Colorbond®

COLORBOND® STEEL COOL ROOFING COLOURS

For Building Professionals

BlueScope

A responsible choice for today and tomorrow

As the world rises to meet the challenges of changing climate, energy conservation and decarbonisation, technology continues to reshape the way our urban environments are designed, built and managed.

BlueScope is committed to an ongoing program of collaboration, research, and development to bring industry leading innovation to our COLORBOND® steel products. For decades we have worked in close collaboration with global coatings suppliers and key stakeholders such as commercial architects, specifiers, and builders to continually improve the durability and performance of our products.

A 'cool roof' is made from materials designed to have high solar reflectance and thermal emittance, to help keep the roof surface temperature cooler in the sun. A roof surface which reflects sunlight and emits thermal infrared radiation stays cooler than a roof surface that absorbs sunlight and limits thermal infrared radiation. The performance of a cool roof, including potential energy savings and thermal comfort improvements, depends on a wide range of factors including building type, design, location, and other considerations such as insulation, the way the building is used and the type and efficiency of heating and cooling systems.

The COLORBOND® steel cool roofing colours bring together a number of our proprietary coatings and manufacturing technologies whilst offering a higher level of thermal performance. The COLORBOND® steel cool roofing colours have the potential to improve thermal comfort, reduce the need for air conditioning and lower ongoing energy bills.[1]

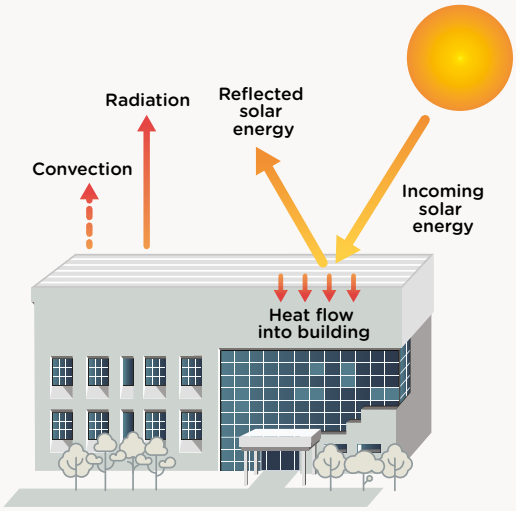
These cool roofing colours all feature low Solar Absorptance (SA) values of less than or equal to 0.45, which enables deemed-to-satisfy compliance for the roof cladding material within the National Construction Code (NCC) Section J energy efficiency provisions.

Cool roofs explained

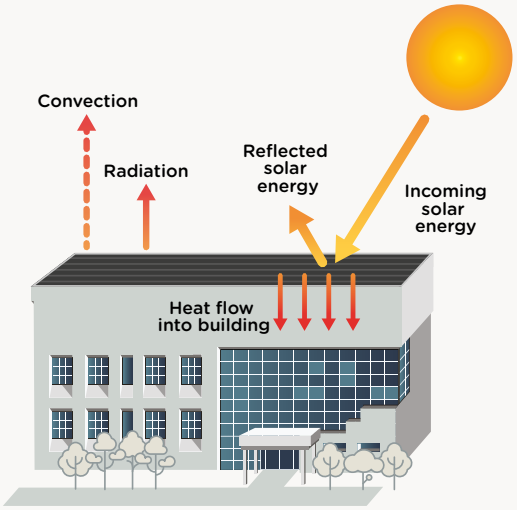
As the challenges of climate change and energy conservation become more urgent, it's helpful to understand the fundamental science that has inspired the development of the COLORBOND® steel range of cool roofing colours and their technologies.

The two key surface properties that determine a roof's temperature are solar reflectance and thermal emittance. Both are measured on a scale from 0 to 1. The higher the values, the cooler the roof surface will remain.

Cool roofs combine high solar reflectivity and high thermal emittance to reduce energy absorbed into the roof that converts to heat.



Cool roofs – limit heating due to high reflectance of solar energy and maximise heat loss via radiation due to high thermal emittance.



Hot roofs – cause heating due to low reflectance of solar energy and low loss of heat via radiation due to low thermal emittance. Heats the outdoor air due to convection.

What is solar reflectance?

Solar reflectance is the ability of a material to reflect and not absorb energy from the sun. While some dark-coloured roofs can potentially absorb 90% or more of incoming solar energy causing them to heat up, cool roofs with high solar reflectance properties can absorb significantly less of the incoming solar energy and reflect the energy and heat away from the building.

What is thermal emittance?

Thermal emittance is how efficiently a material or surface cools itself by emitting thermal radiation. A bare metal surface, for example, would have low thermal emittance so would stay warmer. By contrast, a light-coloured pre-painted surface, such as a COLORBOND® steel cool roof colour, would have higher thermal emittance, helping to keep that surface cooler.

Cool roofing benefits

Cool roofing materials can potentially provide a range of benefits such as[1]:

- improving building occupants' thermal comfort
- reducing air conditioning equipment capital costs due to reduced cooling capacity required
- reducing ongoing air conditioning equipment operational costs through energy savings
- extending roof system life by decreasing expansion and contraction
- reducing air conditioning equipment maintenance costs and prolonging life due to reduced operational demands
- keeping solar panels cooler and generating more efficiently
- reducing energy demand, which can mean reduced greenhouse gas emissions from power generation
- mitigating the effects of Urban Heat Islands

1. Actual cool roofing performance will depend on a wide range of factors including roof colour, roof shape, level and location of insulation, type, location, shape, and function of the building.

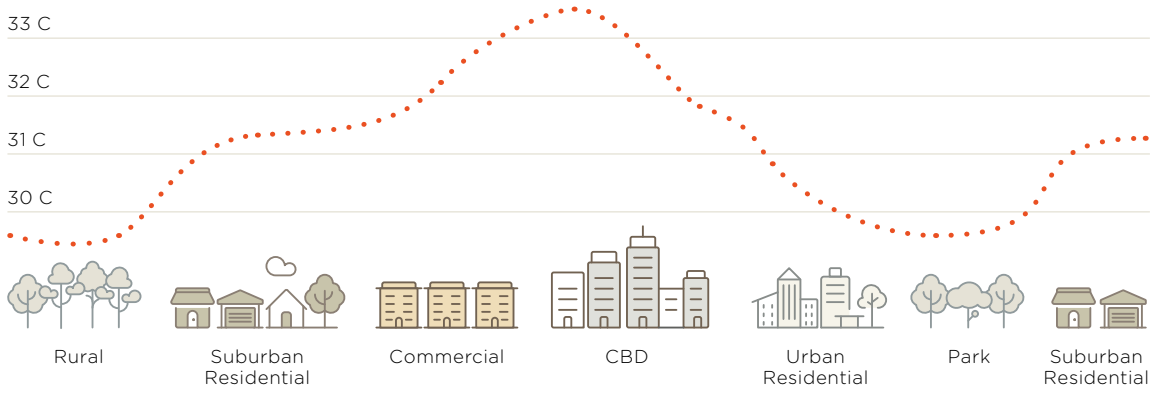
THE EFFECTS OF URBAN HEAT ISLANDS

The concept of Urban Heat Islands (UHIs) has been well understood for decades.

UHIs can form over time where vegetation is replaced with non-reflective, high mass, water resistant and impervious surfaces – our built environment.

The increased absorption of solar energy in high mass, often dark-coloured roofing materials can contribute to elevated local temperatures. Particularly in hot summers, this can impact thermal comfort, increase energy consumption, and drive peak energy demand. In turn, these demands can elevate emissions and may contribute to heat related health conditions.

While temperature spikes are readily observed in cities, they are not limited to busy urban centres. They can evolve around a single building, suburbs, or entire regions. Features of local and regional topography and climate – such as prevailing winds or seasonal rains – can also affect their strength and persistence.



UNDERSTANDING SOLAR CLASSIFICATIONS

Surfmist®
SA = 0.33
SRI = 81

As shown in this example for Surfmist®, the thermal efficiency of COLORBOND® steel cool roofing colours are indicated with two key measures: Solar Absorptance (SA) value and Solar Reflectance Index (SRI)[2].

The Solar Absorptance (SA) expressed as a value between 0 and 1, indicates the proportion of incoming solar radiation that is absorbed by the roofing material. In this case, a lower SA indicates that the roofing colour choice can help keep the roof space and building cooler on hot days. It is used to classify materials under the National Construction Code (NCC).

In Volume One of the NCC, which primarily regulates commercial, industrial and public assembly buildings, the SA of upper roof surfaces is required to be less than or equal to 0.45 to use the 'deemed-to- satisfy' pathway to compliance. All COLORBOND® steel cool roofing colours meet this specification.

The Solar Reflectance Index (SRI) provides a metric to compare the roof surfaces. It's calculated using both the solar reflectance and thermal emittance values described above. The higher the SRI, the cooler the surface temperature of the roof will be in the sun.

2. Solar absorptance has been measured in accordance with ASTM E903-96, Standard Test Method for Solar Absorptance, Reflectance, and Transmittance of Materials Using Integrating Spheres. The COLORBOND® steel Solar Absorptance values are nominal values based on new product and measured in accordance with ASTM E903-96. Solar Reflectance Index has been determined in accordance with ASTM E1980-11, Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces'.

INNOVATIVE BLUESCOPE TECHNOLOGY

As one of Australia's largest manufacturers, BlueScope is committed to an ongoing program of collaboration, research, and development to bring industry leading innovation to our COLORBOND® steel products.

Our protective coating technologies – many exclusive to BlueScope and including proprietary intellectual property – combine with COLORBOND® steel's inherent strength and durability to offer a truly versatile and high performing design solution.

Like all COLORBOND® steel products, our cool roofing colours, coatings and protective systems have been developed and proven through our long-standing outdoor exposure and accelerated laboratory testing program. This program replicates some of the harshest climate conditions in both natural and built environments around Australia to help us continually improve the performance and durability of our products.

Stockland Shopping Centre, Hervey Bay, QLD

Various studies have been undertaken using this Stockland Shopping Centre as a reference case to better understand roof microclimate and compare the performance of COLORBOND® Coolmax® steel in the colour Whitehaven® with roofing made from conventional ZINCALUME® steel.

The findings of a detailed analysis using Computational Fluid Dynamics and Dynamic Thermal Simulation are featured here:

COLORBOND® STEEL COOL ROOFING COLOURS

Inspired by nature and developed for our diverse and extreme environments, COLORBOND® steel has always celebrated the colours, textures and light of Australia's unique landscapes.

These cool roofing colours all feature low Solar Absorptance (SA) values of less than or equal to 0.45, which enables 'deemed-to-satisfy' compliance for the roof cladding material within the National Construction Code (NCC) Section J energy efficiency provisions.

COLORBOND® COOLMAX® STEEL

Whitehaven®
SA = 0.23
SRI = 95
C

Dover White™
SA = 0.28
SRI = 88

Surfmist®
SA = 0.33
SRI = 81
U

Classic Cream™
SA = 0.33
SRI = 81

Galactic®
SA = 0.34
SRI = 80

Surfmist® Matt
SA = 0.35
SRI = 78

Cosmic®
SA = 0.39
SRI = 73

Southerly®
SA= 0.40
SRI = 71

Evening Haze®
SA = 0.43
SRI = 67

Paperbark®
SA = 0.43
SRI = 67

Shale Grey™
SA = 0.44
SRI = 66
U

Legend

SA = (Solar Absorptance) is a measure of how much of the sun's heat that a material absorbs. Choosing a colour with a lower SA is a cooler option and may help you meet building regulations such as the NCC. These are nominal values based on new product and measured in accordance with ASTM E903-96.

SRI = (Solar Reflectance Index) provides a guide of a surface's ability to reject solar heat on the basis of the relative temperature of surfaces with respect to a reference black (SRI=0) and white surface (SRI=100). The SRI value of a surface is calculated from its solar reflectance and thermal emittance. These are nominal values based on new product and determined in accordance with ASTM E1980-11.

U Available in COLORBOND® Ultra steel for coastal and industrial environments. Other colours in the Classic finish may be available on request.

C Only available in COLORBOND® Coolmax® steel. Available exclusively in the colour Whitehaven®.

COLORBOND® COOLMAX® STEEL OPTIMUM THERMAL PERFORMANCE

Innovative COLORBOND® Coolmax® steel is a tailored roofing product designed to provide and maintain high solar reflectance. The technology behind COLORBOND® Coolmax® steel includes an optimised combination of durable ingredients to create our highest solar reflective product. Tested by our scientists in the laboratory and under extreme Australian conditions, COLORBOND® Coolmax® steel is BlueScope's ultimate product for cool roofing performance whilst maintaining the COLORBOND® steel durability that's required for commercial and industrial roofing applications in Australia.

Available exclusively in the colour Whitehaven®, it has a nominal Solar Reflectance (SR) of 0.77, meaning that 77% of the sun's heat is reflected[3].

Achieving a Solar Reflectance Index (SRI) of 95, the highest of any BlueScope product[4], COLORBOND® Coolmax® steel may help to[4]:

- reduce roofing surface temperature
- keep the building interior cooler
- reduce demand on air conditioning and reduce energy costs
- reduce peak cooling loads
- mitigate effects of Urban Heat Islands
- keep solar panels cooler and boost their performance

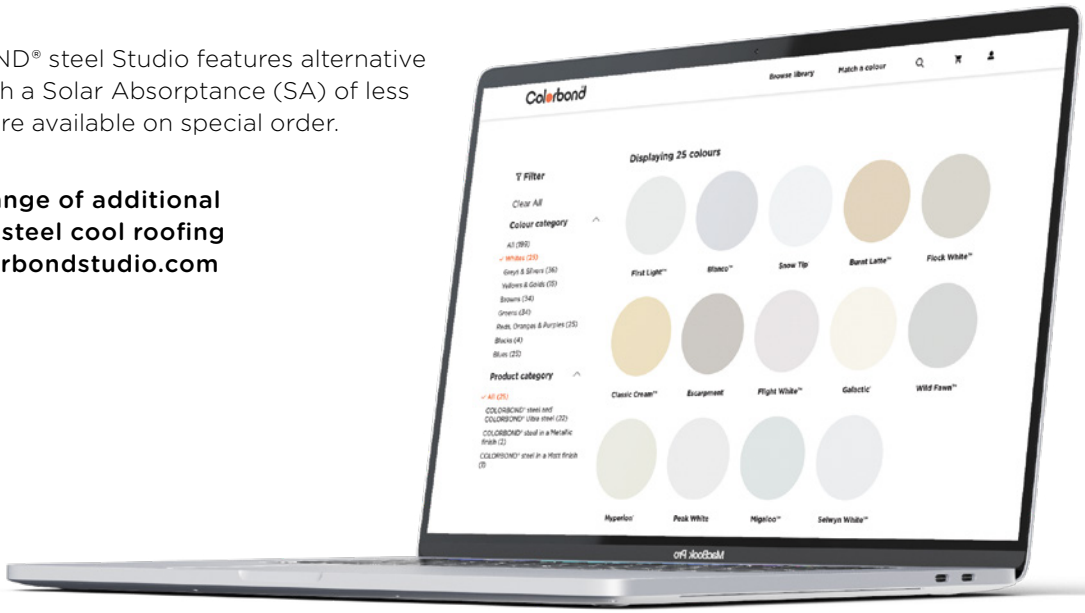
3. Values are based on new product and measured in accordance with ASTM E903-96 and ASTM E1980-11. COLORBOND® steel products' Solar Reflectance (SR) and Solar Reflectance Index (SRI) values may vary as product ages.

4. Results will depend on a wide range of factors including roof colour, roof shape, level and location of insulation, type, location, shape, and function of the building.

ADDITIONAL COOL COLOUR CHOICES FROM THE COLORBOND® STEEL STUDIO

The COLORBOND® steel Studio features alternative cool colours with a Solar Absorptance (SA) of less than 0.45 that are available on special order.

View the full range of additional COLORBOND® steel cool roofing colours at colorbondstudio.com



Performing Arts Centre, Penrith Anglican College, NSW

On 4 January 2020, Penrith in Sydney's Western suburbs was officially the hottest place on earth. While the Bureau of Meteorology recorded a record-breaking 48.9 degrees[5], heat research commissioned by the Penrith City Council recorded temperatures rising as high as 52 degrees in the local government area[6]. COLORBOND® steel Surfmist® in a Classic finish with a Solar Absorptance (SA) value of 0.33 was a sensible choice for this expansive and visually striking roof, designed by TERROIR architects.

5. Source: 'BOM, 'Greater Sydney in January 2020: record heat, severe storms, smoke and dust', 3 February 2020.
6. Source: Pfautsch S., Wujeska-Krause A., Rouillard S. (2020) Benchmarking Summer Heat Across Penrith, New South Wales. Western Sydney University, 56 p.

Capecare Dunsborough, WA

Aged care and independent living facility by Gary Batt Associates Architects. The roof cladding is COLORBOND® Ultra steel Shale Grey™ in a Classic finish with a Solar Absorptance (SA) value of 0.44.

Building a sustainable future

BlueScope is committed to creating products designed not just for durability and performance but also with sustainability and compliance at top of mind. Design and specify with confidence, knowing that COLORBOND® steel is manufactured with these environmental and sustainability credentials:

SUPPORTING A CIRCULAR ECONOMY

Steel itself is 100% recyclable. Steel's inherent properties allow it to be reused or recycled without loss of quality over and over again. COLORBOND® steel incorporates pre- and post-consumer recycled steel content, in addition to the steel that is reclaimed within BlueScope's steelmaking, coating and painting operations.

Designed for longer life

Innovations to improve durability and resilience such as Activate® technology can help conserve resources and energy that may otherwise be invested in products with shorter life spans. COLORBOND® steel with Activate® technology incorporates BlueScope's industry-leading metallic coating to provide enhanced corrosion resistance. The coating incorporates aluminium, zinc and magnesium (designated 'AM') in unique composition and microstructure and was developed to improve corrosion resistance compared to aluminium/zinc alloy coating ('AZ'). The compounds 'activate' the metal coating to provide more effective, longer-lasting sacrificial protection to COLORBOND® steel products.[7]

BlueScope is a founding member of ResponsibleSteel™

The industry's first global multi-stakeholder standard and certification initiative supports the responsible sourcing and production of steel. BlueScope's Port Kembla, NSW Steelworks, where the steel base in COLORBOND® steel is manufactured, is certified to the ResponsibleSteel™ Site Standard.

Global GreenTagCert™ GreenRate™ Level A Certification

Selected COLORBOND® steel exterior roofing and walling products are certified with this program, which provides a holistic sustainability assessment of building products to ensure they meet the GreenRate™ criteria, comply with the National Construction Code and meet the requirements of the Green Star product credits.[8]

Environmental Product Declarations (EPDs)

EPDs are available for selected COLORBOND® steel products. An EPD, based on Life Cycle Assessment (LCA), provides transparent and credible information about the environmental impacts of a product across its lifecycle. EPDs are recognised in environmental rating tools such as Green Star and IS Rating.

COLORBOND® steel's EPD's can be accessed here: steel.com.au/sustainability

7. Activate® technology is not available for COLORBOND® steel products with a galvanised steel substrate.

8. This applies to COLORBOND® steel with Activate® technology in the 22 core colours in the Classic finish for exterior roofing and walling (0.42mm and 0.48mm). Excludes COLORBOND® steel products with galvanised steel substrate.

Rated for environmental performance

Our environmental and sustainability credentials are recognised by a number of national and international rating tools. These credentials can help building owners, developers, and designers to achieve and improve upon desired ratings.

Green Star

Green Star is Australia's largest voluntary sustainability rating system for buildings, building fit outs and communities. Launched by the Green Building Council of Australia (GBCA) in 2003, Green Star assesses the sustainability attributes of a project. Different categories of sustainability impact allocate 'credits' that define clear outcomes a project must meet. Once all credits achieved are compared against credits available in the rating tool, a project can be awarded a certified Green Star rating. Currently, a number of Green Star rating tools include credits that may be gained through the use of COLORBOND® steel.

For more information visit steel.com.au/sustainability

NABERS

The National Australian Built Environment Rating System (NABERS) is a rating system that measures the environmental performance of Australian commercial buildings and tenancies. NABERS rates the energy efficiency, water usage, waste management and indoor environment quality of a building or tenancy and its impact on the environment. Providing a national standard to measure and compare similar buildings, commercial office buildings can be rated on a scale of zero to six stars. As Heating, Ventilation and Air-Conditioning (HVAC) systems typically account for the majority of energy costs in a commercial building, the range of COLORBOND® steel cool roofing colours can play an important role in increasing a building's energy efficiency by potentially helping to reduce equipment loads, which may contribute to improving the building's NABERS rating.

Infrastructure Sustainability Rating

COLORBOND® steel is also included in the Infrastructure Sustainability Council of Australia's ISupply Directory which connects sustainable products and services with projects and assets undertaking Infrastructure Sustainability (IS) ratings.

Colorbond®

PERFORMANCE BACKED BY BLUESCOPE WARRANTY

When you purchase COLORBOND® steel you are buying products made and backed by BlueScope, one of Australia's largest manufacturers. BlueScope offers a variety of warranties* subject to application and eligibility criteria. Visit bluescopesteel.com.au/warranties for more information.

Bulli Hospital & Aged Care Centre, NSW

The roof cladding is COLORBOND® Coolmax® steel in the colour Whitehaven® with a Solar Absorptance (SA) value of 0.23. Designed by architects Billard Leece Partnership.

RESEARCH, DESIGN AND SPECIFY

Visit SteelSelect® for easy access to a one-stop source for product information, technical data, CAD and texture files, design inspiration, case studies and specification tools from Australia's leading steel product manufacturers.

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*Warranties are subject to exclusions, application, and eligibility criteria. For full terms and conditions and to determine the eligibility of your product for the warranty visit bluescopesteel.com.au/warranties or contact BlueScope on 1800 800 789. Warranties provided by BlueScope do not affect consumer rights under the Australian Consumer Law.

COLORBOND® steel colour swatches and images shown in this brochure have been reproduced to represent actual product colours as accurately as possible. However, we recommend checking your chosen colour against an actual sample of the product before specifying, as varying light conditions and limitations of the printing process may affect colour tones.

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BlueScope

• Front Cover: Penguin Parade Visitor Centre, Philip Island, VIC by TERROIR architects.