



# **COOL METAL ROOFING MEMO**



# Cool Roofing Memo

This document is designed to provide a broad overview on Cool Roofing Topics specific to metal roofing. For questions and further information on this topic, please submit your inquiry via [Ask ASC](#) on [ascbp.com](#)

## Background

The meteorological phenomenon of the urban heat island effect, outlines that the materials in most city buildings and roads reflect much less solar radiation compared to the vegetation they replace. This retained solar radiation drives up temperature in urban areas. For example, fresh asphalt reflects only 4% of sunlight compared to as much as 25% for natural grassland. The heat island effect drives up energy consumption, primarily due to higher cooling costs. Higher temperatures can also have negative impact on urban dwellers including health issues.

Solutions to reduce the heat island effect include selecting efficient roofing materials. A primary driver of material efficiency is material composition, color, and pigment technology.

Paints achieve color through pigments (an insoluble powder). Cool pigments, found standard on most metal roofing products, are scientifically modified pigments that more effectively reflect heat. Several building products, including metal, use cool pigments. Cool pigments typically have no impact on visual color depth. Cool pigments enhance the reflectivity of colors, but still don't replace natural properties. Light colors with cool pigments still offer superior reflectivity to dark colors with cool pigments.

## Definitions

### Solar Reflectance and Emissivity

Solar radiation reaches the earth's surface in three distinct wavelengths: ultraviolet, infrared, and visible light. Near infrared (NIR) radiation is responsible for heat build-up within a structure. Two key metrics used to assess color efficiency - Solar Reflectance and Emissivity.

Solar Reflectance measures the amount of total solar radiation, visible and non-visible (infrared and ultraviolet) light that is reflected from a surface (this may also be called Total Solar Reflectance).

- SRV is expressed as a percentage from 1 to 100;
- The higher the number the more solar radiation that is reflected
- In roofing materials, the higher the value the better (more reflective)

Emissivity denotes a surfaces ability to dissipate heat away from itself (or re-radiate infrared energy)

- Emissivity is expressed as a decimal from 0.0 – 1.0,
- An emissivity closer to 1 represents a surface that re-radiates the majority of its absorbed energy.
- For roofing material, a high emissivity value is better
- Emissivity can vary by material type – metal offers excellent emissivity

## **Solar Reflectance Index (SRI)**

The Solar Reflectance Index (SRI) is a metric that incorporates both Solar Reflectance and Thermal Emissivity. SRI is a singular metric that assesses the impact of solar radiation on a surface and the transfer of heat to the structure with factors such as air flow considered.

SRI offers the best metric to evaluate and compare thermal efficiency between colors. This is why it is common in building codes and green building requirements. SRI is a scale from 0 to 100. Materials that absorb and retain solar radiation have a lower number, whilst highly reflective materials have a higher number. Materials degrade at different rates due to weathering variables such as trapped dirt, urban grime, color fade etc. These factors can influence thermal performance. To capture this change, building programs may request both initial and aged SRI values. Initial represents the SRI when new, and aged represents performance after 3 years of installation in accordance with ASTM testing. A key advantage of metal is that its aged SRI performance does not degrade with time, offering stable SRI performance for 10 to 20 years and beyond.

## **Other Considerations**

Roof slope can have a significant impact on heat transfer to the structure. Slope refers to the pitch of the roof, or the angle of the roofing surface. In roofing, there are two primary types, low slope, and steep slope. Low slope refers to a pitch or angle between 0 and 9.5 degrees off horizontal and steep slope is everything above. Roof slope is typically determined by factors such as building size, design objectives, budget, and the need to manage internal building volume. Most large footprint structures (such as warehouses) will use a low slope design, to reduce internal attic space or roofing costs. Most residential buildings fall into the steep slope category. Low sloped roofs face the sun more consistently or for a greater period throughout the day, resulting in a greater opportunity to absorb heat. This is why most building programs will require a higher SRI value for low slope roofs.

## **The Cool Roof Rating Council (CRRC)**

The Cool Roof Rating Council (CRRC) is an independent, non-profit organization that develops fair, accurate, and credible methods for evaluating and labeling the radiative properties of roofing and exterior wall products.

The mission of the CRRC 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. The CRRC is the primary entity responsible for independently testing and accrediting the aged performance of SRI values. Programs such as California's Title 24, products must be listed with CRRC to achieve program accreditation.

The CRRC is a great resource for gathering SRI data as it manages a database of roofing materials with independently verified initial and aged SRI data. This database covers many different materials and roofing product types. The database can be found at <https://coolroofs.org/directory/roof>. All ASC Building Products standard DuraTech XL colors are listed in this directory.

# Cool Roofing Building Programs

## LEED V4.1

LEED is an acronym for Leadership in Energy and Environmental Design. 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:

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

LEED Credits	Max Points Available	ASC Profiles Support
SS Credit 7.2 – Heat Island Reduction (Roof)	1-2	All ASC coatings that meet minimum SRI values (full LEED credit).
MRC3 – Recycled Content. 25%	1-2	ASC supplied steel roofing and trims have 30%-40% post consumer recycled content and 20%-35% pre consumer recycled content (partial LEED credit based on all materials used on the project).

## SS Credit 7.2 – Heat Island Reduction: 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:  
 $(\text{Area or SRI Roof}/0.75) + (\text{Area of vegetated roof}/0.5) \geq \text{Total Roof Area}$

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:

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

#### Example:

A 20,000 sqft building has 10,000 sqft of low slope ( $\leq 2:12$ ) 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.

$[10,000 \times 47 / 78 + 10,000 \times 47 / 29] / .75 = 34,630$  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

Note: ASC Building Products publishes SRI values on the “Color” section of the website to assist users in the identification of the appropriate roofing color. Visit [www.ascbp.com/metal-roofing-colors/](http://www.ascbp.com/metal-roofing-colors/) to learn more.

### **MRC3 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 ASC Building Products' roof and siding 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)

## 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.

To achieve this and similar to LEED, Title 24 has reflective requirements for structures based on construction type, occupancy type, slope, and climate zone (location). Climate zones with more pronounced heat island effects and cooling loads, have higher reflective requirements.

In general, Title 24 requires minimum aged solar reflectance, thermal emittance and SRI values based on climate zone, the delineation of low slope or steep slope and if the building is commercial or residential. Title 24 establishes the CRRC as the supervisory entity responsible for administering the program and products and must have CRRC verified aged data.

The code is nuanced and detailed with several additional standards for select cities and jurisdictions. It is recommended to access the latest rules and regulations directly via the energy commission <https://www.energy.ca.gov/>

For questions related to ASC Building Products' metal roofing solutions and Title 24, please submit an inquiry via [Ask ASC](#) on [ascbp.com](http://ascbp.com).



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