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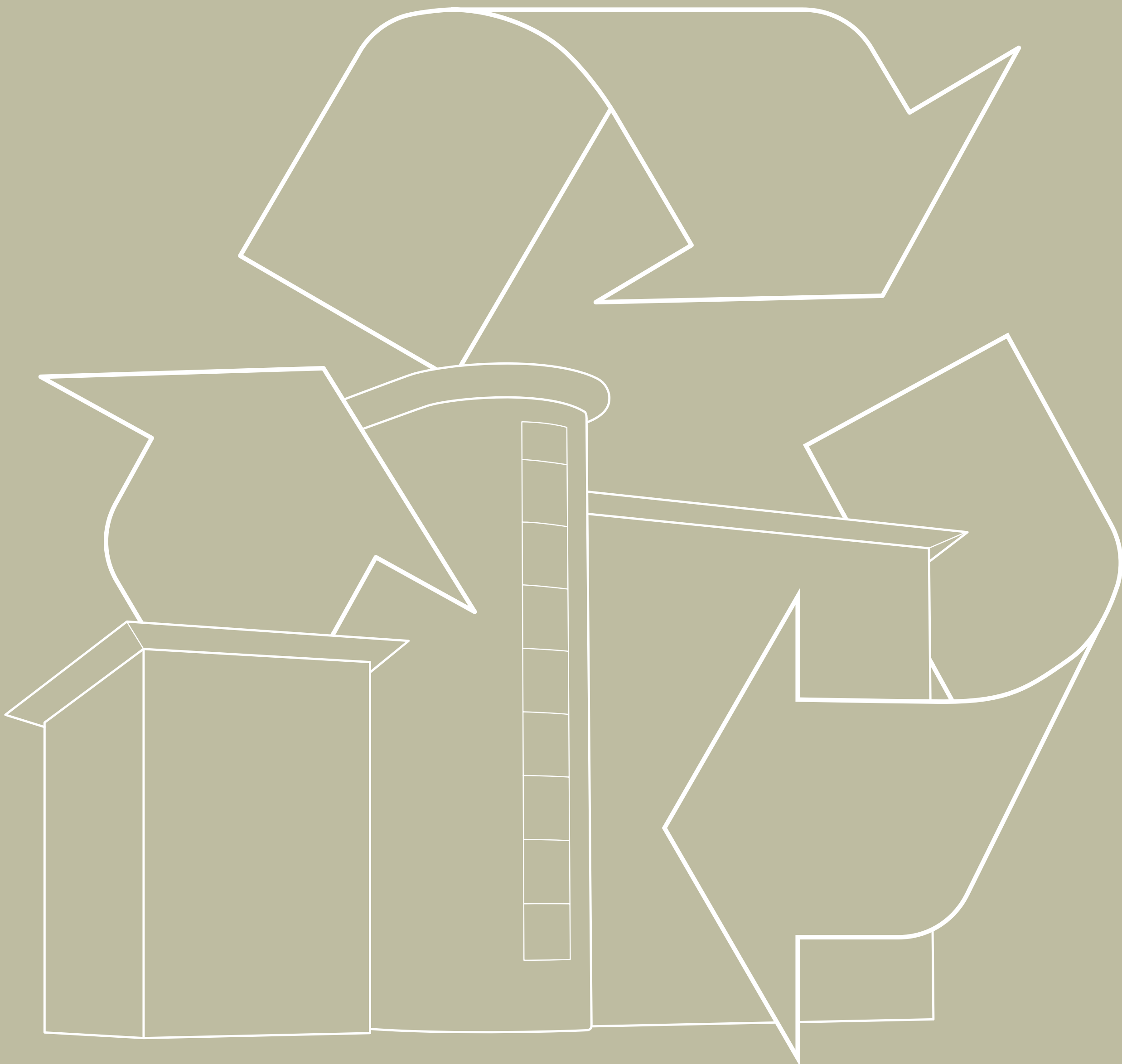
corus

Corus Colors

# Colorcoat® Technical Paper

## End of life options for pre-finished steel buildings



# Corus and sustainability

**Since 1970 Corus have reduced the amount of energy used in steelmaking by 40% and worked to make steel a fully traceable product. Our site in North Wales which manufactures Colorcoat® products, contains two areas of Special Scientific Interest within its boundaries. Breeding sites for Common Tern co-exist in close proximity to ongoing operations, demonstrating an ability to manage our operations and their environmental impact without compromising biodiversity.**

**Life Cycle Analysis and Life Cycle Costing studies are available for Colorcoat® pre-finished steel products and Corus continuously look for ways to improve product performance both functionally and environmentally. We also evaluate how our products are used during their lifetime as part of the cladding system and assess the environmental impact from cradle to grave.**

## Working together with the Steel Construction Institute (SCI)

Formed in 1986, the SCI is an independent, member-based organisation and provides one of the world's largest research and technical organisation supporting the use of steel in construction. The SCI recognised the importance of sustainability as early as 1993, when they set up the first European project to study embodied and operational energy in buildings of different materials. They work closely with Corus to reduce the impact of steel based construction techniques and provide advice to the market.

# Contents



# Overview

The problem of disposing of construction materials at the end of a building's useful life is an ever-increasing concern. One of the key benefits of pre-finished steel-based cladding systems is the inherent recyclability of steel, but there are always other components in a cladding system to consider too. This report gives advice on the disposal of various steel-based cladding systems used in the building envelope, including a snapshot overview of legislation, together with typical disposal rates and costs. Options for the different systems are reviewed in order to assist with the problems faced by demolition contractors and building owners. This will also help to guide designers towards providing best value solutions for new buildings where end of life needs to be considered at the outset. For this reason a forward view on likely changes to legislation and practice is also given.

This Corus Colorcoat® Technical Paper combines knowledge gained by the Steel Construction Institute (SCI) on legislative issues with Corus research in the market-place to provide a definitive guide to the end of life options for pre-finished steel based cladding systems.

# Introduction

**The sustainability of a building in terms of its material usage, construction, occupation and end of life is becoming an ever more important consideration. This is driven by the need to provide a better quality of life for people and protect the needs of future generations.**

**Many construction companies use the term ‘environmentally friendly’ to describe their offering without providing any quantitative information or credible research to substantiate such claims. Whilst some information might be available to explain how the products are manufactured sustainably, few companies address what happens to the products at the end of their life.**

# End of life options

## When a building envelope comes to the end of its current life there are a number of options available to the building owner, designed to either extend its life further or ensure it is disposed of safely and with minimum impact both economically and environmentally.

- **Refurbishment** – can extend the life of the pre-finished steel building envelope by many years. Options available include overpainting, overcladding or recladding if the original cladding has been damaged or is beyond repair.
- **Re-use** – careful removal of the cladding could enable it to be re-used elsewhere, most typically for agricultural applications.
- **Recycling** – wherever possible if refurbishment or re-use are not options, the cladding should be recycled so that it can re-enter the supply chain at the manufacturing stage. Any elements which cannot be recycled should be disposed of as safely as possible and with minimal environmental impact.

**Left:** Re-use of pre-finished steel cladding in agricultural application.

**Right:** Overpainting pre-finished steel cladding.

# Refurbishment

Refurbishing buildings offers a sustainable approach to achieving new facilities without the full cost of new build, effectively extending the useful life of the building and so minimising the impact of the resources used. Refurbishment may be undertaken for purely aesthetic reasons, in which case it results in an improvement in the working and social environment, or for functional reasons, such as to upgrade insulation. In all cases, effective use is made of still-functioning aspects of the building, only replacing those which have gone beyond their useful life, and thereby minimising both the work carried out and the use of resources.

Buildings using pre-finished steel cladding systems are ideally suited to refurbishment – whether it be for aesthetic or functional reasons. There are a number of refurbishment options available including overpainting, overcladding and recladding of damaged areas.

## Case study

This building reinforces the long-term performance claims made for Corus Colorcoat® pre-finished steel products, whilst also demonstrating the ease of refurbishment. Constructed in 1973, it has been in constant use for the storage and distribution of Guinness.

As part of a broader maintenance schedule, it was repainted in 2003 to restore the original appearance. The cladding was generally in excellent condition on three elevations out of four. The fourth elevation had been more exposed to weathering and had suffered physical damage from loading, but was still suitable for refurbishment by recladding.

**Left:** 1973.
**Right:** 2004.

A full guide to refurbishment using pre-finished steel cladding systems can be found on **www.colorcoat-online.com**

# Re-use

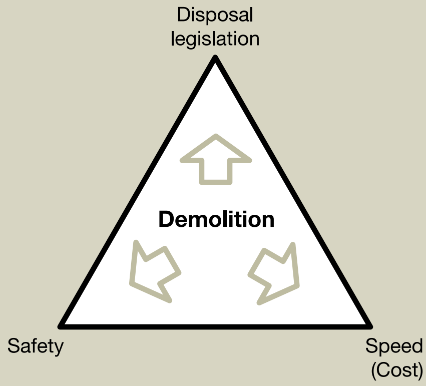
Where building materials are to be disposed of, re-use is generally the lowest impact option, both financially and environmentally. With careful dismantling and removal it is possible to re-use some of the materials used in the original construction. The European Commission Life Cycle assessment for steel construction[1] states that while around 10% of total construction steel is re-used, 15% of the cladding sheets removed from buildings during the demolition process enter the market for re-use.

For a number of years, the agricultural sector has provided a market for the re-use of pre-finished steel clad buildings, particularly for portal frame sheds. By contrast, the re-use of roof and wall cladding systems within the commercial and industrial sector is less common. This is mainly because of aesthetic problems with second hand cladding, the impact of different panel lengths and purlin spacing and the limited likelihood of achieving full regulatory approval where re-used materials are used extensively.

## Demolition practices

Portal frame buildings are considered by the industry to be relatively simple and inexpensive to demolish. The speed and ease inherent in the construction of a metal clad building is reflected in the demolition process. Machinery is generally used to remove the roof and wall sheets and materials are then segregated.

The pre-finished steel cladding and frame have a scrap or re-use value unlike many other materials which makes them more popular with demolition contractors. However, the main challenges faced by the demolition industry today revolve around tightening time constraints imposed by clients, ensuring safety on-site and ever more complicated legislation regarding the disposal of




**Photography:** Interface Marketing on behalf of Liebherr.

## Re-use of built-up systems

Built-up systems are by their very nature relatively easy to disassemble and separate out the different elements. The reclaimed pre-finished steel sheets could be re-used in agricultural buildings and the mineral wool and glass fibre insulation quilts could be re-used for applications such as domestic lofts. However, the careful removal and separation of materials required for re-use are not always compatible with demolition practice so in reality, re-use may be limited.

## Re-use of factory insulated foam filled composite panel systems

The re-use of factory insulated foam filled composite panels is very small and few are currently entering the waste stream. Specific fixing requirements for re-use are not popular with the agriculture industry and the panels move more slowly from reclamation yards than pre-finished steel sheets recovered from built-up systems. Unless current demolition practice or equipment changes significantly, the re-use of factory insulated foam filled composite panels is unlikely to improve.

## Future for re-use

The short timescales for building demolition and the impact of the Work at Height Regulations 2005, mean that re-use rates are likely to drop rather than increase without the intervention of specific measures or legislation to encourage re-use. Demolition contractors do not have the time to ‘disassemble’ the building in a way that would yield a significant percentage of re-useable sheets with the buildings often being pulled apart by large machines that can damage the sheets.

The implications of the Work at Height Regulations 2005 preclude most contractors from using manual labour to remove sheets individually and preserve them, and again demolition is more safely deployed with a machine. Easily accessible sheets at ground level that could be removed relatively safely are invariably damaged during the demolition phase so of little use.

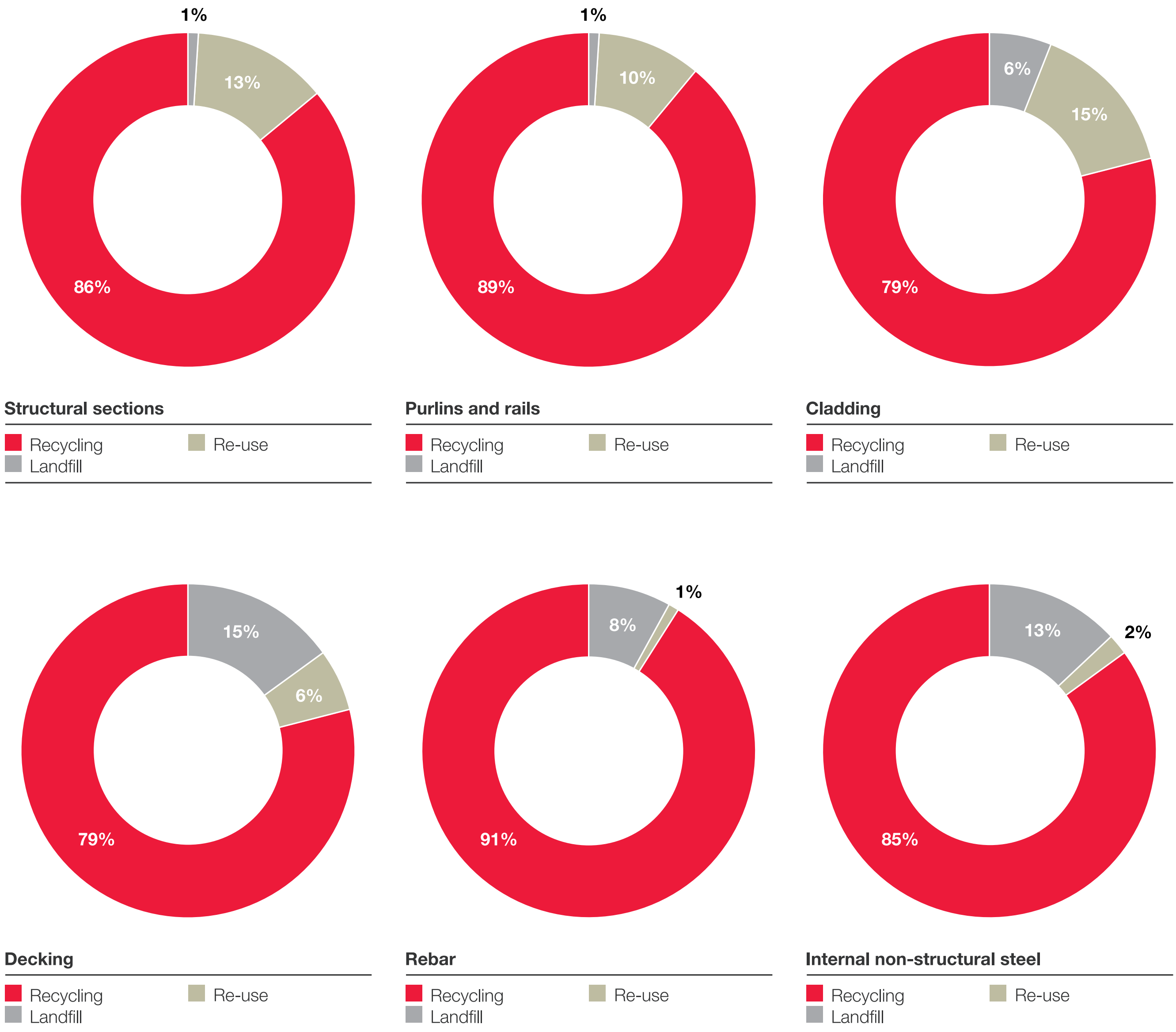
**Together with the Colorcoat® Centre for the Building Envelope, based at Oxford Brookes University, Corus is researching building envelope designs that will encourage future disassembly and re-use. These include interchangeable cladding, novel fixing methods that remove the need to put holes in the envelope, flexible mounting structures and innovative detailing.**

# Recycling

Wherever possible, if construction waste cannot be re-used, as much as possible of it should be recycled to re-enter the supply chain at the manufacture stage. Research suggests that overall 84% of construction steel is recycled while only 6% of steel cladding enters landfill[2].

The means and costs of recycling and disposal for built-up and composite cladding systems vary significantly and so these are dealt with separately within this report. However, in each case, the main aim is to recycle as much as possible, which requires effective separation of the steel components from the remainder of the system.

**Fig. 1. Re-use and recycling of constructional steel**




**Source:** J Ley, M Sansom and A Kwan (2002) Material flow analysis of the UK steel construction Sector[3]

# Recycling of built-up systems

**The recycling of built-up systems is relatively straight forward. The two key elements to consider are the pre-finished steel outer and inner sheets and the mineral wool or glass fibre insulation. These two elements are readily separated during the demolition process so that the steel can be recycled without further processing. The positive value of the steel scrap more than offsets the costs of disposal of insulation, giving a marginally positive overall value to the operation.**

## Insulation

Mineral wool manufacturers will take back ‘clean’ insulation material from demolition so long as no building rubble or steel is mixed in with it. The same is also true of a small number of glass fibre manufacturers. However, despite this, very little insulation is returned to the manufacturers for recycling. This is in part due to the inherent low density of the material, which makes it uneconomic to transport over long distances and undesirable from a life cycle impact perspective. Currently, most mineral wool and glass fibre insulants from built-up systems generally go to landfill after segregation from the other demolition waste. Corus research with landfill sites suggests both mineral wool and glass fibre are classified as ‘difficult waste’ and must be bagged before landfill.

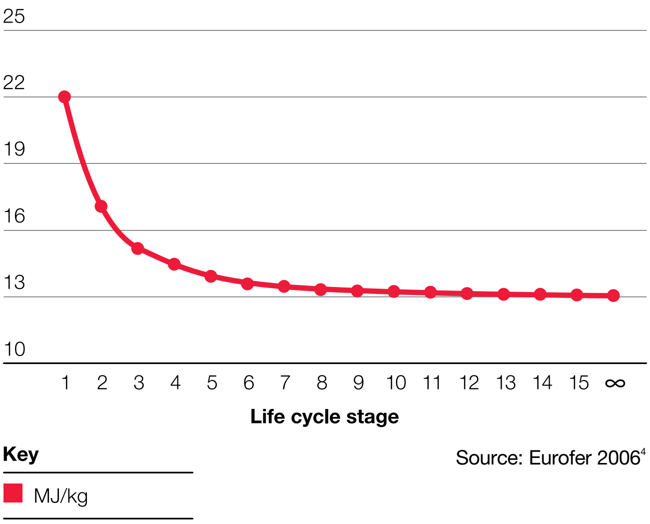
**More information, supplied by the SCI, on the regulatory infrastructure and its effect on end of life requirements for built-up systems is included on www.colorcoat-online.com**

## Steel scrap recycling

The steel industry has been operating steel scrap recycling on a large scale for more than 150 years. Recycling of steel scrap has always had economic as well as environmental advantages for the steel industry, saving resources and energy.

The steel recycling infrastructure is very efficient and all the steel in collected end of life products is recycled. Products that are easy to disassemble, with easy to separate steel parts, such as pre-finished steel from built-up systems, have a greater potential to be recycled. The steel can be recycled indefinitely without any downgrading.

**Fig. 2. Multiple recycling reduces the average energy requirement per kg of steel**




Source: Eurofer 2006[4]

**In the steelmaking process, the pre-finished steel coatings are normally destroyed, and the substrate steel recovered regardless of the coating type. Corus has shown through research that pre-finished steel can be readily recycled without further burden to the environment. Corus will take back any Confidex® guaranteed pre-finished steel used in a built-up cladding system manufactured by CA Group, Corus Panels and Profiles, Euroclad and Tegral.**

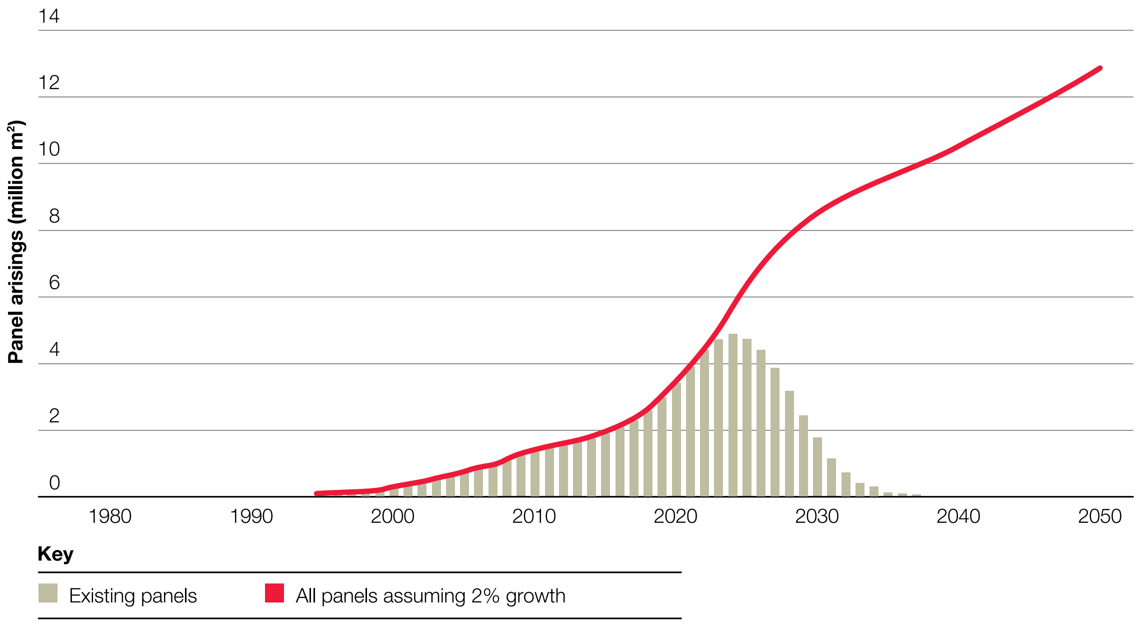
# Recycling of factory insulated foam filled composite panels

Increasing pressure to develop environmentally robust and cost effective recycling routes is expected over the next five years as significant amounts of buildings constructed using factory insulated foam filled composite panels reach the end of their life.

By their very nature, composite panels present a greater challenge at end of life than built-up systems, since the components are adhesively bonded together. To achieve the optimum solution for disposal, the foam core and steel sheets need separation, but the presence of gases known as blowing agents in the core can complicate this, depending on the blowing agents used.

Due to their relative bulk in comparison with their weight, whole factory insulated foam filled composite panels are not suitable for charging directly to the steelmaking processes. Manually separating the outer sheets from the foam core and recycling the steel and foam separately is not generally a viable option due to the level of manual labour involved and the potential release of blowing agent gases.

**Fig. 3. Predicted annual arisings of composite panels entering the waste stream, showing both existing panels and the total number, assuming 2% year-on-year growth**




**Source:** M Sansom, 'Recycling of organically coated composite steel cladding panels – phase 1 report' 2003[5].

## Blowing agent categories for factory insulated foam filled composite panels

Note that the use of ozone depleting substances (ODS) is banned under the Montreal Protocol.

- Chlorofluorocarbons (CFC-11) pre-1990. Considered Ozone Depleting Substance (ODS).
- Reduced Chlorofluorocarbons (CFC-11) 1991-1994. Considered Ozone Depleting Substance (ODS).
- Hydrochlorofluorocarbons (HCFC-141b) 1994-2003. Considered Ozone Depleting Substance (ODS).
- Hydrocarbons (mainly Pentane based) and Hydrofluorocarbons (HFC) recently introduced are not Ozone Depleting Substance (ODS).

Ozone Depleting Substances have been banned from the manufacture of foams since January 2004. Hydrocarbons and HFCs are not considered to be ozone depleting and are now the most common substances used during foam manufacture.

Most factory insulated composite panels used for the building envelope currently contain HFCs because of the fire resistance requirements. Although HFCs used do not contain ODS they do have a high global warming potential. Future legislation may restrict emissions of these gases to the atmosphere during recycling and a requirement for collection of these gases may be included.

Pentane-based factory insulated composite panels are more prevalent in cold storage applications due to the differences in fire testing and legislation, and are less common in current building envelope applications.

**Global warming potential:**

| | |
|---|---|
| HFC 365 | 890Kg $CO_2$ eq/Kg |
| HFC 245 | 950Kg $CO_2$ eq/Kg |
| Pentane | 11Kg $CO_2$ eq/Kg |

Legislation on the disposal of ODS-containing foams states that where practicable, the ODS gases should be collected and disposed of safely.
This legislation has had a significant effect on the disposal of fridges, but is equally applicable to foam filled composite panels produced before 2004, since these blowing agents have been banned. It should be noted that if the blowing agents used in the panels are unknown then the panels must be treated as if they contain ODS. For this reason it is important that good quality records are kept in all cases.

As a result, factory insulated foam filled composite panels in buildings reaching the end of their lives require a different approach to recycling and disposal than built-up systems. This also needs to take into account the type of blowing agents used in the manufacture of the foam. The options for consideration are:

- Landfill.
- Fragmentation / shredding.
- Fridge recycling.
- High temperature incineration.

## Landfill

Panels containing CFC and HCFC (ODS) are classified as hazardous waste. Most landfill operators will not accept panels with these blowing agents making landfill a very difficult option to pursue at end of life.

Panels containing pentane and HFCs are non-ozone depleting and currently have a non-hazardous classification. As such they can be considered for landfilling, however, many landfill sites are still reluctant to accept them. The bulk and organic nature of the panels may make them a target in future UK and EU legislation to limit landfill. There is also speculation that future legislation may treat global warming gases in the same way as ODS which would lead to a change in classification. This route for the disposal of factory insulated foam filled composite panels cannot be considered as reliable particularly given the large increase in panels coming to the end of their life over the next 10 to 15 years. There is also a likelihood of future legislation aimed at reducing landfill usage.

## Fragmentation / shredding

Fragmentation through existing recycling facilities used for automotive shredding is technically a viable route only for pentane and HFC blown panels.

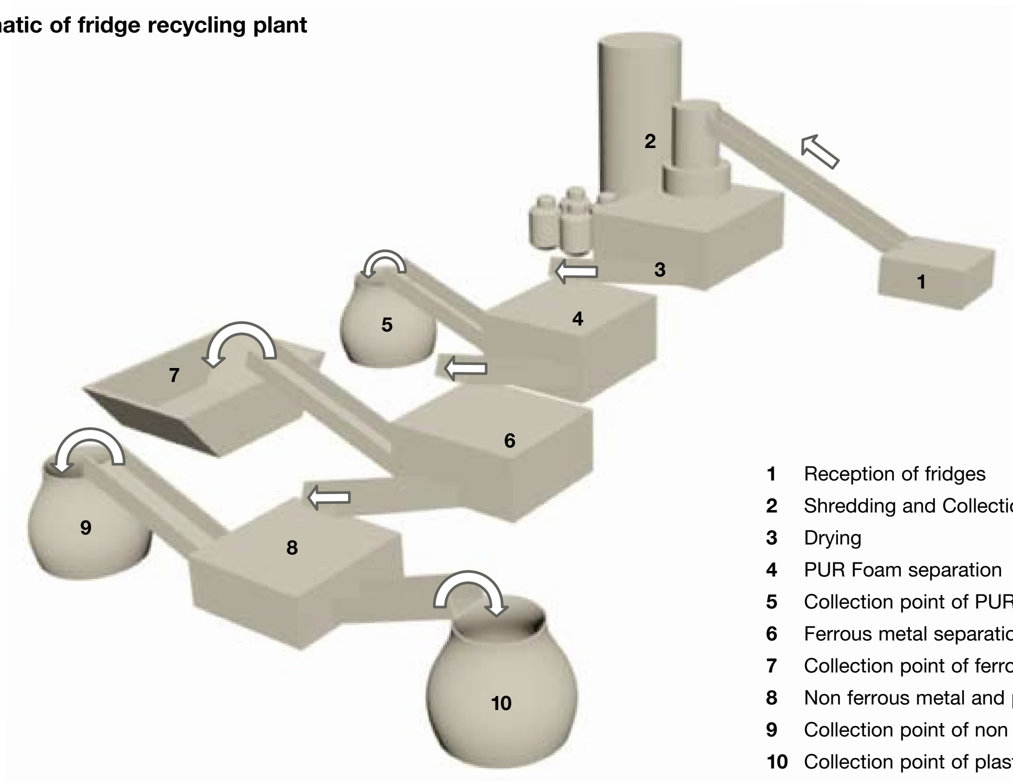
However, there are two reasons why this route is unlikely to be used to any great degree:

- Inherent in this process is the release of gases used as blowing agents to the atmosphere. While there is currently no legislation regarding the release of HFCs, their high global warming potential (up to 1,000 times worse than $CO_2$) may be a target for future legislation in this direction. Even in the absence of such legislation, releasing HFCs cannot be recommended on the grounds of the global warming caused.
- A large volume of panels, for example those removed from a large industrial unit, would need to be carefully integrated into the automotive waste stream and would increase the level of gases and dust released in the fragmentation process. Some recyclers stated that there could be an increased risk of explosion in the fragmentation process if the panels are not managed appropriately.

## Fridge recycling

Fridge recycling plants are now commonplace in the UK, with over 30 currently operating. Technically they appear to provide the best option for recycling and disposing of factory insulated foam filled composite panels at the end of their life where blowing agent gases are to be captured. Currently, this means all panels incorporating ODS or those of unknown provenance, although potential future legislation may broaden this net. Air cyclones, magnets and eddy-current technology would separate the various materials with the steel available for recycling as scrap and the polyurethane dust liberated from the foam going for landfill. The gases would be captured and contained and sent to specialist waste companies for high temperature incineration.

**Fig. 4. Schematic of fridge recycling plant**




1 Reception of fridges
2 Shredding and Collection of CFC gasses
3 Drying
4 PUR Foam separation
5 Collection point of PUR foam
6 Ferrous metal separation
7 Collection point of ferrous metal
8 Non ferrous metal and plastic separation
9 Collection point of non ferrous metals
10 Collection point of plastic

There are restrictions on the panel size that could be handled, requiring factory insulated foam filled composite panels to be cut down before being processed. To deliver an efficient operation, using the current set up, the panels would also have to be mixed with fridge feedstock. However, as the number of factory insulated foam filled composite panels entering the waste stream increases in the coming years, it can be expected that installations will be modified to take account of this.

The costs associated with recycling factory insulated foam filled composite panels through a fridge plant are between £7-9 per m$^2$. This is made up of a recycling cost of between £5 and £7 per m$^2$ and an assumed transport cost of up to £2 per m$^2$ from the demolition site to the recycling facility, based on a distance up to 100 miles.

## High temperature incineration

High temperature incineration is often quoted as an appropriate technique for dealing with polyurethane foams. However, separating the foam core from the outer and inner steel sheets is not practical and would result in Ozone Depleting Substances or hydrocarbons entering the atmosphere.

Incinerators are limited by similar dimensional constraints as fridge recycling plants (1 $m^3$ feedstock) but should be able to handle factory insulated foam filled composite panels, although this is not commonplace. The high temperature incineration would effectively process the foam core but the steel inner and outer sheet would fall through as slag to the bottom of the furnace mixed in with any other metal or glass waste. The resulting steel scrap would have a limited value as scrap due to the cross contamination with other materials. The cost of high temperature incineration is also relatively expensive at around £15 per $m^2$ and so would not be considered a sensible option.

**More information, supplied by the SCI, on the regulatory infrastructure and its effect on end of life requirements for factory insulated foam filled composite panels is included on www.colorcoat-online.com**

# Recycling of factory insulated mineral wool composite panels

## The amount of mineral wool composite panels used for cladding, predominantly on walls, has risen in recent years. Two methods of recycling these panels are currently available.

### Steel scrap recycling

This would involve manually separating the outer and inner sheets and recovering the steel scrap for recycling. The mineral core would be landfilled or returned to the mineral wool manufacturer for recycling. The practicalities of this manual process for end of life disposal would only lend itself to the treatment of relatively small factory insulated mineral wool composite panel volumes.

### Fragmentation

Using the shredder route is more appropriate for larger volumes of mineral wool panels. As the mineral wool panels contain no blowing agents, they can safely be handled through the fragmentation route. The steel could be recycled effectively and the mineral wool landfilled along with the other automotive shredder waste. Any future requirement for recycling of the mineral wool core could potentially be accommodated by dedicated shredding facilities if volumes of the panels for recycling were sufficient. Additionally, mineral fibres recovered from fibre-cored composite panels are generally clean and so suitable for recycling themselves.

**More information, supplied by the SCI, on the regulatory infrastructure and its effect on end of life requirements for factory insulated mineral wool composite panels is available on www.colorcoat-online.com**

## Development of alternative insulation materials

Corus have worked with Excel Industries, CA Group, the Building Research Establishment (BRE) and the Steel Construction Institute on a number of Waste and Resources Action Programme (WRAP) projects.

Excel Industries manufacture cellulose insulation from recycled newspaper, which has become established over the past 20 years as a mainstream insulation product for domestic applications.

An initial study examined the compatibility of cellulose with metal cladding and other system components and indicative fire performance when used as part of a built up twin skin system. A further study examined the technical issues of site construction and fire performance as well as commercial viability.

When tested to EN1187 test method 4, a built-up roof system achieved a $B_{ROOF}$ classification. When tested to BS476 part 22, a built-up wall system achieved 30 minutes insulation.

A demonstration building has been constructed at Excel Industries in Rhymney, South Wales. The building, which measures 8 m wide x 10 m long x 4 m high is being monitored for moisture build up, thermal performance and compatibility with system components.

A full report on this work is available on www.wrap.org.uk

Cross section through a built-up system prototype using cellulose insulation.

# Summary of end of life options

## Refurbishment

Refurbishment offers a well proven method for extending the life of the pre-finished steel building envelope either through overpainting, overcladding or recladding.

## Re-use

Built-up systems which are easy to disassemble are more frequently re-used, mainly in agricultural applications.

There is very little re-use of factory insulated composite panels (foam filled or mineral wool) mainly because of specific fixing requirements and the need for careful removal of panels which can take extra time.

Reduced timescales for building demolition and the impact of Work at Height Regulations 2005, mean that re-use rates are likely to reduce further.

## Recycling / disposal

### Built-up systems

A well established process is in place for handling built-up systems at end of life which is easy and cost effective.

- The pre-finished steel can be separated and is 100% recyclable.
- Glass-fibre and mineral wool insulation can be processed for re-use at lower grade and mineral wool could be recycled effectively through the manufacturing process. At present the majority of mineral wool and glass-fibre insulation liberated at disposal goes to landfill.

Demolition contractors are happy to recover built-up systems and use the scrap value of the steel to offset their costs.

### Factory insulated foam filled composite panels

Different recycling / disposal options need to be considered because of the potential risk of ozone depleting or global warming potential gases being released if not handled appropriately.

- Landfill is not an option for the disposal of factory insulated foam filled composite panels containing CFC and HCFC blowing agents and this may also extend to Pentane and HFCs in the future. Practically very few landfill sites will now accept any factory insulated foam filled composite panels.
- Fragmentation / shredding would release the blowing agents from factory insulated foam filled composite panels, so is not an option for those which contain, or may contain, CFCs or HCFCs. While this is technically a feasible route for small amounts of panels blown with HFCs, the high global warming potential of the gas liberated means that this process would cause significant environmental damage and so cannot be recommended. If legislation in the UK and EU changes to ban the release of such gases, as is anticipated, then this route would in any event no longer be available.
- Fridge recycling is likely to offer the most practical option for disposal and recycling of factory insulated foam filled composite panels when blowing agents need to be collected (as is currently the case for CFC / HCFC and in the future likely for HFC / Pentane). However, panels would need to be cut down to fit the current dimensions of the machines and this route is relatively costly.
- Incineration could be used to process the foam core with the steel inner and outer sheet falling through as slag, mixed in with other materials. This reduces the scrap value of the steel as it will be contaminated with other materials and has similar constraints to fridge recycling in terms of panel size. This route is also the most expensive.

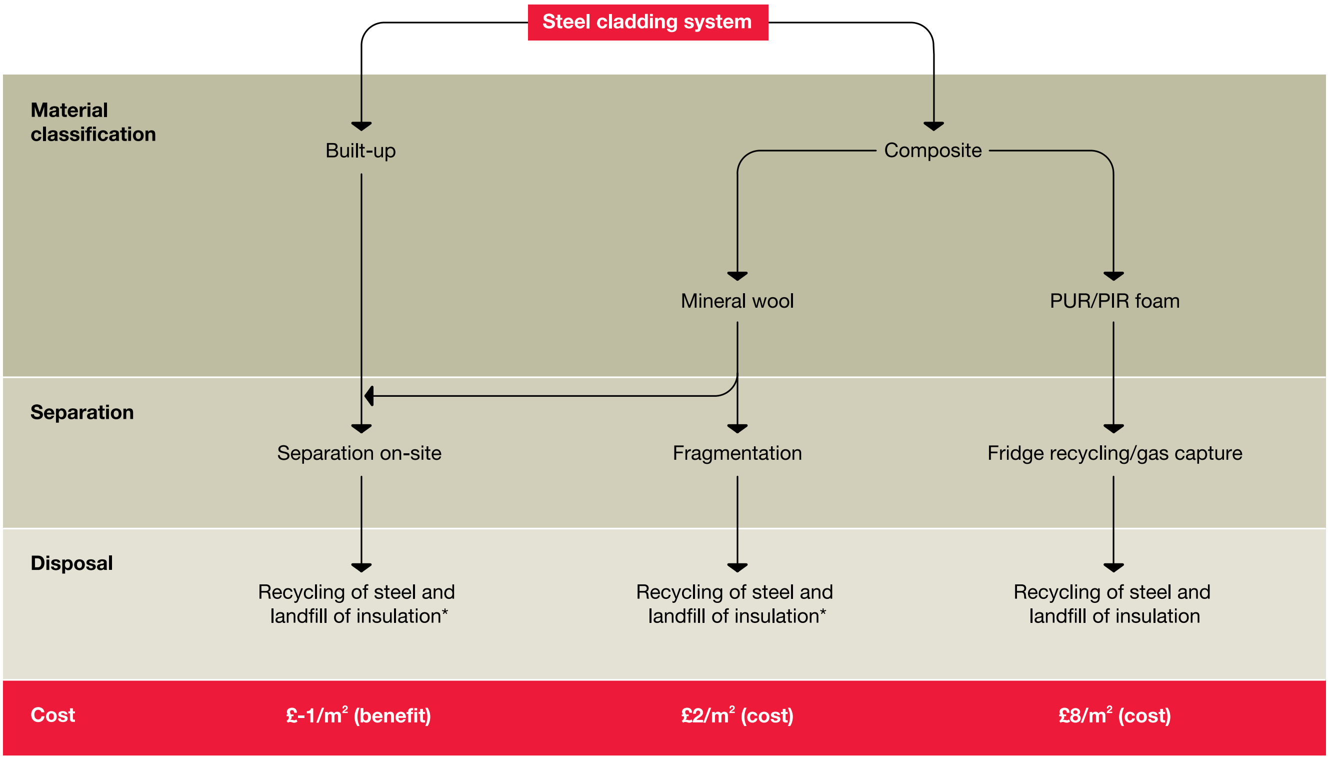
Panels need to be treated carefully during demolition to ensure no release of gases.

There is little industry experience in handling factory insulated foam filled composite panels at end of life. However, there will be a significant increase in the amounts coming through in the next 10 years.

Demolition contractors perceive factory insulated composite panels as more difficult and expensive to deal with than built-up systems.

One difficulty for the demolition contractors is the inability to distinguish between CFC / HCFC and hydrocarbon blown panels, prompting the question 'how do we know which is which?' For this reason, it is essential that accurate records are kept of products used in the construction process. Current options for landfilling are disappearing as environmental controls become stricter and fragmentation / shredding is only an option for certain panels (dependent on blowing agents used) and in small volumes. Incineration is very expensive and destroys much of the steel scrap value.

**Fig. 5. Best practice route for disposal and recycling of pre-finished steel-based cladding systems**




* Most factory insulated composite panels used for building envelope currently contain HFC because of the fire resistance requirements. Although HFC's used do not contain ODS they do have a high global warming potential. Future legislation may restrict emissions of these gases to the atmosphere during recycling and a requirement for collection of these gases may be included.

Fridge recycling / gas capture is therefore recommended as the separation process.

Pentane-based factory insulated composite panels are more prevalent in cold storage applications due to the differences in fire testing and legislation, and are less common in building envelope applications currently. Fragmentation is acceptable as the separation process.

**Table 1: Summary of anticipated costs for recycling and / or disposal of pre-finished steel cladding systems**

| System | Current route | Cost | Possible future route |
|---|---|---|---|
| Built-up system pre-finished steel | Steel scrap recycling | Up to £1.00/m² scrap benefit | Steel scrap recycling |
| Built-up system insulation | Landfill | £0.60/m² | Recycling into manufacturing process (available now but not prevalent) |
| Factory insulated foam filled composite panel | Fridge recycling | £7.00 – £9.00/m² | Fridge recycling |
| Factory insulated foam filled composite panel | Incineration | £15.00/m² | Fridge recycling |
| Factory insulated mineral wool composite panel | Separated on-site | £2.00/m² | Fragmentation / shredding |

**Note:** Includes transport up to 100 miles.

# Further information

**1** The European Commission, 2002, Life cycle assessment for steel construction, Report EUR 20570 EN.

**2** J Ley, "An environmental and material flow analysis of the UK steel construction sector", Engineering Doctorate Thesis, University of Wales, 2003.

**3** J Ley, M Samson and A S Kwan, 'Material flow analysis of the UK steel construction sector', Processing of Steel in Sustainable Construction, International Iron and Steel Institute World Conference, May 2002, Luxembourg.

**4** EUROFER (European Confederation of Iron and Steel Industries), "Steel Recycling – One aspect of the steel industry's contribution to the sustainable use of natural resources within an integrated product policy", 2006.

**5** M Samson, "Recycling of Organically Coated Composite Steel Cladding Panels – Phase 1 report", commissioned by the DTI and Biffaward, 2003.

## CPD accreditation

This paper has been assessed and approved as conforming to RIBA CPD guidelines. As such the content has been designated to fit under the following core curriculum headings:

**General Headings**
1 Professional context
2 Construction Skills
**Subjects**
1 Sustainable architecture
2 Specification writing and choosing materials
**Knowledge level**
**General awareness**

To receive a CPD certificate for this paper, please go to www.colorcoat-online.com/cpd where you will be asked to correctly answer five short questions on the content of the paper before being issued with an electronic certificate.

# 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®

Corus has demonstrated that Colorcoat HPS200® can be recycled without additional burden to the environment. It has been eco-designed to exceed future legislative requirements and reduce its environmental impact, providing a long-term sustainable building envelope solution.

- All traces of heavy metals and fire retardants have been removed from the topcoat.
- Undesirable organotin stabilizers and phthalate plasticisers replaced with higher performing alternatives.

More information about the environmental performance of Colorcoat HPS200® is provided in an Environmental Product Declaration. This is available from **www.colorcoat-online.com**
Environmentally stable in-use, Colorcoat HPS200® has passed stringent testing to BS6920 'Suitability of non-metallic products for use in contact with water intended for human consumption' supporting its use for rain water collection systems.

### Confidex® Guarantee

Offers the most comprehensive guarantee for pre-finished steel products in Europe and provides peace of mind for up to 30 years. Unlike other guarantees, Confidex® covers cut edges for the entirety of the guarantee period and does not require mandatory annual inspections.

### 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. Unavoidable $CO_2$ emissions from the pre-finished steel cladding system including fixings and insulation, are measured from cradle to grave and the impact offset. More than just offsetting, the aim is to encourage specification of the most sustainable pre-finished steel products and cladding systems.

### 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**

www.colorcoat-online.com



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**Sales contact details**
Corus Colors
Shotton Works
Deeside
Flintshire CH5 2NH
United Kingdom
T: +44 (0)1244 812345
F: +44 (0)1244 831132
**www.colorcoat-online.com**

**Colorcoat Connection® helpline**
T: +44 (0)1244 892434
F: +44 (0)1244 836134
e-mail: colorcoat.connection@corusgroup.com