COLORSTEEL® & Reflectivity

Light Reflectance & Solar Reflectance

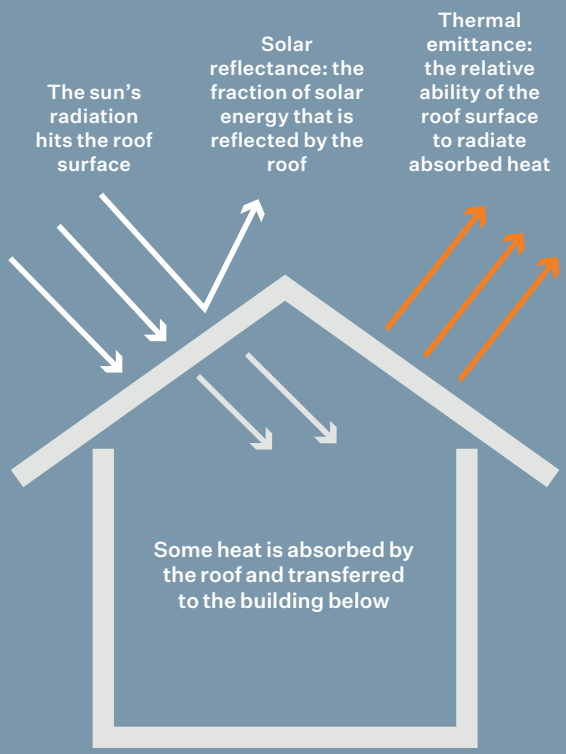
A reflection of our exacting standards

There are two measures of light or solar reflectance that, on the surface, appear to refer to the very same thing. On closer inspection, however, it's clear they are used for quite different purposes.

Total Solar Reflectance (TSR) measures the amount of solar energy across the entire spectrum that is reflected away from an object. This correlates closely to the temperature that the object will reach on a hot summer's day.

Light Reflectance Value (LRV) on the other hand, focuses solely on the total quantity of visible light that, when illuminated by a light source, is reflected by a surface in all directions and at all wavelengths. LRV runs on a scale from 0% (absolute black) to 100% (perfectly reflective white), with all other colours fitting within these extremes. With LRV of 0%, black absorbs all light. Pure white, conversely, has a light reflectance of 100% and absorbs no light. LRV is an indicator of how the human eye sees a colour and of that colour's brightness.

It's possible, therefore, to have colours that look the same and have the same or similar Light Reflectance Values, but which reach quite different temperatures in the sun. Equally, you could have two colours where one appears darker than the other, but both reach the same temperature when exposed to the sun.



The power of infrared reflectance technology

To determine the TSR of COLORSTEEL® colours, research laboratories exposed a sample of each colour to a full range of wavelengths between 250nm and 2500nm and then measured the reflectance at each 0.5nm step.

To obtain the LRV of pre-painted steel colours, a full range of wavelengths, between 400nm and 800nm, was measured with a spectrophotometer and then weighted using the CIE Standard Observer methodology.

This data was used to develop a range of pigments that reflect a larger proportion of the sun's energy in the near-infrared region.

This cutting-edge infrared technology was then incorporated into COLORSTEEL® paint systems to deliver durability and measurable energy savings in both domestic and commercial situations[1].

IR technology now enables popular COLORSTEEL® colours such as Karaka and Ironsand to remain visually identical, while providing a cooler roof surface on hot summer days.

Cost-effective in summer

In summer, when the sun is at its most intense for greatly increased periods, extreme levels of solar energy land on a roof. Depending on the nature of the structure, this can produce a high level of heat within the building itself. This, in turn, often requires the near constant use of power-hungry electric cooling systems.

The IR technology present in COLORSTEEL® enables a reduction in roof temperature, particularly in darker colours. This can moderate the temperature of the internal environment and reduce required cooling costs when compared to roofing materials of a similar colour with low solar reflectance[2].

Of course, depth of colour has a major impact on a roof's heat levels. Specifying lighter colours undeniably reduces temperatures. However, building design and appropriate insulation can also affect this.

The Metal Roofing Manufacturers' (MRM) Code of Practice provides the following approximate temperatures that a lightweight metal roof can be expected to reach on a hot summer's day in New Zealand.

COLOUR DEPTH/ INSULATION	DEGREES CELSIUS
Insulated dark colour	80°
Insulated light colour	60°
Uninsulated dark colour	65°
Uninsulated light colour	50°

In areas where aesthetic preference or local regulations dictate a darker colour, the use of COLORSTEEL® with IR reflectance will successfully lower roof temperatures by up to 8 degrees Celsius, depending on the colour.

Temperature-neutral in winter

In New Zealand's winter months, with the sun lower in the sky, greater cloud cover and shorter daylight hours, the effect of IR reflectance technology is reduced. Providing suitable design features (particularly around insulation) are in place, internal heat retention should not be an issue.

With an eye on the environment

Reduced LRV values may also prove helpful when meeting local authority guidelines in relation to the reflectivity of roofing and cladding materials. These restrictions are generally applied to coastal locations or other visually attractive or significant landmarks, with the aim of preserving the natural amenity and character of the area. In these instances, LRV will provide the best measure of visible reflectance.

Reflectance Measures of COLORSTEEL®

COLORSTEEL® COLOUR	TOTAL SOLAR REFLECTANCE %	LIGHT REFLECTANCE VALUE %
Cloud	72	76
Desert Sand	58	51
Ebony	5	5
FlaxPod®	25	7
Grey Friars	28	10
Gull Grey	57	50
Ironsand	28	8
Karaka	25	8
Lichen	44	28
Lignite	30	11
Mist Green	40	25
New Denim Blue	25	11
Permanent Green	26	10
Pioneer Red	36	15
Sandstone Grey	42	27
Scoria	32	12
Slate	27	9
Thunder Grey	30	12
Titania	67	69
Windsor Grey (G10)	23	7

[1] Due to their pigment composition, Ebony, KowhaiGlow® and FlaxPod® cannot be produced with solar reflectance technology. Figures are also available for many non-standard colours. Please contact New Zealand Steel for more information.
[2] Results depend on level of insulation, building shape and function. Average reduction is approximately 5%.

For more information about COLORSTEEL® products
call **0800 697 833** or visit **colorsteel.co.nz**

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