defined as material diverted from the waste stream during the manufacturing process. Excluded is reutilization of materials such as rework, regrind or scrap generated in a process and capable of being reclaimed within the same process that generated it.

The steel used in the panels that make up AEP Span's roof and wall panels is made in a Basic Oxygen Furnace facility (BOF). Steel made in a BOF facility contains an average post-consumer recycled content of 25.5%, and an average pre-consumer recycled content of 6.8%. (These values are based on data from the November 2009 issue of the Steel Recycling Institute publication *Steel Takes LEED with Recycled Content*.)

Post consumer recycled content is 25.5%

Pre consumer recycled content is 6.8%

Therefore the total = $25.5 + \frac{1}{2} * 6.8 = 28.9\%$ (2 points)

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CHPS:

CHPS is an acronym for Collaborative for High Performance Schools. The CHPS Board Members are from a broad range of government, private industry, and nonprofit organizations. CHPS oversees the nation's first green building rating program especially designed for K-12 schools. Similar to LEED, the CHPS Criteria is a comprehensive system of environmentally responsible benchmarks designed by the CHPS technical committee. It assigns credits or points for achievement in a wide variety of categories. Metal roofs can contribute up to 5 points depending on the situation. For example, installing a Cool Roof is 1 point, using Recyclable material is 1-2 points, potential credit for Waste Water collection, potential credit for construction waste management, etc. The CHPS program uses a scorecard and the following rules apply:

- 1) Major Modernization or a new building on an existing campus
 - a. Minimum points required to be a CHPS certified school is 25 out of 85.
- 2) New school
 - a. Minimum points required to be a CHPS certified school is 32 out of 85.

The CHPS Technical Committee offers credit interpretations for school districts and design teams with a registered CHPS project.

For more information visit: www.chps.net

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California High Performance Incentive (HPI) Program:

Proposition 1D set aside \$100 million for the High Performance Incentive (HPI) program to promote the use of high performance attributes in new construction and modernization projects for K-12 schools. Using CHPS guidelines, the California Division of the State Architects (DSA) established another criterion for California. The HPI amount will be based on the points attained by the district within the following five categories:

- Site
- Water
- Energy
- Materials
- Indoor Environmental Quality

Again metal roofs can contribute up to 5 points depending on the situation. The California HPI scorecard is the following:

- 1) Major Modernization or a new building on an existing campus
 - a. Minimum points required to be eligible for HPI credit is 20 out of 77.
- 2) New school
 - a. Minimum points required to be eligible for HPI credit is 27 out of 75.

The DSA will verify the HPI rating criteria to determine the number of points the project receives. These points are multiplied by a percentage factor which will ultimately provide an increase to the project's base grant ranging from two to ten percent.

For more information visit: www.dsa.dgs.ca.gov/OtherProg/hps.htm

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California Title 24 Energy Code:

California's energy standards are known as Title 24. The Energy Efficiency Standards for Residential and Nonresidential Buildings is the official name of Part 6 of the California Energy Commission's Title 24. It was established in 1978 in response to a legislative mandate to reduce California's energy consumption.

The principle concept of Title 24 is the energy budget. Each building gets an energy budget based on climate zone and building components. Each type of component, such as windows, HVAC and roofs, receives a baseline value which contribute to the budget. Individual components may exceed their baseline values, however, a building must meet the budget or no building permit will be issued. The 2005 Title 24 baseline budget for low-sloped non-residential buildings assumes that the standard building budget includes a cool roof component.

The standards adopted in October 2005, required that low-slope ($\leq 2:12$) new nonresidential building roofs and re-roofing projects over air-conditioned spaces meet a minimum reflectance of 0.70 and a minimum emittance of 0.75. The new standards proposed for 2008, require that low-slope ($\leq 2:12$) new nonresidential building roofs and re-roofing projects over air-conditioned spaces meet a minimum reflectance of 0.55 and a minimum emittance of 0.75 (see chart below for all 2008 proposed requirements).

There are several cities that adopted standards that exceed 2005 Title 24. California cities & counties include La Quinta, Los Altos Hills, Marin County, Mill Valley, Palm Desert, Rohnert Park, Santa Monica, Culver City, and Santa Barbara. Please contact E&M department for details.

There are two separate approaches an architect can take to assure energy code compliance:

- Prescriptive Method: You must demonstrate that the building complies with Title 24, and then demonstrate that the building complies with all of the relevant prescriptive requirements in the Tier 1 Prescriptive List. This means that the roof meets minimum reflectance and minimum emittance requirements
- Performance Method: An energy consultant makes an energy simulation with a computer program supplied by the California Energy Commission. The whole building complies if the total energy is less than that of the standard design (which includes a Cool Roof). The proposed design may or may not have a Cool Roof as long as total energy use is less than the standard design. Tradeoffs can include lighting, water heating, HVAC, windows, doors and walls to offset the lack of a Cool Roof.

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2008 Revision (goes into effect Jan 2010):

2008 Title 24 Prescriptive Standards for Cool Roofing						
Category	Aged TSR	Aged TE	Min SRI	Climate Zones	Comments	Reference Sections
<u>Non-Residential</u>						
Steep Slope (new construction and alterations)	0.20	0.75	16	2-16	<5 lb/ft ²	143/149
Steep Slope (new construction and alterations)	0.15	0.75	10	1-16	≥ 5 lb/ft ²	143/149
Low Slope (new construction and alterations)	0.55	0.75	64	2-15	(1)	143/149
<u>Residential</u>						
<u>Low Rise Steep Slope</u>						
New Construction < 5 lb/ft ²	0.20	0.75	16	10-15	(2)	151
Alterations < 5 lb/ft ²	0.20	0.75	16	10-15	(3)	152
New Construction ≥ 5 lb/ft ²	0.15	0.75	10	1-16	(2)	151
Alterations ≥ 5 lb/ft ²	0.15	0.75	10	1-16	(3)	152
<u>Low Rise Low Slope</u>						
New Construction	0.55	0.75	64	13,15	(2)	151
Alterations	0.55	0.75	64	13,15	(4)	152
<u>High Rise Low Slope</u> (new construction and alterations)	0.55	0.75	64	10,11,13,14,15		143/149

COMMENTS:

- (1) **EXCEPTIONS:** Metal building roofs in CZ 3 and 5 where U factor is 0.048; BIPV; roof > 25 lb/ft²
- (2) **EXCEPTIONS:** BIPV are exempt; roofs of ≥ 25 lb/ft² are exempt
- (3) **EQUIVALENCE:** Insulation with a thermal resistance of at least 0.85 hr-ft²- °F/Btu or at least a 3/4" airspace is added to the roof deck over an attic; sealed ducts; 1/150 ventilation in zones 10,12,13; buildings with at least R-30 ceiling insulation; radiant barrier in the attic; ductless attic; R-3 minimum roof deck insulation above vented attic in CZ 10,11,13 and 14
- (4) **EXCEPTION:** ductless attic

CRRC - Cool Roof Rating Council:

The **Cool Roof Rating Council (CRRC)** was created in 1998. Its stated purpose is to independently evaluate, certify, and report the solar reflectivity and emissivity of roofing products. After a difficult start, CRRC launched its product-rating program in January, 2003. Compliance with the CA Title 24 Energy Code requires that the approved roofing materials (in our case - coatings) be CRRC approved for low slope applications, unless architects seek compliance by the performance method (see CA Title 24 section above for clarification).

In order to be “listed” in the CRRC Directory, sample materials must be submitted to approved, independent accredited testing laboratories who measure and certify the results for the CRRC. Additionally, a random sampling program allows CRRC to monitor continuous compliance. Since changing our paint vendor to BASF now PPG, we are working to get all “Cool” colors listed with CRRC.

Visit the CRRC website for a complete listing of registered colors (www.coolroof.org).

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Important Note: The values published above by CRRC are lower than the actual measured values published in our literature. This is because PPG (previously BASF) used Color Family Groups to register ASC products. These values are default values and not the actual measured values.

The only way the actual initial Solar Reflectance would be listed on the CRRC Product List is if a full blown three year study was initiated requiring 9 panels of two different batches of each color be submitted to the three Atlas test sites for three years of exposure followed by measurement of the aged radiative properties by an AITL.

That said, the Solar Reflectance values published on the literature are accurate and were measured in accordance with ASTM E903 by a CRRC accredited AMTL. There is nothing wrong using this actual data in company literature intended for distribution to customers and architects. Furthermore, for LEED 2.2 certification, PPG would calculate the SRI using lab measured solar reflectance and emissivity. Do not use default CRRC values to calculate SRI, use the actual values published in the literature.

For more information, visit www.coolroofs.org

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Cool Roof Legislation:

Several energy conscious areas of the country have passed or introduced legislation that incorporates cool roof requirements. Some of the more noteworthy are:

- Georgia Energy Code
- California's Energy Code (Title 24)
- Florida State Energy Code
- Chicago Energy Conservation Code

These set strict limits on reflectivity and emissivity values and in some regions are rapidly changing from voluntary to mandatory programs. Many major cities such as Atlanta, Baton Rouge, Nashville, Sacramento, Salt Lake City, and Houston currently have or are seriously considering similar cool roof programs.

Energy Policy Act of 2005 (revised for 2009):

The Energy Policy Act of 2005, revised for 2009, provides federal tax credits for those who install energy efficient products from January 1, 2009, through December 31, 2010. There are three categories that are eligible for Tax Credits or Deductions (see below).

Tax Credits for Consumers (Home Improvements): (Jan. 1, 2009 to Dec 31, 2010)

Metal Roofs - 30% of cost, up to \$1500

All ENERGY STAR labeled metal roofs qualify for the tax credit.

- For existing homes only (not available for new homes) and must be principal residence
- Installation or labor costs are not included.
- Manufacturer's (ie ASC Profiles) Certification Statement required.

Note: Tax Credits for Consumers (Home Improvements) were not available in 2008.

Refer to the Energy Star Website for roof product listings:

- Excel: http://downloads.energystar.gov/bi/qplist/roofs_prod_list.xls
- PDF: http://downloads.energystar.gov/bi/qplist/roofs_prod_list.pdf

To claim the tax credit for energy efficient products "[placed in service](#)" in 2009, you will need to file the 2009 IRS Form 5695 and submit it with your 2009 taxes (by April 15, 2010). On the [2009 1040 form](#), the residential energy tax credit (from Form 5695) is claimed on line 52. For products "placed in service" in 2010, you would take the tax credit on your 2010 income taxes.

Also save your receipts and the Manufacturer's Certification Statement for your records. A Manufacturer's Certification Statement is a signed statement from the manufacturer certifying that the product or component qualifies for the tax credit. The IRS encourages manufacturers to provide these Certifications on their website to facilitate identification of qualified products.

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Tax Credits for Home Builders: (up to Dec. 31, 2010):

Eligible contractors need to fill out [IRS Form 8908](#) to get the tax credit. The IRS has provided the following guidance regarding the tax credits for constructing energy efficient new homes available under the Energy Policy Act of 2005:

[IRS Notice 2006–27](#) provides guidance for the credit for building energy efficient homes other than manufactured homes.

[IRS Notice 2006–28](#) provides guidance for the credit for building energy efficient manufactured homes.

Home builders are eligible for a \$2,000 tax credit for a new energy efficient home that achieves 50% energy savings for heating and cooling over the 2004 International Energy Conservation Code (IECC) and supplements. At least 1/5 of the energy savings must come from building envelope improvements. This credit also applies to contractors of manufactured homes conforming to Federal Manufactured Home Construction and Safety Standards.

There is also a \$1,000 tax credit to the producer of a new manufactured home achieving 30% energy savings for heating and cooling over the 2004 IECC and supplements (at least 1/3 of the savings must come from building envelope improvements), or a manufactured home meeting the [requirements](#) established by EPA under the ENERGY STAR program.

Please note that, with the exception of the tax credit for an ENERGY STAR qualified manufactured home, these tax credits are not directly linked to ENERGY STAR. Therefore, a builder of an ENERGY STAR qualified home may be eligible for a tax credit but it is not guaranteed.

These tax credits apply to new homes located in the United States whose construction is substantially completed after August 8, 2005 and that are acquired from the eligible contractor for use as a residence from January 1, 2006 through December 31, 2009.

Tax Deductions for Commercial Buildings: (up to Dec. 31, 2010):

A tax deduction of up to \$1.80 per square foot is available to owners or designers of new or existing commercial buildings that save at least 50% of the heating and cooling energy of a building that meets ASHRAE Standard 90.1-2001. Partial deductions of up to \$.60 per square foot can be taken for measures affecting any one of three building systems: the building envelope, lighting, or heating and cooling systems. These tax deductions are available for systems “[placed in service](#)” from January 1, 2006 through December 31, 2013.

This document is intended to be an educational piece and may not have the latest detailed information. Please refer to the Energy Star website for updates and downloadable forms: http://www.energystar.gov/index.cfm?c=products.pr_tax_credits

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Tax Incentives from Utilities:

Many utilities have set up tax incentive programs getting their consumers to be proactive about installing energy efficient products. Many of these programs referenced the Codes, Councils, and programs above to come up with their plan. These incentives offered by the utilities are above and beyond any Federal and State tax incentives. These incentives are subject to change. Some notable utilities that have tax incentives available are:

PG&E (Pacific Gas & Electric):

Sales Region: California

Program Name: Residential Cool Rebate

Product Requirements: Tier 1: Reflectivity ≥ 0.25 & Emissivity ≥ 0.75

Tier 2: Reflectivity ≥ 0.40 & Emissivity ≥ 0.75

Rebate: \$10/square – Tier 1 (depending on reflectivity)

\$20/square – Tier 2 (depending on reflectivity)

Utility Program information:

<http://www.pge.com/myhome/saveenergymoney/rebates/remodeling/coolroof/>

SMUD (Sacramento Municipal Utility District):

Sales Region: California

Program Name: Residential Cool Roof Program

Product Requirements: Reflectivity ≥ 0.40 and Emissivity ≥ 0.75

Rebate: \$10 per square with financing available from SMUD to pay for the re-roof

Utility Program information: www.smud.org/rebates/cool%20roofs/index.html

Southern California Edison (Pacific Gas & Electric):

Sales Region: California

Program Name: Cool Roof Rebate Program

Product Requirements: Tier 1: Reflectivity ≥ 0.25 & Emissivity ≥ 0.75

Tier 2: Reflectivity ≥ 0.40 & Emissivity ≥ 0.75

Rebate: \$10/square – Tier 1 (depending on reflectivity)

\$20/square – Tier 2 (depending on reflectivity)

Utility Program information:

www.sce.com/RebatesandSavings/Residential_Heating+and+Cooling/CoolRoof/

Los Angeles Dept. of Water & Power:

Sales Region: California

Program Name: Non-Residential Custom Performance Program (CPP)

Product Requirements: Reflectivity ≥ 0.70 and Emissivity ≥ 0.75 although lesser values may also provide savings depending on calculations

Rebate: \$0.08 per kWh based on expected energy saving performance

Utility Program information: www.ladwp.com/ladwp/cms/ladwp008836.jsp

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Florida Power & Light Company:

Sales Region: Florida

Utility Program information: www.fpl.com/business/savings/building_envelope.shtml

There may be more incentive based programs throughout the country. Please check your local utility to see if they have a tax incentive/rebate program for installing cool metal roofing.

Summary:

Many of these codes and organizations continue to grow, especially with the ever increasing concerns about high energy costs, global warming, etc. These programs will all be monitored and this Cool Roofing Memo updated as needed.

The following Quick Reference Chart provides a simple overview of all the cool roofing policies.

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Current Cool Roof Policies **

Policy	Policy Req't's ¹	Minimum Initial SR	Minimum Aged SR	Minimum Emittance	Notes
Energy Star					
Low Slope (\leq 2:12)	N/A	.65	.50	---	
High Slope ($>$ 2:12)	N/A	.25	.15	---	
LEED v2.2					
Low Slope (\leq 2:12)	Credit	---	---	---	Min SRI of 78
High Slope ($>$ 2:12)	Credit	---	---	---	Min SRI of 29
CA Energy Code (Title 24)	Required	.70	---	.75	
ASHRAE					
90.1 Commercial	Credit	.70	---	.75	
90.2 Residential		.65	---	.75	
IECC	Credit	.70	---	.75	
Chicago Energy Conservation Code					
Low Slope (\leq 2:12)	Mandatory	.25	.25	---	
Moderate Slope (2:12-5:12)	Mandatory	.15	.15	---	
FL State Energy Code					
Commercial	Required	.65	---	.80	
Residential	Credit	.65	---	.80	
Georgia Energy Code	Required	.70	.75	---	

Notes:

1 – “Mandatory” = refers to policies where cool roofs must be used to comply; “Required” – refers to policies where cool roofs are not mandatory, but an energy penalty is given if one is not used; “Credit” – refers to policies where cool roofs are not mandatory, but an energy credit is earned if one is used.

** Data within chart is not all-inclusive and is for reference purposes only. Please refer to specific policies for detailed program information.