

TATA STEEL



Colorcoat Renew SC[®]
Integrated solar air heating solution



TATA STEEL

Tata Steel is one of Europe's largest steel producers. We serve many different and demanding markets worldwide, including aerospace, automotive, construction, energy & power, and packaging. Our primary steelmaking operations in the UK and the Netherlands are supported by a global sales and distribution network.

Innovation and continuous improvement are at the heart of our performance culture. We aim to create value by offering a sustainable and value-added steel product range supported by unrivalled customer service. By working in partnership with you, we find the best solutions to meet your needs and help your business to perform.

Our European operations are a subsidiary of Tata Steel Group, one of the world's top ten steel producers. With a combined presence in nearly 50 countries, the Tata Steel Group including the Europe operations, Tata Steel Thailand and NatSteel Asia, has approximately 80,000 employees across five continents and an aggregate crude steel production capacity of over 28 million tonnes.

TATA STEEL AND SUSTAINABILITY

Steel is an essential material, intrinsic to our way of life and to the products society will demand in a sustainable future. Steel is a material that is used, not consumed. It is recycled and used again, without any loss of quality, time after time. At Tata Steel, we are committed to making the products society needs and to making them in the most responsible way possible.

This means, practically, that we commit to:

- Producing steel products for the future.
- Investing in sustainable steel-making.
- Improving our existing processes.
- Facilitating the recycling loop.

Our steel enables our customers to make safer cars, more energy-efficient buildings and infrastructure, easily-recoverable and

recyclable packaging and many other products which help to move society towards our vision of a sustainable future.

Colorcoat Renew SC[®] is the latest system to be added to our portfolio to ensure that we provide energy efficient buildings for the future.

RENEWABLE TECHNOLOGY

Colorcoat Renew SC® is an integrated solar air heating solution that encompasses system design, renewable energy generation and control, to provide space heating and ventilation air for any type of building whether it's new build or retrofit, industrial, commercial, public or residential.

As the worldwide demand for energy continues to rise, there is an increasing need to reduce CO₂ emissions and to develop renewable energy sources. As buildings account for 50% of global energy consumption and 50% of carbon dioxide emissions, Tata Steel are committed to developing and delivering steel solutions that will play a significant role in reducing this impact. A series of innovations are being developed to address the generation of renewable energy and to support our vision to transform the building envelope from a passive energy conservation role to one of active, efficient and affordable energy generation.

Colorcoat Renew SC® is the latest system to be added to the Tata Steel portfolio helping us to achieve this vision. This renewable energy solution offers simple, efficient and cost effective space heating and ventilation for all types of building.

The proven technology behind Colorcoat Renew SC® was originally pioneered in North America and is already leading the way in the solar heating industry for that part of the world. Tata Steel, together with the Low Carbon Research Institute and the Welsh Government, have invested £6 million in the creation of the Sustainable Building Envelope Centre, where the research team have reviewed the technology and further extended its capability.

The system captures heat from the sun and draws it into the building through a micro-perforated Colorcoat Prisma® collector on the exterior of the building. The pre-heated fresh air can then be distributed directly into the building as ventilation or ducted into the main heating system to reduce the energy load.

Many aspects of the building design and its environment will have an impact on the renewable energy output. Part of the system solution is a user friendly software tool developed to deliver the perfect system

design to meet the building requirements. Colorcoat Renew SC® also incorporates our unique pre-engineered control system to maximise the renewable heat generated from the system and can also measure and monitor the performance.

This combination of design, generation and control is unique to Colorcoat Renew SC®, providing you with a highly efficient and cost effective way to reduce energy requirements and CO₂ emissions.



A SUSTAINABLE ENERGY SOLUTION

At Tata Steel we take a holistic approach to the three dimensions of sustainability, namely economic, social and environmental development. Colorcoat Renew SC® can contribute to all three.

Economic benefits

Today's economic climate demands investment strategies that reduce costs and optimise efficiency. Colorcoat Renew SC® provides you with a free source of energy that can save up to 50% on heating bills with little or no impact on the environment.

Typically provides a four month embodied carbon payback

Savings can be made from:

- A highly efficient renewable energy system that can convert 75% solar energy into useable heat. 1m² of collector typically delivers 250kWh energy per year, providing cost effective heating for your building.
- Payback typically less than ten years without the need for Government financial incentives.
- Lowest cost solution to achieve National targets for CO₂ emission reduction and Local targets for renewable energy - in UK this includes achievement of Target Emission Rates (TER).
- When operating, prevents heat loss through conduction under the area of the collector so reduces energy bills.
- Destratification via roof level ducting reduces the heating load by circulating the hot air to floor level.
- Positive pressure created by the operation of the Colorcoat Renew SC® system reduces infiltration of external cold air which would otherwise need to be heated.
- In summer, savings are made due to solar shading from the collector, additionally night time purge with cold air can cool the fabric of the building and reduce cooling loads in the day.

- Low operational costs. The solar energy used is free. The only additional costs are the low running costs of the fan.
- Saves money by reducing the load to heat forced ventilation air to the required temperature as input air is already preheated.
- Longevity and low maintenance requirements offered by the Colorcoat Prisma® collector. Colorcoat Prisma® has been proven to provide superior solar absorption and durability for maximum collector efficiency.

Environmental benefits

Colorcoat Renew SC® generates renewable heat energy from a clean source which will contribute to environmental benefits for both the building owner and the planet.

- The technology can deliver a four month carbon payback, the shortest of any current renewable energy system.
- Colorcoat Renew SC® produces clean green energy, reducing dependency on fossil fuel heating and the associated emissions.
- At the end of its life the Colorcoat Prisma® collector is fully recyclable through conventional steel scrap collection and processing routes, and can be infinitely recycled into new products.

Social benefits

We are committed to making the products that society needs and to making them in the most responsible way. This includes minimising the impacts on people and the communities that they live in.

Colorcoat Renew SC® can improve the environment in which people live, work and interact as the system can:

- Supply fresh air to meet building ventilation requirements. This is of particular benefit to schools and supermarkets where occupant comfort is important and fresh air supply is a design requirement.
- Be incorporated unobtrusively into the building envelope design.
- Provides the ideal solution for building envelope refurbishment, which can further extend the lifetime of the building, improve its aesthetic appearance in the local community and improve the thermal performance of the building, all whilst reducing operational energy consumption.

ENERGY SAVING

The Colorcoat Prisma® collector is installed as an additional skin onto a new or existing structurally sound wall (metal or non-metal), creating a cavity between the wall and the metal skin. Negative air pressure created within the cavity by a ventilation fan draws the pre-heated boundary layer air through the micro perforations in the transpired solar collector's surface into the cavity.

Fresh heated air from the cavity is then fed either directly into the building as ventilation air (industrial applications), or ducted into a HVAC unit (commercial and residential applications), where it is used as a pre-heater to the main heating system thereby reducing the heating load. This heated air is introduced at ceiling level and recirculated to where it is required, this reduces stratification within the building and results in less energy being lost through the building's roof.

Figure 2. Diagram of airflow through the Colorcoat Renew SC® system

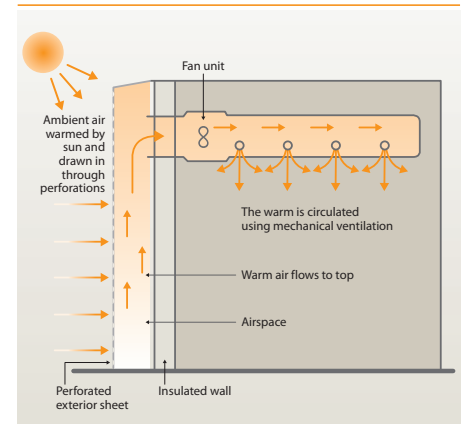
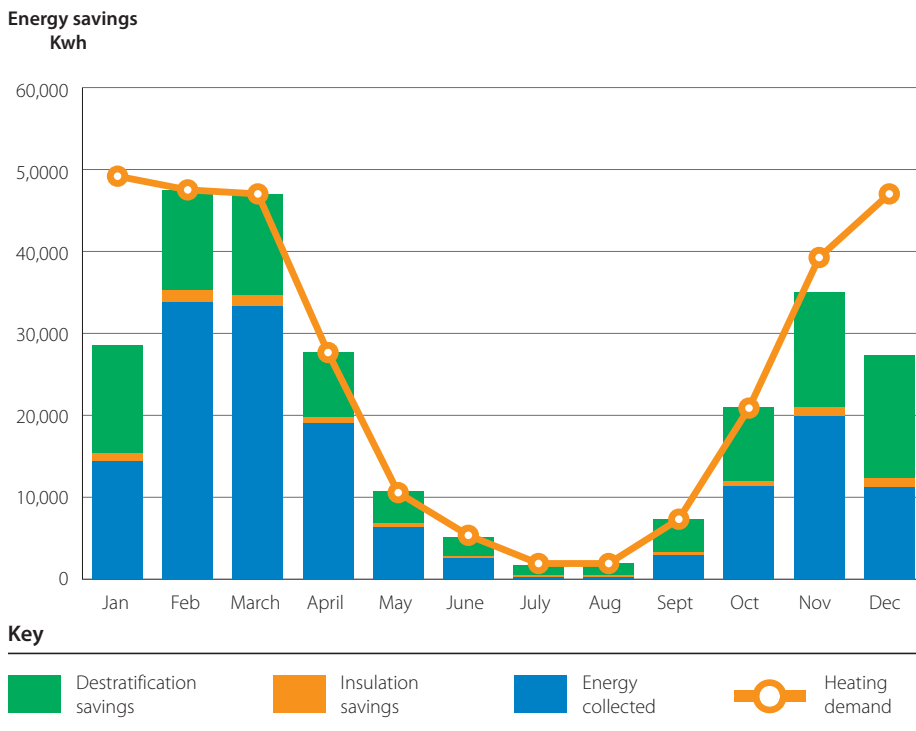


Figure 1. Typical graph of energy saving versus heating demand for Colorcoat Renew SC®



The heat produced from transpired solar collector systems using Colorcoat Prisma® has been independently proven to provide up to 50% of daytime space heating requirements.

At Tata Steel and through our market leading Supply Chain Partners we have the technical expertise and knowledge to support you with building design, feasibility assessments and energy performance calculations to help you to maximise the performance of your building whilst reducing both operational costs and environmental impacts.

The quick and easy to install, Colorcoat Renew SC® incorporates a range of collector designs from our Supply Chain Partners to match the leading UK building envelope systems. This choice provides you with a variety of options for your building's design to blend or contrast with the wall cladding.

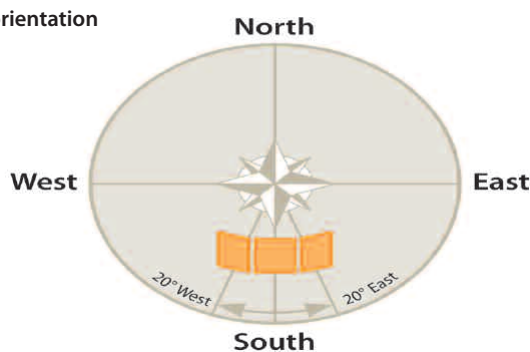
IS YOUR BUILDING SUITABLE?

Colorcoat Renew SC[®] is ideally suited to buildings where ventilated, fresh air is used to deliver space heating but it can be fitted to any building, new build or retro fit that has a requirement for space heating during the day.

As the system uses solar energy to generate heat there is simply a requirement for a southerly facing, unshaded wall elevation for installation of the collector. The most efficient orientation is due south, but the system will still work in other orientations as shown below. Simply put, a larger collector area (or darker colour) may be required to deliver an equivalent amount of heat as for due south.

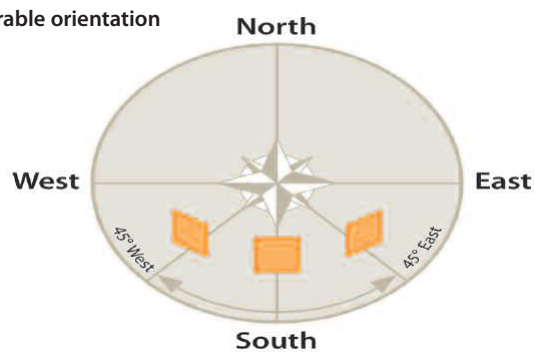
Figure 3. Siting options for the Colorcoat Renew SC[®] system

Ideal orientation



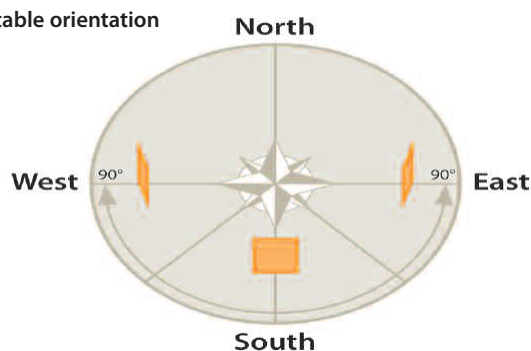
Facing due South, East to West variation 20°, 96% - 100% solar gain.

Favourable orientation



Facing South East to South West, variation 45°, 80% - 100% solar gain.

Acceptable orientation



East facing through to West facing, variation 90°, 60% solar gain.

OPTIMISING PERFORMANCE

Colorcoat Renew SC® is unique in that it provides you with the optimum combination of system design and specification, maximum renewable energy generation and a pre-engineered control system.

Design

How the collector design is affected by its size; colour; the building aspect; climatic conditions; perforation pattern and required air flow rates; is a complex balance that we have analysed, modelled and piloted. We have then used this information to develop a user friendly software model that enables our accredited Supply Chain Partners to determine the perfect system design for your needs.

The software uses NASA weather data for exact building location for accuracy of performance calculations.

Benefits of the design software:

- Enables feasibility studies, design and specification of the Colorcoat Renew SC® solar air heating system.
- Developed for current European design practices and construction standards to enable optimisation of renewable energy output at lowest cost.
- Uses specific system data for accurate prediction of renewable energy delivery, CO₂ savings and payback periods.
- Provides accurate prediction of potential energy savings via intelligent analysis of destratification and air-tightness (building fabric performance).
- Provides optimum collector size for your required energy output.

Generate

Colorcoat Renew SC® incorporates Tata Steel's successful Colorcoat Prisma® pre-finished steel for the solar collector.

The collector colour and the pre-finished steel used is critical for determining the thermal absorptivity rates and collector system efficiency. Colorcoat Prisma® has been proven to provide superior solar absorption and durability for maximum collector efficiency and longevity. Our technical know-how has resulted in development of metallic colours that deliver good efficiencies.

Colorcoat Prisma® combines a versatile palette of contemporary and traditional colours with durability and inherent flexibility. This results in a modern and durable finish that will look as good as the day it was installed for years to come.

A further benefit is that at the end of the Colorcoat Prisma® collector's life it can be infinitely recycled with no deterioration of steel properties.

Guaranteed performance

The corrosion resistance and colour stability of the Colorcoat Prisma® collector is guaranteed for up to 25 years, meaning that solar absorption efficiency is maintained for the lifetime of the collector.

Table 1. Solarthermal performance by colour

Colorcoat Prisma®	Solarthermal Performance
Black	Very High
Kronos	
Anthracite	High
Anthracite Matt	
Chocolate Brown	
Clover	
Atlantis	
Slate Grey	
Helios	Good
Oxide Red	
Alaska Grey	
Zeus	
Grey Aluminium	
Pegasus	
Denim	
Terracotta Matt	
Orion	Moderate
Copprum Matt	
Ephyra	
Aquarius	Low
Silver Metallic	
Athena	
Oyster	
Sirius	
Hamlet	
Cream	
White	

Colorcoat
Renew SC® can
provide 80%
improvement
in air source
heat pump
efficiency

Control

As part of the Colorcoat Renew SC® solution, we provide a pre-engineered control system to reduce design time and costs and ensure a consistency of performance. This control system maximises the delivery of renewable heat from Colorcoat Renew SC®, and can also enable data monitoring and metering for future system optimisation.

Our control system includes the hardware and embedded logic that controls and powers the operation of Colorcoat Renew SC® and can provide metering, monitoring and networking to enable both energy measurement for future government incentive schemes and review of the system performance. It comprises of a control panel with compatible instrumentation to suit the application and is supplied with all necessary documentation for installation, commissioning and operation.

Control system options are available for sole control of the Colorcoat Renew SC® system or for connection with other Mechanical and Electrical (M&E) systems within the building. It can also be easily networked to a building management system (BMS) via the specially developed controller in order to reduce operating costs.

Integration with HVAC installations

Colorcoat Renew SC® is designed to suit most space heating configurations. It can act as a parallel heating and ventilation source or integrate economically with new or existing HVAC systems.

Pre-warmed air from Colorcoat Renew SC® can be boosted, stored and/or converted into alternative mediums through integration with a heat pump. When Colorcoat Renew SC® is used in conjunction with Air Source Heat Pumps a significant improvement to the Coefficient of Performance (COP) is available. For example a 20°C lift in air temperature supplied via Colorcoat Renew SC® can deliver an 80% improvement in the coefficient of performance for the air source heat pump.

DEDICATED SUPPORT ACROSS THE SUPPLY CHAIN

We have developed a robust supply chain for the design, supply, installation and commissioning of Colorcoat Renew SC®. The actual route depends on whether there is a requirement for an engineered or a pre-engineered solution. Colorcoat Renew SC® is available in a pre-engineered form to suit common M&E applications or can be engineered for more complex systems. Our supply chain is flexible to meet both needs. The performance of Colorcoat Renew SC® can be integrated with proprietary design software such as IES for detail design.

Pre-engineered solutions

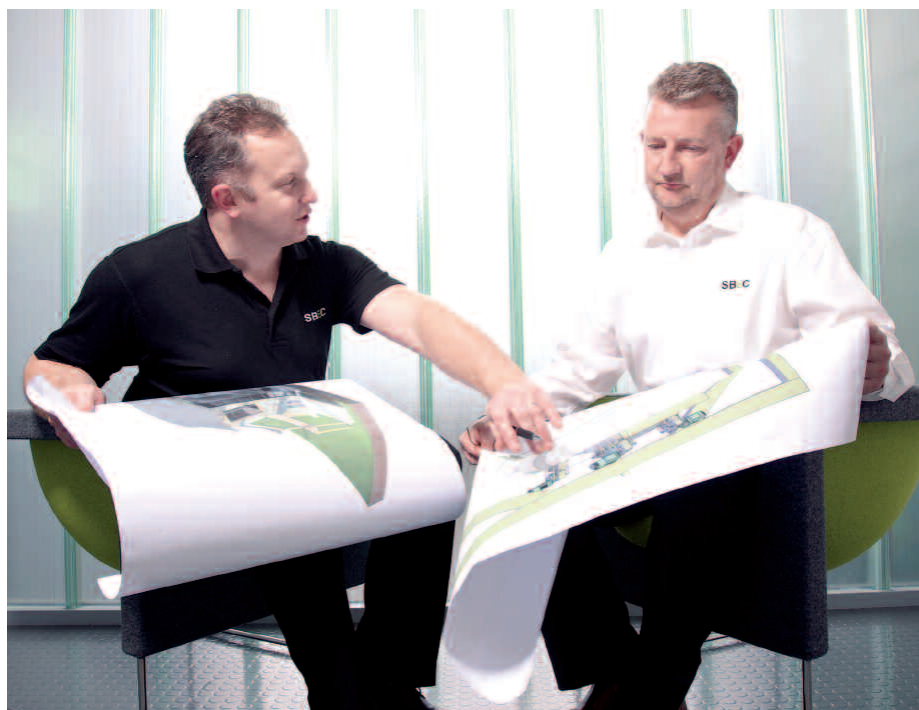
A pre-engineered solution is ideal for buildings adopting a regular HVAC solution and is a lower cost option as the plug and play approach reduces bespoke design and commissioning costs. We have developed a number of different configurations to suit your needs that are dependent on variables such as air change requirements, building size and integration with other HVAC systems.

System accreditation and availability

The pre-engineered solutions are readily available through our accredited Supply Chain Partners in a range of collector system designs that we have assessed to ensure efficiency of airflow characteristics and detail design. Approved accessories such as fans and ducts form part of the overall specification and facilitate integration of the Colorcoat Renew SC® system within the project.

Specialists from our supply chain can give you an initial feasibility assessment for your building including a calculation of predicted system energy efficiency and payback. Additionally they are fully experienced in system design and installation so are able to advise you on the best solution to fit your building. This includes advice on integration with other boost technologies to optimise energy performance.

For further details of our partners please contact the Colorcoat Connection® helpline on +44 (0) 1244 892434.





Compliance with Building Regulations

Part L2:2010

BRE have recognised the contribution from transpired solar collector system technology such as Colorcoat Renew SC® and it is included in SBEM Building Regulations compliance software, helping you to meet the target emission rates (TER) defined in Approved Document Part L2:2010 for new buildings.

Planning compliance

In addition to a reduction in CO₂ emissions, the operation of Colorcoat Renew SC® can help achieve national sustainability targets and meet the increasing requirements of Local Authority Planning approval systems to incorporate renewable energy technologies in all new developments.

BREEAM and the Code for Sustainable Homes

Incorporation of Colorcoat Renew SC® into the building design can qualify for additional points for schemes, such as BREEAM and the Code for Sustainable Homes (CfSH) in both the renewable energy and responsible sourcing sections, as the Colorcoat Prisma® collector is certified to BES6001 responsible sourcing standard.

Further lobbying is now underway to include the technology in the Renewable Energy Directive (RED) and the Renewable Heat Incentive (RHI).

CASE STUDIES

Sustainable Building Envelope Centre

Factfile

Collector: 95m² Colorcoat Prisma® in Anthracite Matt, 62m² in Linden Green.

Client: Tata Steel

Architect: Welsh School of Architecture

M&E contractor: Kimpton Building Systems

Cladding contractor: Lester Fabrications

System manufacturer: Tata Steel

Predicted financial payback: 10 years

Predicted energy saving: 39MWh/year



The Sustainable Building Envelope Centre (SBEC) is a £6 million research centre co-funded by Tata Steel, the Low Carbon Research Institute and Welsh Government to accelerate the development of low carbon solutions for the built environment.

The SBEC building was fitted with Colorcoat Renew SC® to provide a highly efficient source of renewable energy at a low cost. With up to 75% efficiency converting solar radiation to usable heat energy, the system installed at SBEC has the potential to produce up to 39MWh per year.

The building's southerly wall has been covered with a total of 1795m² of Colorcoat Prisma® in Matt Anthracite, which includes 95m² of collector providing heat to the workshop. There is also a 62m² Colorcoat Prisma® collector in Linden Green on the façade of the building to heat the office accommodation.

Colorcoat Renew SC® has been integrated with other technologies within the building, such as heat pumps, underfloor heating and phase change material.

Working with industrial partners has enabled system integration and control strategy design to optimise renewable energy performance through the Building Management System.

By using Colorcoat Renew SC® SBEC benefits from a cladding system that is durable and sustainable, as well as incorporating a technology which will significantly reduce the energy outlay of the building.



Deeside Leisure Centre

Factfile

Collector: 260m² Colorcoat Prisma® in Slate Grey.

Client: Flintshire County Council

M&E contractor: Kimpton Building Systems

Cladding contractor: Lester Fabrications

System manufacturer: Tata Steel

Predicted financial payback: 10 years

Predicted energy saving: 110MWh/year



A multi-million pound project to improve the facilities at Deeside Leisure Centre and to reduce the overall energy consumption of the building. Colorcoat Renew SC® has helped the Centre to reduce operational costs, improve the building's environmental performance and supply clean, fresh air to provide the optimum environment for occupancy comfort,

The refurbishment team needed to identify and integrate a source of renewable energy that would be cost effective to install, and that would minimise energy consumption in the longer term. The solution was Colorcoat Renew SC®, installed as an additional skin onto an existing wall at the Leisure Centre.

The system uses 260m² of Colorcoat Prisma® by Tata Steel in Slate Grey as the solar collector, combining inherent durability with superior absorption rates to feed ventilated air directly into the building. The pre-engineered control system helps the centre to maximise heating efficiency and ensure that the



performance is optimised for this unique building.

The system is expected to provide 70MWh solar radiation and 40MWh reduction of thermal losses each year, equating to payback in less than 10 years.

The system will provide benefits to Deeside Leisure Centre for years to come and provides an excellent example of how buildings can meet the sustainability challenges faced by the existing UK building stock, and contribute to the overall drive for an energy efficient built environment.

Jaguar Land Rover Deck 92

Factfile

Collector: 565m² Colorcoat Prisma® in Slate Grey.

Client: Jaguar Land Rover

Architect: Hasker Architects Ltd.

M&E contractor: Couch Perry Wilkes

Main Contractor: Anglo Holt

Contractor: Roofwise

System manufacturer: Tata Steel

Predicted financial payback: 8 years

Predicted energy saving: 82MWh/year (solar radiation) + 112MWh (reduction of thermal losses).



The Jaguar Land Rover Deck 92 project is a new 10,000m² material, planning and logistics centre. The Centre incorporates Colorcoat Renew SC® enabling the building envelope to play an active role in the building's environmental performance.

Using Colorcoat Renew SC® on this building has enabled the provision of pre-heated, ventilated, fresh air thereby reducing the energy load on the primary heating system and minimising heat losses due to the infiltration of cold ambient air.

The pre-engineered control system optimizes the renewable heat gain and provides night time purge cooling in the summer months.

By incorporating Colorcoat Renew SC® Jaguar Land Rover have achieved a low cost source of renewable energy, reduced overall energy consumption in the building and helped towards their targets of reducing CO₂ emissions from their manufacturing operations.

With 565m² of Colorcoat Prisma® collector in Slate Grey, Jaguar Landrover benefits from a pre-finished steel cladding system that is durable, sustainable and will deliver 82MWh solar radiation and 11MWh reduction of thermal losses per annum, providing a payback of approximately eight years.



www.colorcoat-online.com/renew

Trademarks of Tata Steel
(formerly Corus UK Limited)

Colorcoat, Colorcoat Connection, Colorcoat Prisma and Colorcoat Renew SC are registered trademarks of Tata Steel UK Limited.

Care has been taken to ensure that the contents of this publication is accurate, but Tata Steel Europe Limited and its subsidiaries, (including Tata Steel UK Limited), do not accept responsibility or liability for errors or information that is found to be misleading. Suggestions for, or descriptions of, the end use or application of products or methods of working are for information only and Tata Steel Europe Limited and its subsidiaries accept no liability in respect thereof.

Before using products or services supplied or manufactured by Tata Steel Europe Limited and its subsidiaries, customers should satisfy themselves as to their suitability.

Printed with biodegradable vegetable inks on material sourced from responsible managed forests, certified in accordance with the FSC. Contains 10% recovered fibre, diverting waste from landfill.

Tata Steel

Shotton Works

Deeside

Flintshire

CH5 2NH

T: +44 (0) 1244 812345

F: +44 (0) 1244 892345

www.colorcoat-online.com

Colorcoat Connection® helpline

T: +44 (0) 1244 892434

F: +44 (0) 1244 892321

E: colorcoat.connection@tatasteel.com