



Corus Colors

Colorcoat® Technical Paper

An introduction to BREEAM for pre-finished steel industrial buildings



Corus and BREEAM

Corus is a company committed to providing the very best pre-finished steel products for use in roof and wall cladding systems. Colorcoat® products offer the ultimate in durability and guaranteed performance reducing building life cycle costs and environmental impact.

Corus have a well-established reputation for providing specifiers with comprehensive advice and guidance to support the design and construction of the pre-finished steel building envelope. Together with the SCI, Corus endeavour to explain BREEAM, BREEAM Industrial¹ and how the specification of the building envelope forms an important part of the key issues that can contribute to the BREEAM assessment.

Working together with the Steel Construction Institute (SCI)

The SCI is an independent, member-based organisation. It is probably the world's largest research and technical organisation supporting the use of steel in construction. Since its formation in 1986, SCI has played a leading role in technical innovation and information dissemination; helping the steel construction sector achieve a world-leading market share for steel.



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Overview

Quality design linked with modern methods of construction and a practical approach to the operational use of a contemporary building can provide significant environmental benefits. The embodied and operational environmental impact of an individual building can be gauged through the BREEAM family of assessment methods and tools. These are designed to help construction professionals understand and mitigate the environmental impact of the developments they design and build.

This Colorcoat® Technical Paper aims to give the specifier, building owner and client a comprehensive understanding of

the benefits of having an industrial and warehouse building assessed within the BREEAM scheme. The Technical Paper also demonstrates how the incorporation of Colorcoat® pre-finished steel into the specification for both roof and wall cladding systems can maximise the credits assessed under the energy, materials and waste categories. Roof and wall cladding systems incorporating Colorcoat® pre-finished steel liners and external sheets are detailed to optimise current design practice, reduce air-leakage paths and minimise fabric heat loss through the building envelope. In addition pre-finished steel building envelope

specifications incorporating Colorcoat® products achieve the highest ratings within the Green Guide enabling top BREEAM credits to be achieved under this category.

The BREEAM scheme also recognises that further credit can be achieved where the diversion of non-hazardous construction waste from landfill is minimised. For steel products waste to landfill is virtually zero because the majority of steel from site is either re-used or recycled. The sustainable attributes of pre-finished steel roof and wall cladding systems can contribute, directly and indirectly, to achieve the overall BREEAM score.

Introduction to BREEAM

BREEAM (Buildings Research Establishment's (BRE) Environmental Assessment Method) is the UK's leading and most widely used environmental assessment method for buildings and has become the *de facto* UK standard.

Developed in the early 1990s, BREEAM is based on many years of construction and environmental research and is validated by input from the construction and property industries, government and building regulators. A BREEAM assessment considers the building in context including public transport links and ecological disruption, with the result that location and type of site can strongly influence the overall rating.

Under BREEAM, credits are awarded in nine categories according to the construction and in-use performance of the building. These credits are then weighted and aggregated to produce a single overall score on a scale of 'Unclassified', 'Pass', 'Good', 'Very Good', 'Excellent' and 'Outstanding'.

BREEAM is developed and managed under the governance of the BRE Global Sustainability Board to ensure balance

and independence. It is also managed and overseen by the United Kingdom Accreditation Service (UKAS). Certification against BREEAM is by independent licensed assessors who are trained by the BRE and operate within a quality assurance framework. To date, approximately 115,000 buildings have been certified under BREEAM and a further 600,000 have been registered for assessment. By far the majority of these buildings are housing and residential buildings but the assessment of industrial and non-domestic building is on the increase.

Although BREEAM is currently voluntary, it is now a policy and funding requirement of many clients, particularly housing associations and clients in the public sector, that a certain BREEAM rating is achieved. Organisations currently specifying minimum BREEAM standards include Office of Government Procurement, the Housing Corporation, Welsh Assembly Government and Regional Development Agencies. Furthermore, should a code for non-domestic sustainable buildings be developed, it is highly likely that this will be based on BREEAM, just as the Code for Sustainable Homes was based on EcoHomes.

BREEAM is a generic methodology that is tailored to meet the requirements of specific building types. There are currently 13 versions of BREEAM including:

- Offices
- Industrial
- Retail
- Healthcare
- Prisons
- Courts
- Multi-residential
- Schools
- Code for Sustainable Homes
- EcoHomes
- EcoHomes XB

Any projects falling outside the current BREEAM 'family' can be assessed using the BREEAM Bespoke scheme. BRE also offers an international scheme for buildings outside the UK.

BREEAM is continuously reviewed and updated. The current version is BREEAM 2008. A number of the BREEAM 2008 Assessor manuals, including BREEAM Industrial 2008¹, are available for free download from the BREEAM website: **www.breeam.org**

BREEAM assessments

Non-domestic BREEAM schemes can be used to assess the environmental impacts of a building in accordance with the relevant Assessor manuals, in England, Scotland, Wales and Northern Ireland.

This BREEAM scheme is used to assess the environmental impacts arising as a result of an individual building development (including external site areas) at the following stages:

1. **Design Stage (DS)** - leading to an Interim BREEAM Certificate.
2. **Post-Construction Stage (PCS)** – leading to a Final BREEAM Certificate.

The post-construction review serves to confirm the interim assessment and, importantly, confirm that the ‘as built’ performance matches that envisaged at the design stage.

A BREEAM assessment can be carried out at the above stages for the following types of building project:

- Whole new buildings.
- Major refurbishments of existing buildings.
- New build extensions to existing buildings.
- A combination of new-build and existing building refurbishment.
- New build or refurbishments that are part of a larger mixed use building.
- Existing building fit-out.

Speculative developments can be assessed using the BREEAM scheme despite the fact that several issues are specific to the fully fitted-out building. In this case, the speculative development is assessed against the BREEAM standard and, in addition, a ‘maximum potential’ BREEAM score is calculated. This is to enable the developer to demonstrate to potential tenants, the maximum potential BREEAM rating once the building is fitted-out and operational.

Buildings assessed using BREEAM are awarded credits according to their performance under the nine environmental categories shown in Table 1. Compliance criteria for each issue assessed, are clearly set out in the relevant BREEAM Assessor manual. The percentage of available credits achieved under each category is then multiplied by the corresponding weighting as detailed in Table 1, and the nine weighted scores summed to give a single overall BREEAM score. The building is then rated on a scale of ‘Unclassified’, ‘Pass’, ‘Good’, ‘Very Good’, ‘Excellent’ or ‘Outstanding’ according to the scale shown in Table 2.

For example, if under the five ‘Management’ issues assessed, 6 credits are achieved out of a possible 10, i.e. 60%, the weighted management score is $60\% \times 12\% = 7.2$. This calculation is repeated for each of the other eight categories and the nine weighted scores summed to give the overall BREEAM rating score.

Table 1. Assessment categories, available credits and weightings

Assessment category	No. of issues assessed*	Available credits*	Weighting (%)
Management - Overall management policy, building commissioning and construction site management.	5	10	12
Health & Wellbeing - Indoor issues affecting the health and well-being of the building users.	14	15	15
Energy - Carbon dioxide emissions associated with the operation of the building and sub-metering.	8	27	19
Transport - Proximity of the building to public transport networks and other amenities; provision of facilities to promote non-vehicular transport.	7	11	8
Water - Measures to reduce water consumption within the building.	4	6	6
Materials - Environmental impacts and responsible sourcing of products and materials; re-use building structure and facades.	7	11	12.5
Waste - Construction site waste management; use of recycled aggregates; provision of storage for recyclable waste.	4	7	7.5
Land Use & Ecology - Redevelopment and remediation of brownfield sites, minimising ecological impact during construction and enhancing ecological value of the site.	6	10	10
Pollution - Air, water, light and noise pollution issues.	8	11	10
Totals	63	108	100

* See the appendix for a full listing and brief description of all BREEAM Industrial 2008¹ credits.

Table compiled using information provided in BREEAM Industrial 2008 Assessor Manual¹

Table 2. Overall BREEAM 2008 rating and required scores

BREEAM rating	% Score
Unclassified	< 30
Pass	≥ 30
Good	≥ 45
Very Good	≥ 55
Excellent	≥ 70
Outstanding*	≥ 85

Table compiled using information provided in BREEAM Industrial 2008 Assessor Manual¹

*Note; there are additional requirements for achieving a BREEAM Outstanding rating.

In addition to achieving the overall scores in Table 2, there are minimum standards required to achieve different BREEAM rating levels. These are shown in Table 3.

Table 3. Minimum standards for different BREEAM ratings

BREEAM Issue	Minimum number of credits				
	Pass	Good	Very Good	Excellent	Outstanding
Man 1 - Commissioning.	1	1	1	1	2
Man 2 - Considerate Constructors.				1	2
Man 4 - Building user guide.				1	1
Man 9 - Publication of building information (BREEAM Education only).					1
Man 10 - Development as a learning resource (BREEAM Education only).					1
Hea 4 - High frequency lighting.	1	1	1	1	1
Hea 12 - Microbial contamination.	1	1	1	1	1
Ene 1 - Reduction of CO ₂ emissions.				6	10
Ene 2 - Sub-metering of substantial energy uses.			1	1	1
Ene 5 - Low or zero carbon technologies.				1	1
Wat 1 - Water consumption.		1	1	1	2
Wat 2 - Water meter.		1	1	1	1
Wst 3 - Storage of recyclable waste.				1	1
LE 4 - Mitigating ecological impact.			1	1	1

Table compiled using information provided in BREEAM Industrial 2008 Assessor Manual¹

Additional ‘innovation credits’ have been introduced in BREEAM 2008. These provide additional recognition for a building that innovates in the field of sustainable performance, above and beyond the level currently recognised within the standard BREEAM criteria. An additional 10% can be added to a building’s final BREEAM score, 1% each for up to 10 credits per building.

Innovation credits are achieved by meeting exemplary performance for a number of specific, existing BREEAM issues or, where outside this scope, by application to BRE. More details on innovation credits are given in the relevant Assessor manuals.

To achieve the highest ‘Outstanding’ BREEAM rating, in addition to exceeding

the overall score of 85, see Table 2, and meeting the minimum requirements in Table 3 the design team must produce a case study of the building and commission an assessment of the building, in use, during its first three years. Failure to fulfil both these additional requirements will result in the BREEAM rating being downgraded to ‘Excellent’.

BREEAM Industrial¹

BREEAM Industrial¹ can be used to assess one or a combination of the following types of industrial building:

1. Storage and distribution warehouses including cold food storage.
2. Light industrial/factory units e.g. manufacturing, assembly, packaging and small 'starter' or 'nursery' units.
3. Workshops: e.g. manual workshops and vehicle workshops.

The building functions/areas covered by the BREEAM Industrial¹ scheme include:

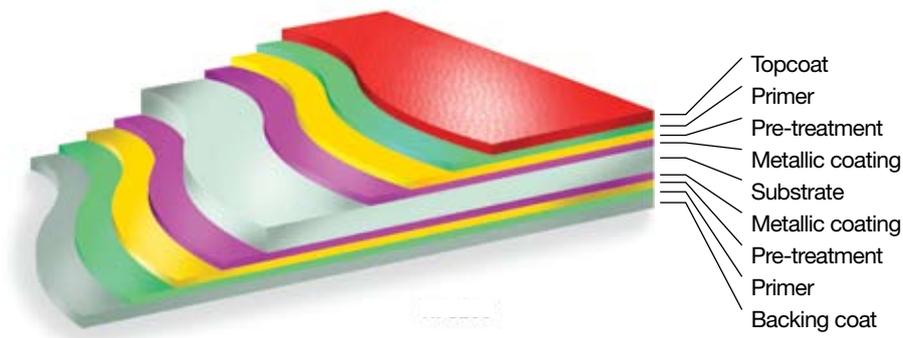
- Operational areas such as storage and warehousing, light industrial/factory uses, workshops and cold storage.
- Office areas including meeting and training rooms.
- Other associated functions/areas such as reception, kitchen facilities, restrooms and plant rooms.

More detail of the types of building that are covered under the scope of BREEAM Industrial¹ is given in the Assessor manual. Building types falling outside of this

scope can be assessed using the BREEAM Bespoke scheme.

The approach to the assessment of office areas within industrial buildings depends on the floor area of office space provided. The compliance criteria for relevant issues, e.g. health and well-being criteria vary depending upon whether the office area is greater or less than 500 m². Where the office floor area is greater than 500 m² and less than 3,000 m², the office building should be assessed using BREEAM Offices. If the office floor area is greater than 3,000 m² advice should be sought from the BRE.

Pre-finished steel building envelopes and BREEAM



The following is a description of the BREEAM Industrial¹ credits that are directly relevant to the specification of the building envelope of industrial buildings, i.e. the roof and external walls incorporating Colorcoat[®] pre-finished steel products.

Pre-finished steel is made up of a number of paint layers and treatments applied to the metallic coated strip of steel in an automated and carefully controlled manufacturing process. Each layer has a particular function and the performance of a pre-finished steel product is greatly influenced by them.

Colorcoat[®] pre-finished steel is manufactured within a continuous process, which guarantees high quality

standards through controlling the coating thickness, colour and gloss, adhesion and corrosion resistance.

Pre-finished steel, also known as pre-painted steel, is extensively used for the building envelope. Manufacturing to exacting standards provides high quality and cost effective pre-finished steel products that can be processed further into finished systems such as composite panels, roof sheeting and facades. When specifying roof and wall cladding systems, it is the choice of the pre-finished steel product that will provide the long-term appearance and function of the building envelope and should therefore be given as much importance during selection as the system itself.

The full listing of issues assessed under BREEAM Industrial 2008¹ is given in the Appendix. The building envelope of an industrial building incorporating Colorcoat[®] pre-finished steel, has an important role to play with respect to some key issues assessed under the energy, materials and waste categories. Attention to these key issues in relation to the building envelope could be the difference between a 'Very good' and 'Excellent' BREEAM rating. The key issues are described on page 8.

Energy

The operational energy performance of buildings and associated CO₂ emissions is the most highly weighted and challenging criteria within BREEAM.

Of the eight energy issues assessed, Ene 1 and Ene 6 are relevant to the specification of the building envelope.

Ene 1 - Reduction in CO₂ emissions

Up to 15 credits are available based on the buildings CO₂ index (EPC rating) taken from the Energy Performance

Certificate (EPC) compared to the benchmarks given in Table 4.

Table 4. BREEAM credits and required EPC rating for Ene 1

BREEAM credits	CO ₂ Index (EPC rating)	
	New build	Refurbishment
1	63	100
2	53	87
3	47	74
4	45	61
5	43	50
6	40	47
7	37	44
8	31	41
9	28	36
10	25	31
11	23	28
12	20	25
13	18	22
14	10	18
15	0	15
Exemplar credit 1	< 0	≤ 0
Exemplar credit 2	True zero carbon building	

Table compiled using information provided in BREEAM Industrial 2008 Assessor Manual¹

To assess performance under this issue, the building has to be modelled using a method compliant with the National Calculation Method (NCM) and an Energy Rating and certificate produced using 'Approved software' by an 'Accredited Energy Assessor'.

For a design stage assessment, a copy of the EPC output from the 'approved software' and the 'Accredited Energy Assessor's' name and accreditation number is required.

For a post-construction assessment, a copy of the final registered EPC from the 'Approved software' for the constructed building is required. The final rating must account for any changes to the specification occurring during construction and the measured air-leakage rate, ductwork leakage and fan performances as required by Building Regulations.

Building envelopes incorporating Colorcoat® pre-finished steel can easily achieve good operational energy performance.

Pre-finished steel building envelope systems minimise fabric heat losses by providing:

- **Good levels of thermal insulation.**
Low u-values down to 0.16 W/m²K for roofs and 0.2 W/m²K for walls are achievable using currently available systems from Corus supply chain partners.
- **Good air-tightness.**
Although dependent on building size and geometry good detailing of interfaces within steel building envelopes can achieve air-leakage rates of less than 3 m³/h/m².

Ene 6 - Building fabric performance & avoidance of air infiltration

Compliance with this criterion, for which 1 credit is available, includes a number of measures. These relate both to the building fabric and specific design measures addressing entrances and loading bays to the building.

Concerning the fabric, the requirement is to undertake a thermographic inspection of the building envelope to confirm:

- Continuity of insulation in accordance with the construction drawings.
- Avoidance of excessive thermal bridging.
- No air-leakage paths through the fabric except through intentional openings.

With rising energy prices and the need to comply with Approved Document L2A³ and L2B⁴ of the Building Regulations, England and Wales or Section 6, Scottish Standards⁵ there is a particular need to focus on the operational energy performance of buildings.

Roof and wall cladding systems incorporating Colorcoat® pre-finished steel liners and external sheets are detailed to optimise current design practice, reduce air-leakage paths and minimise fabric heat loss through the building envelope.

The Colorcoat® Technical Paper 'Creating an air-tight building envelope'⁶ explains how good air-tightness using pre-finished steel-based building envelope systems can easily be achieved.

Materials

Of the seven materials categories considered under BREEAM, three are relevant to the specification of the building envelope. These relate to the

environmental impact of the materials used, Mat 1 and Mat 6, and responsible sourcing of products, Mat 5.

Mat 1 - Materials specification

Under BREEAM, the environmental impacts of construction products are assessed under Mat 1 using the BRE's Green Guide to Specification². Updated in 2008, the Green Guide gives a rating for a range of specifications of major elements of different buildings types.

Specifications are rated on a scale of A+ to E. For more information visit www.thegreenguide.org.uk

Up to 2 credits are available by assessing the environmental impact of the elements shown in Table 5.

Table 5. Elements to be assessed under Mat 1

Building element	Applicable elements	
	New build & Major Refurbishment	Fit Out
External Walls	✓	N/A
Windows	N/A	N/A
Roof	✓	N/A
Upper Floor Slabs	N/A	N/A
Internal Walls	N/A	✓
Floor Finishes / Coverings	N/A	✓

Table compiled using information provided in BREEAM Industrial 2008 Assessor Manual¹

Materials

Green Guide ratings are derived using the BRE's Environmental Profiles life cycle assessment methodology. Using this approach, 13 different environmental impacts are normalised, weighted and aggregated to give a single score in Ecopoints. The average environmental

impact of one Western European citizen person over one year is equal to 100 Ecopoints.

Pre-finished steel building envelope specifications incorporating Colorcoat® products achieve the highest ratings within

the Green Guide enabling top BREEAM credits to be achieved under this category. Table 6 gives the Green Guide ratings for pre-finished steel-based building envelope specifications, which are currently featured in the Green Guide and commonly used in industrial buildings.

Table 6. Currently featured Green Guide ratings for pre-finished steel-based building envelope specifications used in industrial buildings

Green Guide specification	Rating
External walls	
Built-up pre-finished steel profiled wall cladding system: Incorporating Colorcoat® pre-finished steel products, insulation and Colorcoat® PE15 steel liner. Constructed using steel support, structural steel frame with no internal finish.	A+
Factory insulated foam filled composite panels: Incorporating Colorcoat® pre-finished products, pentane blown PUR/PIR insulation and Colorcoat® PE15 steel liner. Constructed using steel support, structural steel frame with no internal finish.	A+
Roofs	
Built-up profiled roof cladding: Incorporating Colorcoat® pre-finished steel products, insulation and Colorcoat® PE15 steel liner. Constructed using galvanised steel rafters and joists.	A+
Factory insulated foam filled composite panels: Incorporating Colorcoat® pre-finished products, pentane blown PUR/PIR insulation and Colorcoat® PE15 steel liner. Constructed using galvanised steel rafters and joists.	A+

Ratings taken from the Green Guide to Specification 2008²

BREEAM credits are awarded according to The Green Guide to Specification² rating as shown in Table 7; 2 credits are awarded where a total of 4 points or more are

achieved and 1 credit awarded where 2 points are achieved. Note that points are different from BREEAM credits.

Table 7. Points per element for different Green Guide Ratings

Green Guide rating	Points / element
A+	3
A	2
B	1
C	0.5
D	0.25
E	0

Table compiled using information provided in BREEAM industrial 2008 Assessor Manual¹

For a new industrial building, only the external walls and roof are assessed as detailed in Table 5. Selecting either a built-up or factory insulated foam filled composite steel cladding specification manufactured with Colorcoat® pre-finished steel for the roof and external walls scores a maximum of 6 points i.e. 3 points for the external cladding sheet and 3 points for the internal liner. Being greater than 4, this translates into 2 BREEAM credits.

Under the Environmental Profiles methodology, specifications are assessed over a 60-year study period such that replacement and maintenance impacts are considered. Generic service lives have been established by the BRE for different specifications and these have been used to derive replacement factors that are applied when replacement, either partial or total, is required over the 60-year study period. The precise methodology for deriving replacement factors is set out in the 'Methodology for

environmental profiles of construction materials'. For example, the replacement factor for a product with a service life of 25 years is 1.9. Therefore the total impact of a product over the 60-year study period is 1.9 times the initial impact of that product.

Currently, within The Green Guide to Specification², ratings are generally provided for generic products, i.e. based on generic or average data rather than manufacturer specific data.

Colorcoat HPS200® Ultra pre-finished steel comes with a Confidex® Guarantee of up to 40 years. The superior durability of Colorcoat HPS200® Ultra and hence the added longevity of the building envelope systems that use it, means that the impact of such systems is some 47% less than the impact to the generic specification over the 60-year study period.

Mat 5 – Responsible sourcing of materials

Increasing attention is being paid to responsible sourcing of construction products and this is reflected in BREEAM 2008. Under this category, up to three credits are awarded for demonstrating that more than 80% of materials within the following major elements of the building have been responsibly sourced:

- Structural Frame
- Ground floor
- Upper floors including separating floors
- Roof
- External walls
- Internal walls
- Foundation /substructure
- Staircase

The following scale is used to award credits for new build and major refurbishment projects:

- ≥ 15 points 3 credits awarded.
- ≥ 10 points 2 credits awarded.
- ≥ 5 points 1 credit awarded.

Reflecting the varying status of responsible sourcing schemes for different materials, a tiered approach is adopted for scoring as shown in Table 8.

Table 8. Tier levels for responsible sourcing assessment under Mat 5

Tier Level	Issue assessed	Points available per element	Evidence / measure assessed	Examples of compliant schemes
1	Legality & responsible sourcing.	3	Certification Scheme	FSC, PEFC and re-used materials.
2	Legality & responsible sourcing.	2	Certification Scheme	There are currently no schemes allocated to this tier.
3	Legality & responsible sourcing.	1.5	Certification Scheme / EMS	<ul style="list-style-type: none"> • Verified timber. • Other materials: Certified EMS for the key process and supply chain. • Recycled materials with certified EMS for the key process.
4	Legality & responsible sourcing.	1	Certification Scheme / EMS	Certified EMS for key process.

Table compiled using information provided in BREEAM industrial 2008 Assessor Manual¹

Materials

For steel products, compliance is demonstrated by specifying products that have been produced by companies that have a certified environmental management system (EMS). This applies both for steel production or the 'key process' and for finishing, e.g. roll-forming purlins, cladding or floor decking.

Steel is a global commodity. The World Steel Association, who represents the major international steel producers, disseminates key performance indicators for the global steel production industry. In its most recent report, the World Steel Association reported that over 90% of steel production facilities are certified to

a registered international environmental management system standard. In the UK, Corus have 100% of their sites certified to the EMS standard ISO 14001⁷, as are their Colorcoat® supply chain partners.

Mat 6 – Insulation

The aim of this credit is to recognise the use of thermal insulation, which has a low embodied environmental impact performance, relative to its thermal properties, and has been responsibly sourced; 1 credit is available for using insulation with low embodied environmental

impact and 1 for responsible sourcing. Under this category, the insulation used within the external walls, ground floor, roof and building services is assessed using the Green Guide ratings, and an overall aggregate score or 'Insulation Index' for the building determined.

Responsible sourcing assessment of insulation is assessed as described for Mat 5 category.

Steel building envelope systems commonly use the following generic insulation materials as shown in Table 9.

Table 9. Generic insulation materials

Insulation	Green Guide rating*
Glass wool	A+
Rigid urethane (pentane blown)	A
Stone wool	A+

* The functional unit for the assessment of insulation is 1 m² of insulation with sufficient thickness to provide a thermal resistance value of 3 m²K/W.

Ratings taken from the Green Guide to Specification 2008²

It is therefore easy to achieve maximum insulation credits when specifying pre-finished steel building envelope systems manufactured and supplied by Colorcoat® supply chain partners.

Waste

Of the four waste criteria, Wst 1, for which up to 4 credits are available, is the most significant. This criterion addresses improved construction site waste management. Credits are achieved by exceeding good and best practice benchmarks for the generation of construction waste.

Up to 3 credits are available by demonstrating that the benchmarks shown in Table 10 for non-hazardous, construction waste generation are achieved.

Table 10. Waste criteria requirements under Wst 1

BREEAM credits	Amount of waste generated per 100m ² gross internal floor area	
	m ³	Tonnes
1	13.0 - 16.6	6.6 - 8.5
2	9.2 - 12.9	4.7 - 6.5
3	< 9.2	< 4.7

Table compiled using information provided in BREEAM industrial 2008 Assessor Manual¹

A further credit can be achieved where at least 75% by weight, or 65% by volume, of non-hazardous construction waste generated by the project has been diverted from landfill and either re-used or recycled.

Cladding systems manufactured using Colorcoat® pre-finished steel are manufactured off-site and therefore site waste is minimal and, for many products, is virtually zero.

The use of pre-finished steel roof and wall cladding systems therefore make a significant contribution to achieving maximum BREEAM waste credits. Furthermore, the economic value of scrap steel and the inherent multicyclability of steel products, ensures that steel construction projects are highly recycled, be it during manufacture, construction or following the demolition of buildings.

More detailed information about the recyclability of steel cladding systems incorporating Colorcoat® pre-finished steel is available in the Colorcoat® Technical Paper entitled 'End of life options for pre-finished steel buildings'¹⁸.

Summary of the benefits of pre-finished steel building envelope systems

Table 11 summarises the sustainable attributes of pre-finished steel roof and wall cladding systems and highlights how these can contribute, directly or indirectly, to achieve the overall BREEAM scores.

Given the synergy of pre-finished steel building envelopes with steel structures in industrial buildings, attributes of structural steel are also highlighted. Furthermore, many large industrial

buildings have an integrated office building. The BREEAM credentials of integral offices, framed and clad in steel, are also provided.

Table 11. Sustainability attributes of steel construction under BREEAM

Credit No.	Credit outline	Contribution from steel to achieve credit
Man 1	Considerate Constructors Scheme (CCS) score	<ul style="list-style-type: none"> Off-site manufacture reduces on-site waste. Rapid construction minimises site activity and disruption to neighbours. Fewer site operatives and a shorter programme improves site safety. Steel construction is quiet and dust generation is minimal. Fewer wet trades reduce the risk of pollution to watercourses. Just-in-time deliveries reduce site congestion. Fewer deliveries to site and deliveries outside peak times reduce local traffic congestion.
Man 3	Monitoring construction site impacts	<p>Although credits are achieved for monitoring rather than achieving specific targets, steel construction has the following benefits:</p> <ul style="list-style-type: none"> On-site energy use is minimised through off-site manufacture and fast on-site construction. Fewer deliveries to site can reduce transport impacts. Air pollution/dust is low. Fewer wet trades reduce the risk of pollution to ground and surface water.
Hea 1	Provision of good day lighting	The affinity of steel structures with highly glazed facades and the 'lightness' and long-spanning capability of steel structures make it easy to achieve this credit.
Hea 2	Adequate view out of the building	The affinity of steel structures with highly glazed facades and the 'lightness' and long-spanning capability of steel structures make it easy to achieve this credit.
Hea 5	Provision of appropriate illuminance levels	The affinity of steel structures with highly glazed facades and the 'lightness' and long-spanning capability of steel structures make it easy to achieve this credit.
Ene 1	Reduction in operational CO ₂ emissions	<p>Pre-finished steel roof and wall cladding systems manufactured from Colorcoat® products will provide:</p> <ul style="list-style-type: none"> Good levels of thermal insulation; minimising fabric heat losses. Excellent air-tightness.
Ene 5	Low or zero carbon technologies	Effective renewable energy technologies such as photovoltaic and building envelope technologies such as Solarwall™ can easily be integrated into pre-finished roof and wall cladding systems manufactured from Colorcoat® products.
Ene 6	Minimising heat losses and air infiltration through the building fabric	Pre-finished steel roof and wall cladding systems manufactured from Colorcoat® products by Colorcoat® supply chain partners are produced to the highest dimensional tolerance and can provide excellent air-tightness using good detailing and construction.

Table 11. Sustainability attributes of steel construction under BREEAM - Continued

Credit No.	Credit outline	Contribution from steel to achieve credit
Mat 1	Environmental impact of major building elements	Pre-finished steel building envelopes incorporating Colorcoat® products achieve the highest Green Guide rating of A+.
Mat 3	In-situ re-use of existing facades	The versatility and strength-to-weight ratio of structural steel enables the retention and re-use of existing facades.
Mat 4	In-situ re-use of existing structures	Steel structures are inherently re-usable, both in-situ and via deconstruction and re-use elsewhere. Furthermore, steel structures are inherently adaptable and extendable where the building is part refurbishment and part new build.
Mat 5	Responsible sourcing of materials within key building elements	100% of Corus' sites and Colorcoat® supply chain partners are certified to ISO 14001 ⁷ .
Mat 6	Environmental impact of thermal insulation	The common insulation materials used in pre-finished steel building envelope systems produced by the Colorcoat® supply chain partners have excellent Green Guide ratings of A or A+.
Mat 7	Design for robustness	Steel columns are inherently robust against damage from pedestrians and vehicles.
Pol 8	Noise attenuation	Pre-finished roof and wall cladding systems manufactured from Colorcoat® products can easily form the basis for an acoustically robust system and meet the stringent acoustic performance required for the building envelope.
Wst 1	Construction site waste management	All steel construction products are manufactured off-site therefore site waste is minimal and, for many products, is zero. Steel construction can therefore make a significant contribution to minimising construction site waste.
Wst 2	Increased use of recycled and secondary aggregates > 25% by weight or volume	Structural steel systems minimise concrete/aggregate use thereby making it easier to achieve this credit. Ground granulated blast furnace slag (GGBFS), a by-product of steelmaking, is a recognised secondary aggregate for the purposes of achieving this credit.

When used as part of the building envelope Colorcoat® products can contribute towards the number of credits for an industrial building when assessed under the overall BREEAM scheme. However, it is important to note that each building is assessed on an individual basis and the specific number of credits awarded under each category will vary at the discretion of the Assessor.

Designing the building envelope to incorporate the principles highlighted within this document is integral to achieving a sustainable building and can help to bridge the gap between categories within the BREEAM rating scheme.

References

1. BREEAM Industrial 2008 Assessor Manual, BES 5052: Issue 2.0. BRE Global, 2008.
2. The Green Guide to Specification Online, BRE, 2008.
3. Approved Document L2A: Conservation of fuel and power. (New buildings other than dwellings) (2006 edition).
4. Approved Document L2B: Conservation of fuel and power. (Existing buildings other than dwellings) (2006 edition).
5. Building (Scottish) Regulations 2004, Section 6 Energy.
6. Corus Colorcoat® Technical Paper; Creating an air-tight building envelope.
7. BS EN ISO 14001:2004 Environmental management systems. Requirements with guidance for use.
8. Corus Colorcoat® Technical Paper; End of life options for pre-finished steel buildings.

Appendix

Full listing and brief description of BREEAM Industrial credits (taken from BREEAM Industrial 2008 Assessor Manual')

Credit ID	Title	Aim of credit	Credits
Management			
Man 1	Commissioning	To recognise and encourage an appropriate level of building services commissioning that is carried out in a co-ordinated and comprehensive manner, thus ensuring optimum performance under actual occupancy conditions.	2
Man 2	Considerate constructors	To recognise and encourage construction sites which are managed in an environmentally and socially considerate and accountable manner.	2
Man 3	Construction site impacts	To recognise and encourage construction sites managed in an environmentally sound manner in terms of resource use, energy consumption and pollution.	4
Man 4	Building user guide	To recognise and encourage the provision of guidance for the non-technical building user so they can understand and operate the building efficiently.	1
Man 8	Security	To recognise and encourage the implementation of effective design measures that will reduce the opportunity for and fear of crime on the new development.	1
Section Total			10

Full listing and brief description of BREEAM Industrial credits (taken from BREEAM Industrial 2008 Assessor Manual¹)

Credit ID	Title	Aim of credit	Credits
Health and well-being			
Hea 1	Daylighting	Where evidence provided demonstrates that at least 80% of floor area in each occupied space is adequately daylight.	1
Hea 2	View out	To allow occupants to refocus their eyes from close work and enjoy an external view, thus reducing the risk of eyestrain and breaking the monotony of the indoor environment.	1
Hea 3	Glare control	To reduce problems associated with glare in occupied areas through the provision of adequate controls.	1
Hea 4	High frequency lighting	Where evidence provided demonstrates that high frequency ballasts are installed on all fluorescent and compact fluorescent lamps.	1
Hea 5	Internal and external lighting levels	Where evidence provided demonstrates that all internal and external lighting, where relevant, is specified in accordance with the appropriate maintained illuminance levels (in lux) recommended by CIBSE.	1
Hea 6	Lighting zones and controls	Where evidence provided demonstrates that, in all relevant building areas, lighting is appropriately zoned and occupant controllable.	1
Hea 7	Potential for natural ventilation	Where evidence provided demonstrates that fresh air is capable of being delivered to the occupied spaces of the building via a natural ventilation strategy, and there is sufficient user-control of the supply of fresh air.	1
Hea 8	Indoor air quality	Where air intakes serving occupied areas avoid major sources of external pollution and recirculation of exhaust air.	1
Hea 9	Volatile organic compounds	Where evidence provided demonstrates that the emissions of VOCs and other substances from key internal finishes and fittings comply with best practice levels.	1
Hea 10	Thermal comfort	Where evidence provided demonstrates that thermal comfort levels in occupied spaces of the building are assessed at the design stage to evaluate appropriate servicing options, ensuring appropriate thermal comfort levels are achieved.	1
Hea 11	Thermal zoning	Where evidence provided demonstrates that local occupant control is available for temperature adjustment in each occupied space to reflect differing user demands.	1
Hea 12	Microbial contamination	Where evidence provided demonstrates that the risk of waterborne and airborne legionella contamination has been minimised.	1
Hea 13	Acoustic performance	To ensure the acoustic performance of the building meets the appropriate standards for its purpose.	1
Hea 14	Office space	To recognise steps taken to provide a good working environment in smaller office areas within the development.	2
Section Total			15

Full listing and brief description of BREEAM Industrial credits (taken from BREEAM Industrial 2008 Assessor Manual¹)

Credit ID	Title	Aim of credit	Credits
Energy			
Ene 1	Reduction of CO ₂ emissions	To recognise and encourage buildings that are designed to minimise the CO ₂ emissions associated with their operational energy consumption.	15
Ene 2	Sub-metering of substantial energy uses	To recognise and encourage the installation of energy sub-metering that facilitates the monitoring of in-use energy consumption.	1
Ene 3	Sub metering of high energy load and tenancy areas	To recognise and encourage the installation of energy sub-metering that facilitates the monitoring of in-use energy consumption by tenant or end user.	1
Ene 4	External lighting	To recognise and encourage the specification of energy-efficient light fittings for external areas of the development.	1
Ene 5	Low or zero carbon technologies	To reduce carbon emissions and atmospheric pollution by encouraging local energy generation from renewable sources to supply a significant proportion of the energy demand.	3
Ene 6	Building fabric performance and avoidance of air infiltration	To recognise and encourage measures taken to minimise heat loss and air infiltration through the building fabric.	1
Ene 7	Cold storage	To recognise and encourage the installation of energy-efficient cold storage systems, therefore reducing operational CO ₂ emissions.	3
Ene 8	Lifts	To recognise and encourage the specification of energy-efficient transportation systems.	2
Section Total			27
Transport			
Tra 1	Provision of public transport	To recognise and encourage development in proximity to good public transport networks, thereby helping to reduce transport-related emissions and traffic congestion.	3
Tra 2	Proximity to amenities	To encourage and reward a building that is located in proximity to local amenities, thereby reducing the need for extended travel or multiple trips.	1
Tra 3	Cyclist facilities	To encourage building users to cycle by ensuring adequate provision of cyclist facilities.	2
Tra 4	Pedestrian and cyclist safety	To recognise and encourage the provision of safe and secure pedestrian and cycle access routes on the development.	1
Tra 5	Travel plan	To recognise the consideration given to accommodating a range of travel options for building users, thereby encouraging the reduction of user reliance on forms of travel that have the highest environmental impact.	1
Tra 6	Maximum car parking capacity	To encourage the use of alternative means of transport to the building other than the private car, thereby helping to reduce transport related emissions and traffic congestion.	2
Tra 8	Deliveries and manoeuvring	To ensure that safety is maintained and disruption due to delivery vehicles minimised through well-planned layout and access to the site.	1
Section Total			11

Full listing and brief description of BREEAM Industrial credits (taken from BREEAM Industrial 2008 Assessor Manual¹)

Credit ID	Title	Aim of credit	Credits
Water			
Wat 1	Water consumption	To minimise the consumption of potable water in sanitary applications by encouraging the use of low water use fittings.	3
Wat 2	Water meter	To ensure water consumption can be monitored and managed and therefore encourage reductions in water consumption.	1
Wat 3	Major leak detection	To reduce the impact of major water leaks that may otherwise go undetected.	1
Wat 4	Sanitary supply shut-off	To reduce the risk of minor leaks in toilet facilities.	1
Section Total			6
Materials			
Mat 1	Materials specification (major building elements)	To recognise and encourage the use of construction materials with a low environmental impact over the full life cycle of the building.	2
Mat 2	Hard landscaping and boundary protection	To recognise and encourage the specification of materials for boundary protection and external hard surfaces that have a low environmental impact, taking account of the full life cycle of materials used.	1
Mat 3	Re-use of building façade	To recognise and encourage the in-situ re-use of existing building façades.	1
Mat 4	Re-use of building structure	To recognise and encourage the re-use of existing structures that previously occupied the site.	1
Mat 5	Responsible sourcing of materials	To recognise and encourage the specification of responsibly sourced materials for key building elements.	3
Mat 6	Insulation	To recognise and encourage the use of thermal insulation which has a low embodied environmental performance relative to its thermal properties and has been responsibly sourced.	2
Mat 7	Designing for robustness	To recognise and encourage adequate protection of exposed parts of the building and landscape, therefore minimising the frequency of use of replacement materials.	1
Section Total			11
Waste			
Wst 1	Construction Site Waste Management	To promote resource efficiency via the effective and appropriate management of construction site waste.	4
Wst 2	Recycled aggregates	To recognise and encourage the use of recycled and secondary aggregates in construction, thereby reducing the demand for virgin material.	1
Wst 3	Recyclable waste storage	To recognise the provision of dedicated storage facilities for a building's operational-related recyclable waste streams, so that such waste is diverted from landfill or incineration.	1
Wst 4	Compactor / baler	To recognise and encourage the provision of facilities which enable efficient and hygienic waste sorting and storage.	1
Section Total			7

Full listing and brief description of BREEAM Industrial credits (taken from BREEAM Industrial 2008 Assessor Manual')

Credit ID	Title	Aim of credit	Credits
Land use and ecology			
LE1	Re-use of land	To encourage the re-use of land that has been previously developed and discourage the use of previously undeveloped land for building.	1
LE2	Contaminated land	To encourage positive action to use contaminated land that otherwise would not have been remediated and developed.	1
LE3	Ecological value of site AND Protection of ecological features	To encourage development on land that already has limited value to wildlife and to protect existing ecological features from substantial damage during site preparation and completion of construction works.	1
LE4	Mitigating ecological impact	To minimise the impact of a building development on existing site ecology.	2
LE5	Enhancing site ecology	To recognise and encourage actions taken to maintain and enhance the ecological value of the site as a result of development.	3
LE6	Long term impact on biodiversity	To minimise the long term impact of the development on the site's, and surrounding area's, biodiversity.	2
Section Total			10
Pollution			
Pol 1	Refrigerant GWP - Building services	To reduce the contribution to climate change from refrigerants with a high global warming potential.	1
Pol 2	Preventing refrigerant leaks	To reduce the emissions of refrigerants to the atmosphere arising from leakages in cooling plant.	1
Pol 3	Refrigerant GWP - Cold storage	To reduce the contribution to climate change from refrigerants with a high global warming potential.	1
Pol 4	NOx emissions from heating source	To encourage the supply of heat from a system that minimises NOx emissions, and therefore reduces pollution of the local environment.	2
Pol 5	Flood risk	To encourage development in low flood risk areas, or to take measures to reduce the impact of flooding on buildings in areas with a medium or high risk of flooding.	3
Pol 6	Minimising watercourse pollution	To reduce the potential for silt, heavy metals, chemicals or oil pollution to natural watercourses from surface water run-off from buildings and hard surfaces.	1
Pol 7	Reduction of night time light pollution	To ensure that external lighting is concentrated in the appropriate areas and that upward lighting is minimised, reducing unnecessary light pollution, energy consumption and nuisance to neighbouring properties.	1
Pol 8	Noise attenuation	To reduce the likelihood of noise from the new development affecting nearby noise-sensitive buildings.	1
Section Total			11
Total credits available			108

The Colorcoat® brand

The Colorcoat® brand is the recognised mark of quality and metal envelope expertise from Corus. With over 40 years experience, we actively develop Colorcoat® products and processes to reduce their environmental impact to a level beyond mere compliance. All Colorcoat® products are manufactured in factory controlled conditions, providing clear advantages onsite in terms of speed of construction and minimising social disruption.

Colorcoat® products manufactured in any UK Corus site are certified to the independently verified international management system, ISO14001 and 100% recyclable, unlike most other construction products.



Colorcoat® products and services

Colorcoat® products offer the ultimate in durability and guaranteed performance reducing building life cycle costs and environmental impact.

Corus has detailed Life Cycle Costing and Life Cycle Assessment information that demonstrates the positive performance of Colorcoat® products when compared with other alternatives. This is available from www.colorcoat-online.com

Colorcoat HPS200® Ultra

The latest generation product for roof and wall cladding, Colorcoat HPS200® Ultra offers an exciting new colour range and dramatically improved colour and gloss performance. Maintenance free, Colorcoat HPS200® Ultra delivers twice the colour and gloss retention of standard plastisols, and is now guaranteed for up to 40 years, combining outstanding performance with unrivalled reliability.

Colorcoat Prisma®

The ideal choice to deliver eye-catching buildings that will stand the test of time. Technically and aesthetically superior to PVDF (PVF2), Colorcoat Prisma® is readily available in the most popular solid and metallic colours. All backed up by the comprehensive Confidex® Guarantee.

Confidex® Guarantee

Offers the most comprehensive guarantee for pre-finished steel products in Europe and provides peace of mind for up to 40 years. Unlike other guarantees, Confidex® covers cut edges for the entirety of the guarantee period and does not require mandatory annual inspections. Available only with Colorcoat HPS200® Ultra and Colorcoat Prisma®.

Confidex Sustain®

Provides a combined guarantee which covers the durability of the Colorcoat® pre-finished steel product and makes the pre-finished steel building envelope CarbonNeutral – the first in the world. Corus and their Confidex Sustain® assessed supply chain partners endeavour to reduce the CO₂ emissions generated in the manufacture of pre-finished steel cladding systems but there will always be some unavoidable CO₂ emissions. These unavoidable CO₂ emissions are measured from cradle to cradle and the impact offset. Our aim is to encourage specification of the most sustainable pre-finished steel products and cladding systems. Available only with Colorcoat HPS200® Ultra and Colorcoat Prisma®.

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A superior alternative to leathergrain plastisol. Providing improved durability at a competitive price. Available in 25 popular colours, with a unique Corus emboss and guaranteed for up to 30 years via the Colorcoat® supply chain partners.

Colorcoat® Building Manual

Developed in consultation with architects and other construction professionals, the Colorcoat® Building manual incorporates over 40 years of Colorcoat® expertise. It contains information about sustainable development and the creation of a sustainable specification.

If you require any further information please contact the Colorcoat Connection® helpline on **+44 (0)1244 892434**. Alternatively further information can be found in the Colorcoat® Building manual or at www.colorcoat-online.com



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