

FIREWALLS

Technical specifications







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FIRE ISSUES SUMMARY

RESISTANCE TO FIRE AND REACTION TO FIRE

Insurance industry approach to fire design

The Association of British Insurers (ABI) publication – Technical Briefing: Fire performance of sandwich panels systems – recommends a risk-based approach to the use of sandwich (composite) panel systems that recognises the different fire resistance of various panel types. It also calls for use of more protected zones in buildings (firewalls) and highlighted the danger of arson. It confirms that superior levels of fire resistance can only be provided by mineral wool cored sandwich panels.

Smoke is a danger

Smoke inhalation is the cause of the majority of deaths due to fire. Therefore the new Euroclass system includes information on the smoke produced when products burn. The smoke from combustible organic materials can be toxic and corrosive. It may cause more damage to the premises than the flames themselves.

The Office of the Deputy Prime Minister has indicated that the next revision to the Building Regulations will refer to smoke produced by burning materials.

Fire load

If a combustible insulation core becomes involved in fire, it presents an additional fire load. Rock fibre, a mineral wool, being made from volcanic rock makes a negligible contribution. Polyurethane (PUR) and Polyisocyanurate (PIR) being hydrocarbon based can potentially make a sizeable contribution to fire load.

Concern of the insurance industry

In the past decade, a number of fire incidents around the world have highlighted concerns about the fire performance of sandwich panels. Because the core of some types of insulated panel is combustible, it is possible that the core material can become involved as a fuel source for a fire.

Euroclasses – the new way to classify fire performance

As part of the EU move to replace old national fire regulations there is a new European classification system for Reaction to Fire. The system categorises building materials into seven classes based on the tendency to exhibit flashover in a standard reference test, from A1 through to F.

The various British Standards referred to in the current National Building Regulations for assessing the fire performance of building products are being replaced by a new European system for classification and new test methods.

Cost benefits of non-combustible design solutions

Davis Langdon & Everest (DLE), the UK's largest Quantity Surveyor Practice, were commissioned to investigate the comparative costs of two external cladding systems from Euroclad and a PIR cored panel manufacturer.

DLE averaged the costs from the three large national roofing and cladding sub contractors to show the comparison. Overall the Euroclad non-combustible system was £87,960 or 25.3% lower in cost.

Also the sub contractors estimated that the Euroclad system would on average take 8 days less to install.

The environment – renewable resources

Rock fibre consists mainly of volcanic rock. By comparison the components of PUR/PIR foams are manufactured from petrochemicals, using non-renewable resources.

The environment – recycling

Rock fibre can be used as landfill where it will return to the ground or can be recycled.

At the current time some plastics can be recycled, but PUR/PIR cannot economically be recycled. The available methods are either to bury them in landfill sites, or to burn them.

Non-combustible design solutions from Euroclad

Euroclad can offer a non-combustible design solution for metal cladding and roofing using built-up systems, with non-combustible rock, or glass mineral fibre insulation. This allows the designer to choose the construction method that is most appropriate for the building and its use – while reducing fire risk by only specifying non-combustible insulation materials.

NON-COMBUSTIBLE v. COMBUSTIBLE

CONCERNS OF THE INSURANCE INDUSTRY

Fire safety is an area where there has been much discussion and argument by manufacturers, building owners, insurance companies and fire brigades. There is a wealth of regulation, guidance, tests, standards, claims and counter claims.

The result is confusion for all involved. However, there are some simple facts that can be stated and some particular points that can be discussed.

- As part of the EU move to replace old national fire regulations there is a new system for classifying the Reaction to Fire of construction products as differentiated by the new Euroclasses
- The new Euroclasses will bring greater transparency and understanding of what is a 'fire safe product' (e.g. smoke is now a factor in classification)
- The new thinking is based on the fact that a small fire is less hazardous than a large fire and that a rapidly growing fire is more dangerous than a slowly growing fire
- This thinking can be extended to a simple approach to low fire risk roof and cladding systems – 'non-combustible design'
- Maximum use of non-combustible materials will produce a design with low fire risk that is 'future proof' (that means the design is unlikely to be overtaken by developments in attitudes to fire performance of materials such as has happened to polyurethane and expanded polystyrene in many applications). If a combustible material is used there is always a likelihood of burning.

Euroclasses

The system categorises building materials into 7 classes ranging from A1 through to F, dependent upon their time to flashover, as shown opposite.

The various British Standards referred to in the current National Building Regulations for assessing the fire performance of building products now include the new European system for classification and new test methods.

In considering the passive fire performance of products there are two areas:

- Reaction to fire performance – the extent to which a product burns and contributes to the development of the fire
- Resistance to fire performance – the ability of the product to prevent the spread of flame or smoke in a fully developed fire and to maintain the structural stability of the elements of the building.

Reaction to Fire covers to what extent products burn and therefore contribute to the growth of fire. As a general principle, the larger the size of the test, the better the realism and reliability. For this reason the defining parameters of the classification system are based on the larger ISO 9705 Room Corner test, which measures the time to flashover, which is perhaps the most dangerous event in a fire. Flashover occurs when there is a sudden increase of combustion with the ignition of smoke and gases.

Flashover before a building can be evacuated will increase the likelihood of loss of life.

Fire resistance is a structural requirement which applies at a later stage in fire development than reaction to fire, and it relates primarily to the ability of a building or parts of a building to maintain their structural integrity and insulation stability and thus prevent the spread of fire from one part of a building to another.

LIKELY REACTION TO FIRE EUROCLASSES FOR MATERIALS

Euroclass	Flashover in room corner reference test ISO 9705	Products
A1	No flash-over	Concrete, brick, rock fibre
A2	No flash-over	Plasterboard, cement, particle board, glass wool (foil faced)
B	No flash-over	Painted gypsum board, some fire resistant MDF
C	Flash-over 10 – 20 minutes	Phenolic foam (foil faced), most fire resistant MDF
D	Flash-over 2 – 10 minutes	Polyisocyanurate foam (foil faced PIR), EPS Type A
E	Flash-over within 2 minutes	Polyurethane foam (laminated faced PUR), wood fibre board
F	No performance determined	EPS Type N, untested or fails Euroclass E

INTRODUCTION TO THE CONSTRUCTION OF AN EXTERNAL FIRE WALL

In accordance with Building Regulations it is sometimes necessary, for certain elements of a building to have a specified period of fire resistance. The regulations vary according to the element and distance from the boundary.

The systems that Euroclad have had tested at approved fire research centres are applicable given that the following criteria are satisfied.

1 Position

The external wall must be 1m or more from the boundary measured from the outer face of the cladding.

2 Type of building

In accordance with regulation B2 of the Building Regulations it must be as defined in Appendix A – Table A2 (see page 9).

3 Height

Refer to Table A2, Appendix A, Part B of the Building Regulations (see page 9).

4 Special requirements by Local Authorities

It may be that local interpretations of building regulations vary or that the building merits special consideration. It is essential that the building designer confirms that the Euroclad system selected complies with the relevant local authority requirements.

5 Direction

Except for the internal firewall, these systems are designed to resist fire from inside the building only.

6 Structural frame

The fire resistant system must be fixed to sheeting rails, which are fixed to supporting cleats through slotted holes with the bolt incorporating a plastic or low melt washer.

Both elements having the purpose of assisting movement through thermal expansion in the event of a fire. The rails are to be at maximum centres of 2,080mm. All bottom sheeting rails need to be single span and all sheeting rails need to be shorter than standard to allow for expansion. The remainder of the frame must be protected by suitable material which gives the same period of protection as the wall itself.

7 Support of wall

When the sheeting rails heat up during a fire they will no longer function as a structural member due to loss of strength (usually at approx 550°C). To prevent the wall moving downwards under its own weight, either a support at the base, or a protected eaves beam is required. The intention is that the inclusion of at least one of these features will support the wall itself during the fire.

GENERAL INTRODUCTION TO FIRE REGULATIONS

It would be impossible to cover all the conditions that come under consideration of fire performance in this publication. The Building Regulations deal comprehensively with the subject of fire performance. However, the following notes may be useful to the specifier in the selection of the most suitable materials.

The relevant sections of the regulations may be summarised as follows:

- 1 Any external cladding which is situated within 1m from any point on the relevant boundary, or nominal boundary, or any building exceeding 18m in height shall have a 'Class O' surface.
- 2 A class O surface is construed as either:
 - i. The material is non-combustible when tested to BS 476 Part 4 (Combustibility). All Corus's metallic coated steels such as Galvatite® and Galvalloy® comply.

Or

- ii. The surface shall have indices of performance not exceeding 12 and (i), not exceeding 6 when tested to BS 476 Part 6 (Fire Propagation). In addition it is essential that the material must obtain a Class 1 rating when tested in accordance with BS 476(b): Part 7, surface spread of flame.

Corus has tested a number of Colorcoat® products which confirm compliance with class 0 rating on the basis of 2 (ii).

- 3 Any external cladding which is situated 1m or more from the boundary and is below a height of 18m from the ground may have a surface which, when tested to BS 476 Part 6 (Fire Propagation) has an index of performance, (I), not exceeding 20.

CORUS FIRE STATEMENT

Fire Rating

Corus Colorcoat Celestia®, Colorcoat Prisma® and Colorcoat HPS200® meet the Class 0 requirements of The Building Regulations for the UK, 2000 as well as the M1 requirements of NF P 92-507 for France and the B1 requirements of DIN4102-1 for Germany.

European standards for resistance and reaction to fire will progressively supersede national standards. The implementation of the European standards will vary from one country to another.



THE ESSENTIAL PARTS OF THE BS 476 RELEVANT TO CORUS PRODUCTS

BS 476 Part 3: External fire exposure roof test

Roofs are graded according to the length of time they resist fire from the outside (e.g. fire in an adjacent building) and the distance of superficial spread of flame on the outside surface. The 'Part 3' test procedure has to be performed on a section of roof structure and it is not just a test of material.

A properly built pitched roof constructed using Colorcoat HPS200® or Colorcoat PVDF® have a notional AA designation within the Building regulations.

BS 476 Part 4: Combustibility

Either a material burns or it does not, there are no intermediate degrees. All Corus metallic coated sheets, such as Galvatite® hot-dip galvanised steel or Galvalloy®, are deemed 'non-combustible'. Pre-finished steels such as Colorcoat® products have to be further assessed.

BS 476 Part 6: Propagation

This is a test which assesses the rate of heat release of a material in burning, by means of a standard procedure. This measures the total heat given off by a material over a period of twenty minutes, expressed as an index of performance, I, calculated from an empirical formula contained in the standard. In addition, the initial heat given off over shorter periods – expressed as the subindices i1, i2, and i3 – is also assessed. All Corus Colorcoat® pre-finished steel products have indices of performance, I, not exceeding 12 and i1 (first 3 mins) not exceeding 6, which have particular significance in relation to Building Regulation requirements.

BS 476 Part 7: Surface spread of flame

This test grades materials in Classes 1 down to 4 in descending order of ranking. Corus has tested a number of Colorcoat® products which confirm compliance with Class 1.

BS 476 Parts 21 and 22: Fire resistance of elements of construction

These tests are designed to assess the performance of complete elements. These should remain stable, resist penetration of flame and hot gases and limit the transfer of heat from one side to the other for the fire resistance period required, usually 1/2, 1, 1 1/2 or 2 hours.

Steel cladding alone is given a zero rating in terms of fire resistance and would therefore be classified as an 'unprotected area' in the context of the Building Regulations. When used in conjunction with suitable insulating materials, the required degree of fire resistance can be met. It should be noted that in most buildings, a large percentage of the external wall may be designated 'unprotected areas' so that profiled steel cladding can be used without any fire resistance requirement.

To ensure the long-term performance and appearance of the building, it is important that the pre-finished steel product is specified alongside the cladding system.

Corus Colorcoat® Products and Services

The Colorcoat® brand provides the recognised mark of quality and metal envelope expertise exclusively from Corus. Over the course of 40 years Corus has developed a range of technically leading Colorcoat® pre-finished steel products which have been comprehensively tested and are manufactured to the highest quality standards. These are supported by a range of services such as comprehensive guarantees, colour consultancy and technical support and guidance.

Colorcoat HPS200®

Exclusive coating technology, superior performance and the unique Confidex® Guarantee make Colorcoat HPS200® the most specified pre-finished steel product in Europe for roof and wall cladding. Now maintenance free for up to 30 years.

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 with the unique Confidex® Guarantee providing cover for up to 25 years on walls.

Colorcoat Celestia®

Offers the creative scope of a metallic effect combined with superior durability and performance all backed up with the Confidex® Guarantee.

Celestia, Colorcoat, Confidex, HPS200, Prisma and Repertoire are registered trademarks of Corus.

Repertoire® Colour Consultancy

The Repertoire® Colour Consultancy can advise on colours and colour strategies using a range of standard shades, as well as discussing individual bespoke colour requirements. Corus can match almost any shade from physical swatches to commonly used references such as RAL, NCS and British Standard and more unusual standards.

Confidex® Guarantee

Evolved from 40 years experience Corus has in pre-finished steel development and manufacture.

Available with Colorcoat HPS200®, Colorcoat Celestia® and Colorcoat Prisma®, the Confidex® Guarantee is clear and simple to register, can easily be transferred if building ownership changes and provides peace of mind and reduced risk for the supply chain.

For more information about Corus Colorcoat® products and services visit www.colorcoat-online.com or call the Colorcoat Connection® helpline on 01244 892434.



EXTERNAL WALL CONSTRUCTION

Paragraph 13.7, Section 13, Part B4 of the Building Regulations states that:

“The external envelope of a building should not provide a medium for fire spread if it is likely to be a risk to health or safety.”

From this, Euroclad Limited concludes that composite wall panels made with insulation comprised of any of the following products (which are combustible) would be excluded on this basis:

- Expanded polystyrene (EPS)
- Fire resistant expanded polystyrene (EPS)
- Polyurethane (PUR)
- Polyisocyanate standard (PIR)
- Polyisocyanate approved (PIR).

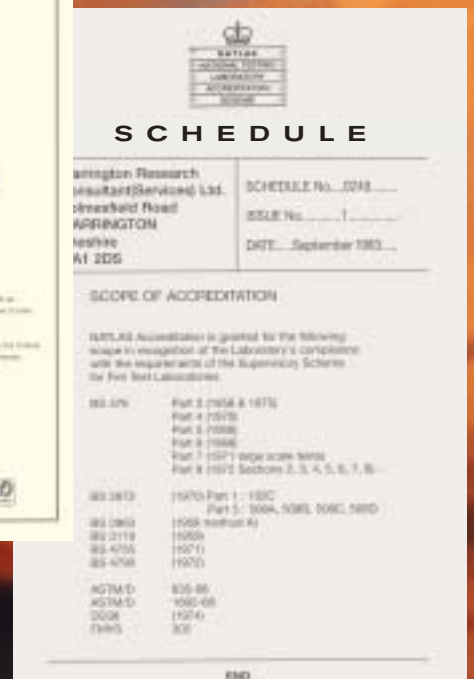
BUILDINGS BETWEEN 18m AND 30m IN HEIGHT

Paragraph 13.7, Section 13, Part B4 of the Building Regulations also states that:

“In a building with a story 18m or more above ground level, insulation material used in ventilated cavities in the external wall construction should be of limited combustibility...”

(Or be non-combustible)

This allows the use of both mineral wool composite panels and mineral wool or glass wool products in a built-up system, for example, as Test Reports are available (Rockwool Cladding Roll – Warrington Fire Certificate Number 70432 and Knauf Insulation Crown Factoryclad / Factoryclad SE – Warrington Fire Cert No WRC65905), but would exclude the combustible insulation products already mentioned.



FIRE SAFETY PERFORMANCE OF BUILDINGS AND STRUCTURES

EXTRACT FROM APPENDIX A: TABLE A1 – Specific provisions of fire test for fire resistance of elements of structure etc.

Part of building	Minimum provisions when tested to the relevant part of BS 476 : (1) (minutes)			Minimum provisions when tested to the relevant European standard (minutes) (12)	Method of exposure
	Loadbearing capacity (2)	Integrity	Insulation		
5. External walls b. Any part 1000mm or more from the relevant boundary	See Table A2	See Table A2	15	REI see Table A2 (10)	From inside the building
7. Compartment walls (other than separating occupancies)	See Table A2	See Table A2	See Table A2	REI see Table A2	Each side separately

Notes:

- Part 21 for loadbearing. Part 22 for non-loadbearing elements. Part 23 for fire-protecting suspended ceilings and Part 24 for ventilation ducts. BS476: Part 8 results are acceptable for items tested or assessed before 1st January 1988.
- Applies for loadbearing elements only (see B3.ii and Appendix E).
- For the purposes of meeting the Building Regulations external walls under item 5b will be deemed to have satisfied the provisions above, provided that they achieve the loadbearing capacity and integrity requirements as defined in table A2 and an insulation requirement of at least 15 minutes.
- The National classifications do not automatically equate with the equivalent classifications in the European column, therefore products cannot typically assume a European class unless they have been tested accordingly. 'R' is the European classification of the resistance to fire performance in respect of loadbearing capacity; 'E' is the European classification of the resistance to fire performance in respect of integrity; and 'I' is the European classification of the resistance to fire performance in respect of Insulation.

EXTRACT FROM APPENDIX A: TABLE A2 – Minimum periods of fire resistance

Purpose group of building		Minimum periods (minutes) for elements of structure in A1			
		Ground or upper story			
		Height(m) of top floor above ground, in a building, or separated part of a building			
		Not more than 5	Not more than 18	Not more than 30	More than 30
Office	Not sprinklered	30*	60	90	Not permitted
	Sprinklered	30*	30*	60	120#
Shop and commercial	Not sprinklered	60	60	90	Not permitted
	Sprinklered	30*	60	60	120#
Assembly and recreation	Not sprinklered	60	60	90	Not permitted
	Sprinklered	30*	60	60	120#
Industrial	Not sprinklered	60	90	120	Not permitted
	Sprinklered	30*	60	90	120#
Storage and other non-residential a. And building or part not described elsewhere	Not sprinklered	60	90	120	Not permitted
	Sprinklered	30*	60	90	120#

* Increased to a minimum of 60 minutes for compartment wall separating buildings.

Reduced to 90 minutes for elements not forming part of the structural frame.

LPS 1181 EXPLAINED

LPS 1181 is a fire test used as part of LPCB approval and is intended to show that combustible linings, sandwich panels and composite panels will not make a significant contribution to fire growth. This is covered in clause 2.2 of the LPC Design Guide for the Fire Protection of Buildings.

This represents the earlier stage of a fire before the room or compartment is fully involved in the fire.

Sandwich panels that have passed this test are currently given the Grade B designation in the LPCB List of Approved Fire and Security Products and Services (Grade B designation is explained below).

The test comprises building an open-ended enclosure (approximately the size of a domestic garage) from the sandwich panels with a timber crib located in one corner. It tests not only the panels, but also the jointing methods and supporting system as well.

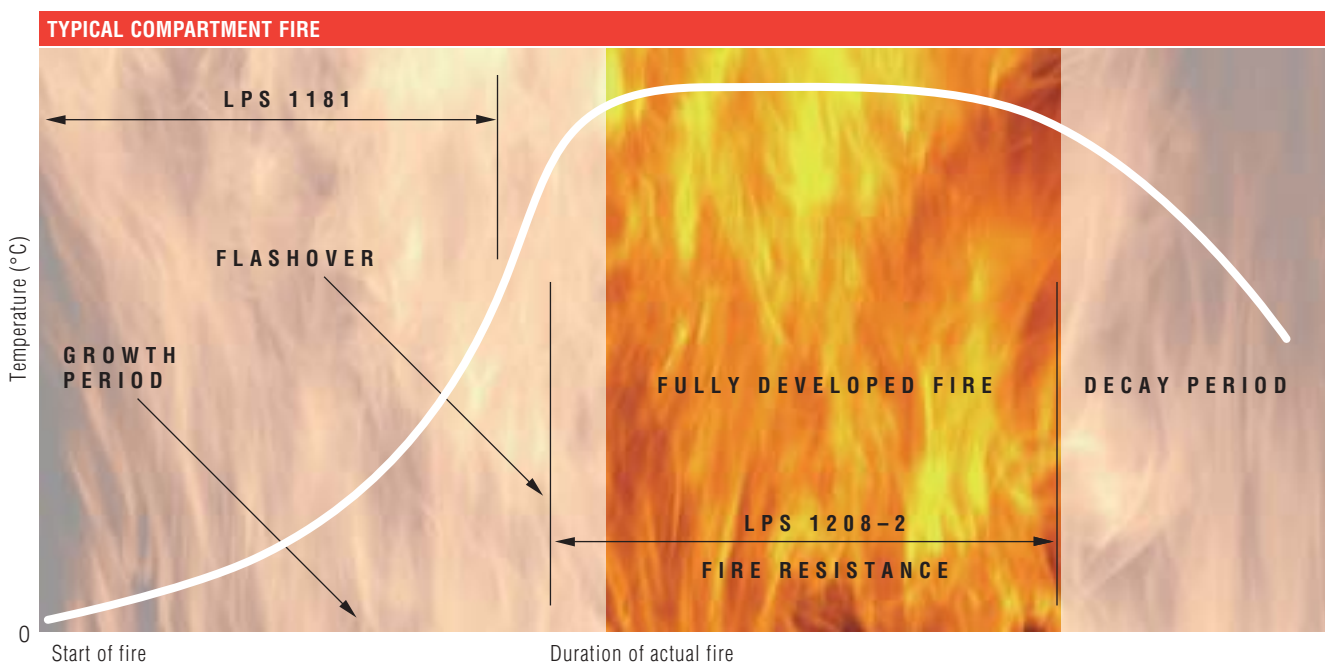
LPCB Approval requires the manufacturer to be quality assured by LPC, however, this assessment stops at the factory gates. To provide an LPC approved construction the 'as built' details on site must exactly comply with the tested system.

Systems approved to LPS 1181 Grade A for external use must also be tested for fire resistance. The value shown on the certificate indicates the fire resistance performance in terms of insulation and integrity, as follows:

LPS 1181 Ext-A15-15
(15 minutes insulation and integrity)

LPS 1181 Ext-A15-30
(30 minutes insulation and integrity)

LPS 1181 Ext-A15-60
(60 minutes insulation and integrity).



LPS 1208 is the standard for evaluating the fire resistance of an element of construction with specific application to compartment walls and floors. Fire resistance is related to the post-flashover stage of a fire. This is the part of the fire where all the contents in the room in which the fire originates are fully involved and are burning.

The basic objective is to maintain the structural integrity of the building and to prevent the spread of fire into other compartments. Furnaces are used to test elements of construction for fire resistance.

The basic criteria used for panels is integrity (no gaps that allow fire and smoke to get through) and insulation (combustible materials on the non-fire side cannot become ignited).

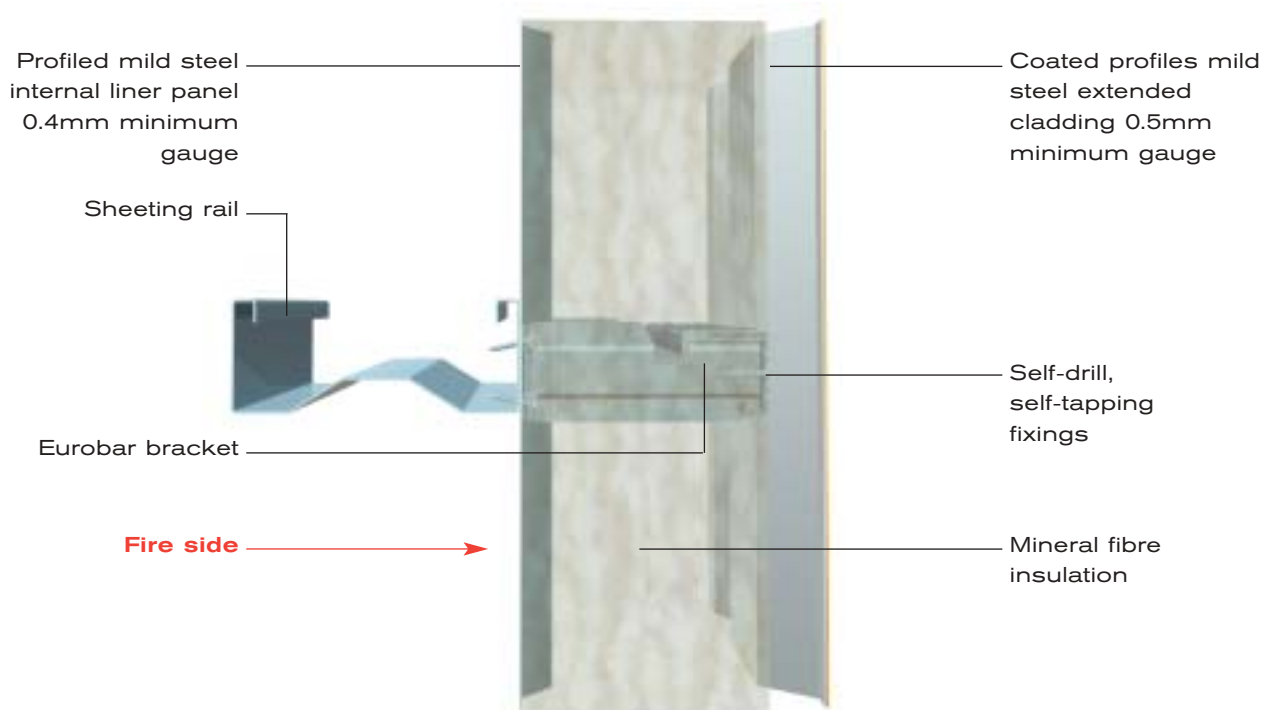
Test reports give the result as follows:

Integrity: 240 minutes

Insulation: 15 minutes.

EUROBAR OVER RAIL SYSTEM

MINERAL FIBRE INSULANT VERTICAL 4 HOUR FIRE WALL



Note: This Fire Wall has been designed and amended to incorporate the insulation requirements of the Building Regulations Approved Documents Part L2A and L2B Conservation of fuel and power and the Building (Scotland) Regulations Part 6 Energy. The amendments have been approved by the Warrington Fire Research Centre as satisfying the stability, integrity and insulation criteria of BS 476 : Part 8 : 1972.

Euroclad has tested an external wall assembly using mineral wool insulant at Warrington Fire Research Centre reference WRCSI No. 36337* from which further assessments* have been determined.

Warrington's conclusion was that if subjected to a fire resistance test in accordance with BS 476 Part 8 : 1972, be capable of complying with the integrity and insulation criteria of the standard for periods.

This applies only to the application where the external wall has the internal lining facing the fire side. All other details are to remain the same as in the original report.

A section of the assembly is illustrated and labelled to assist in a clear understanding of the construction.

*An independent laboratory approved by the D.O.E. (A copy of the complete report and subsequent assessments are available on request).

Eurobar over rail system – Mineral fibre insulant components

EXTERNAL CLADDING SHEET

Trade name	Euroclad 914/38, 1000/32 and MW5C
Pre-finished steel	Corus Colorcoat® products: HPS200® and PVDF. Plastisol
Gauge	0.5mm (minimum)
Supplier	Euroclad Limited

LINER PANEL

Trade name	Euroclad 914/20, 1000/19, MW5C and 1000/32
Substrate	Galvanised sheet
External finish	Polyester
Internal Finish	Backing coat
Gauge	0.4mm (minimum)
End lap	100mm (minimum)
Supplier	Euroclad Limited

EUROBAR

Substrate	Galvanised steel
Bracket gauge	1.5mm
Rail gauge	1.2mm
Supplier	Euroclad Limited

INSULATION CORE

Manufacturer	Rockwool
Reference	Cladding roll
Type	Mineral fibre based insulation
K-value	0.040λ
Density	27kg/m ³
Fixing	Friction fitted between liner sheet and back face of rails of the Eurobar

BOLT, NUT AND STEEL WASHER

16mm diameter bolt and nut with steel washer
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PLASTIC WASHER

To suit 16mm diameter bolt

STRUCTURAL STEEL

1. Sheeting rails
A. Must be supplied with slotted holes which, combined with the use of plastic washers assists thermal expansion
B. Must be supplied shorter than normal to assist thermal expansion
2. Main Frame needs to be protected by suitable material to provide a period of protection equal to the wall itself

POP RIVETS

Reference	TSPD 44 BS (or equivalent)
Application	A. Fixing of end laps on liner panel B. Fixing of flashing on liner panel C. Fixing of side laps on liner panel at 300mm centers (for 30 minutes insulation only)

Note: Side lap stitching **not** required for 15 minutes insulation.

THERMAL PERFORMANCE (@ 1.8m)

Bracket height	120mm
Insulation	120mm
U-value	0.34
Bracket height	140mm
Insulation	140mm
U-value	0.29
Bracket height	150mm
Insulation	127mm
U-value	0.27
Bracket height	160mm
Insulation	160mm
U-value	0.26
Bracket height	170mm
Insulation	170mm
U-value	0.24
Bracket height	180mm
Insulation	180mm
U-value	0.23

Note: Roll End Laps should be overlapped and mechanically trapped by the Eurobar Rail.

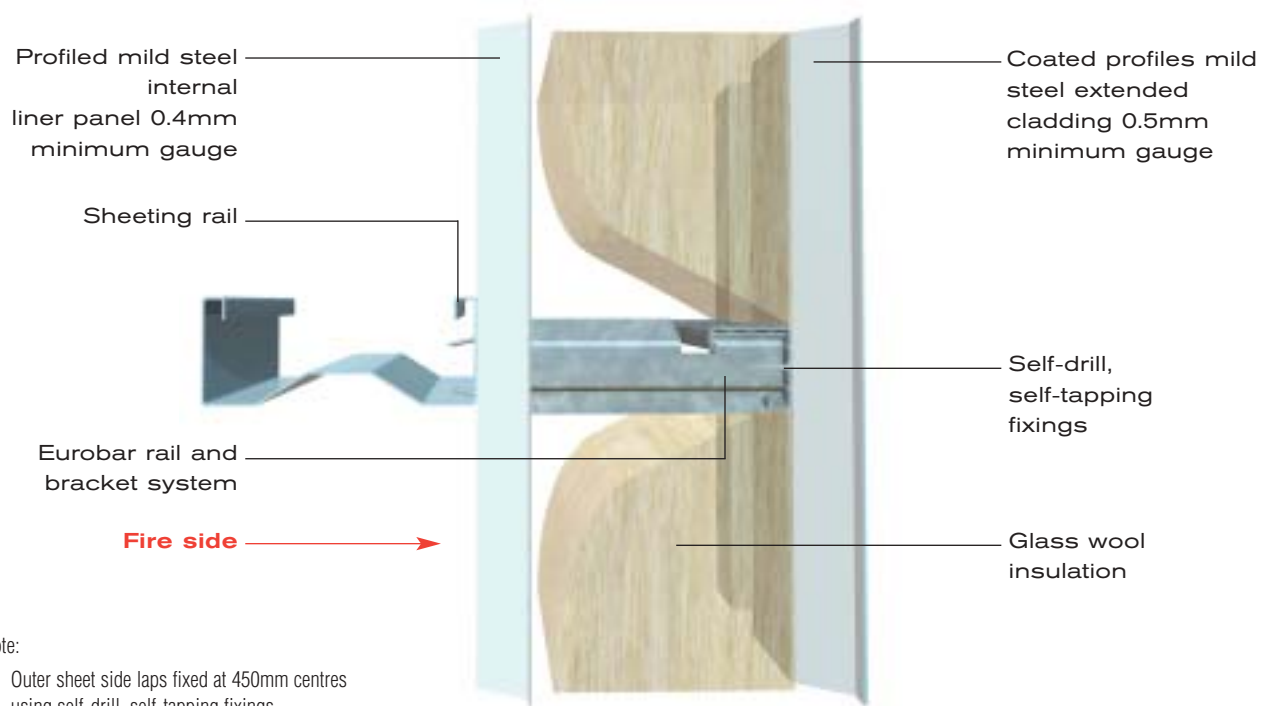
FIXINGS

Self-drill and Self-tap fixings	
Code	MXL38 (or equivalent)
Application	Fixing top sheet to Eurobar rail
Self-drill and Self-tap fixings up to 3.0mm	
Code	TC 25 (or equivalent)
Application	Fixing of Eurobar bracket to sheeting rail
Self-drill and Self-tap fixings 3.0mm to 12.0mm	
Code	TL 32 (or equivalent)
Application	Fixing of Eurobar bracket to sheeting rail
Self-drill and Self-tap fixings	
Code	TC25 (or equivalent)
Application	Temporary fix of liner panel to sheeting
Self-drill and Self-tap fixings	
Code	MXC26 (or equivalent)
Application	Fixing of side laps on outer sheet at 450mm centers

The Euroclad firewall details above may include a proprietary cross-linked butyl mastic sealant, to provide a vapour check at both end and side laps of the liner profile joints. However, proprietary cross-linked butyl mastic sealants must not be used on the external profile.

EUROBAR OVER RAIL SYSTEM

GLASS FIBRE INSULANT VERTICAL 4 HOUR FIRE WALL



Note:

1. Outer sheet side laps fixed at 450mm centres using self-drill, self-tapping fixings.
2. Liner sheet side laps fixed at 450mm centres and laps fixed using TSPD 44 BS steel rivet.

Note: This Fire Wall has been designed and amended to incorporate the insulation requirements of the Building Regulations Approved Documents Part L2A and L2B Conservation of fuel and power and the Building (Scotland) Regulations Part 6 Energy. The amendments have been approved by the Warrington Fire Research Centre as satisfying the stability, integrity and insulation criteria of BS 476 : Part 8 : 1972.

Euroclad has tested an external wall assembly using mineral wool insulant at Warrington Fire Research Centre reference WRCSI No. 36337* from which further assessments* have been determined.

Warrington's conclusion was that if subjected to a fire resistance test in accordance with BS 476 Part 8 : 1972, be capable of complying with the integrity and insulation criteria of the standard for periods. This applies only to the application where the external wall has the internal lining facing the fire side. All other details are to remain the same as in the original report.

A section of the assembly is illustrated and labelled to assist in a clear understanding of the construction.

*An independent laboratory approved by the D.O.E. (A copy of the complete report and subsequent assessments are available on request).

Eurobar over rail system – Glass fibre insulant components

EXTERNAL CLADDING SHEET

Trade name	Euroclad 914/38, 1000/32 and MW5C
Pre-finished steel	Corus Colorcoat® products: HPS200® and PVDF. Plastisol
Gauge	0.5mm (minimum)
Supplier	Euroclad Limited

LINER PANEL

Trade name	Euroclad 914/20, 1000/19, 1000/32 and MW5C
Substrate	Galvanised sheet
External finish	Polyester
Internal Finish	Backing coat
Gauge	0.4mm (minimum)
End lap	100mm (minimum)
Supplier	Euroclad Limited

EUROBAR

Substrate	Galvanised steel
Bracket gauge	1.5mm
Rail gauge	1.2mm
Dimensions	+40mm over actual insulation installed
Supplier	Euroclad Limited

BOLT, NUT AND STEEL WASHER

16mm diameter bolt and nut with steel washer
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PLASTIC WASHER

To suit 16mm diameter bolt

STRUCTURAL STEEL

1. Sheeting rails
A. Must be supplied with slotted holes which, combined with the use of plastic washers assists thermal expansion
B. Must be supplied shorter than normal to assist thermal expansion
2. Main Frame needs to be protected by suitable material to provide a period of protection equal to the wall itself

POP RIVETS

Reference	TSPD 44 BS (or equivalent)
Application	A. Fixing of end laps on liner panel B. Fixing of flashing on liner panel C. Fixing of side laps on liner panel @ 450mm centres (for 15 minutes insulation)

INSULATION

Trade Name	Factoryclad 44 (0.0440λ)	
U-Value	0.35	0.30
Min thickness (mm)	160	200
Supplier	Knauf insulation	
Trade name	Trade Name: Factoryclad 40 (0.040λ)	
U-Value	0.35	0.30
Min thickness (mm)	145	175
Supplier	Knauf Insulation	
Trade Name	Factoryclad 37 (0.037λ)	
U-Value	0.35	0.30
Min thickness (mm)	130	160
Supplier	Knauf Insulation	
Trade Name	Factoryclad 35 (0.035λ)	
U-Value	0.35	0.30
Min thickness (mm)	126	156
Supplier	Knauf Insulation	

Note: Roll end laps should be overlapped and mechanically trapped by the Eurobar rail.

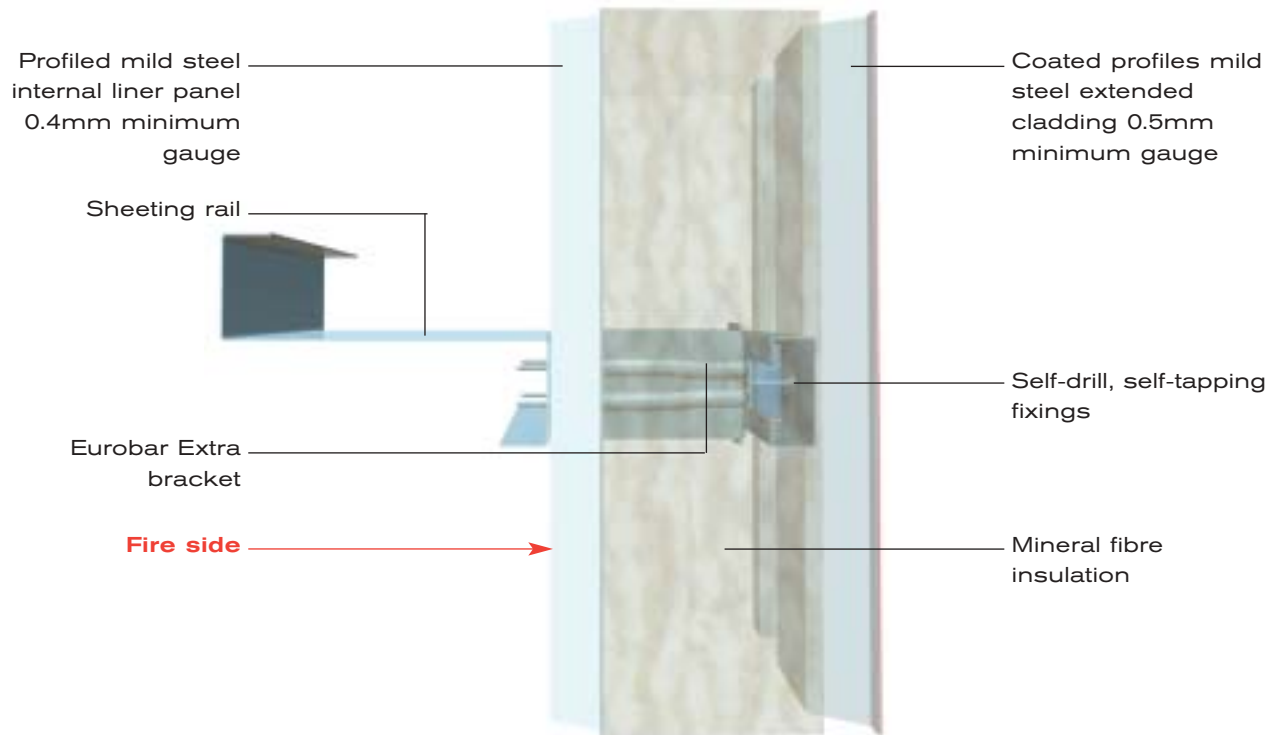
FIXINGS

Self-drill and self-tap fixings	
Code	MXL38 (or equivalent)
Application	Fixing top sheet to Eurobar rail
Self-drill and self-tap fixings up to 3.0mm	
Code	TC 25 (or equivalent)
Application	Fixing of Eurobar bracket to sheeting rail
Self-drill and self-tap fixings 3.0mm to 12.0mm	
Code	TL 32 (or equivalent)
Application	Fixing of Eurobar bracket to sheeting rail
Self-drill and self-tap fixings	
Code	TC25 (or equivalent)
Application	Temporary fix of liner panel to sheeting
Self-drill and self-tap fixings	
Code	MXC26 (or equivalent)
Application	Fixing of side laps on outer sheet at 450mm centers Fixing of side laps on inner sheet at 450mm centres

The Euroclad firewall details above may include a proprietary cross-linked butyl mastic sealant, to provide a vapour check at both end and side laps of the liner profile joints. However, proprietary cross-linked butyl mastic sealants must not be used on the external profile.

EUROBAR EXTRA OVER RAIL SYSTEM

MINERAL FIBRE INSULANT VERTICAL 4 HOUR FIRE WALL



Note: This Fire Wall has been designed and amended to incorporate the insulation requirements of the Building Regulations Approved Documents Part L2A and L2B Conservation of fuel and power and the Building (Scotland) Regulations Part 6 Energy. The amendments have been approved by the Warrington Fire Research Centre as satisfying the stability, integrity and insulation criteria of BS 476 : Part 8 : 1972.

Euroclad has tested an external wall assembly using mineral wool insulant at Warrington Fire Research Centre reference 143439 FR Issue 2* from which further assessments* have been determined.

Warrington's conclusion was that if subjected to a fire resistance test in accordance with BS 476 Part 8 : 1972, be capable of complying with the integrity and insulation criteria of the standard for periods. This applies only to the application where the external wall has the internal lining facing the fire side. All other details are to remain the same as in the original report.

A section of the assembly is illustrated and labelled to assist in a clear understanding of the construction.

*An independent laboratory approved by the D.O.E. (A copy of the complete report and subsequent assessments are available on request).

Eurobar Extra over rail system – Mineral fibre insulant components

EXTERNAL CLADDING SHEET	
Trade name	Euroclad SF500, 914/38, MW5, 1000/32, 914/20 and 13 ¹ / ₂ /3
Pre-finished steel	Corus Colorcoat® products: HPS200®, Celestia®, Armacor®, Prisma® and PVDF. Plastisol
Gauge	0.5mm (minimum)
Supplier	Euroclad Limited

LINER PANEL	
Trade name	Euroclad MW5, 1000/32, 914/20 and 1000/19
Substrate	Galvanised sheet
External finish	Polyester
Internal Finish	Backing coat
Gauge	0.4mm (minimum)
End lap	100mm (minimum)
Supplier	Euroclad Limited
Fixing method	Temporarily fixed to sheeting rails then retained fixing of Eurobar Extra bracket and pop rivet stitched together
Temporary fixings	i. Manufacturer : SFS Intec ii. Reference : SD3 – T15 – 5, 5 x 25
Stitch Fixings (not now required for 15 minutes insulation)	i. Manufacturer: SFS Intec ii. Reference : TSPD 46 BS iii. Type : Steel pop rivets vi. Centers : 300mm (for 30 minutes insulation)

SPACER SYSTEM	
Manufacturer	Euroclad
Reference	Eurobar Extra
Material	i. Bracket : Galvanised steel 1.5mm ii. Rail : Galvanised steel 1.5mm
Fixing method	Through screwed to sheeting rails, at 1000mm centers
Fixings	i. Manufacturer : SFS Intec ii. Reference : SD3 – T15 – 5, 5 x 25

THERMAL BARRIER STRIP	
Manufacturer	Rockwool
Reference	Thermal barrier strip
Type	Mineral fibre based insulation
Thickness	12mm
Density	175kg/m ³
Fixing method	Bonded to Eurobar Extra rails

INSULATION CORE	
Manufacturer	Rockwool
Reference	Cladding roll
Type	Mineral fibre based insulation
K-value	0.040λ
Density	27kg/m ³
Fixing	Friction fitted between liner sheet and back face of rails of the Eurobar Extra

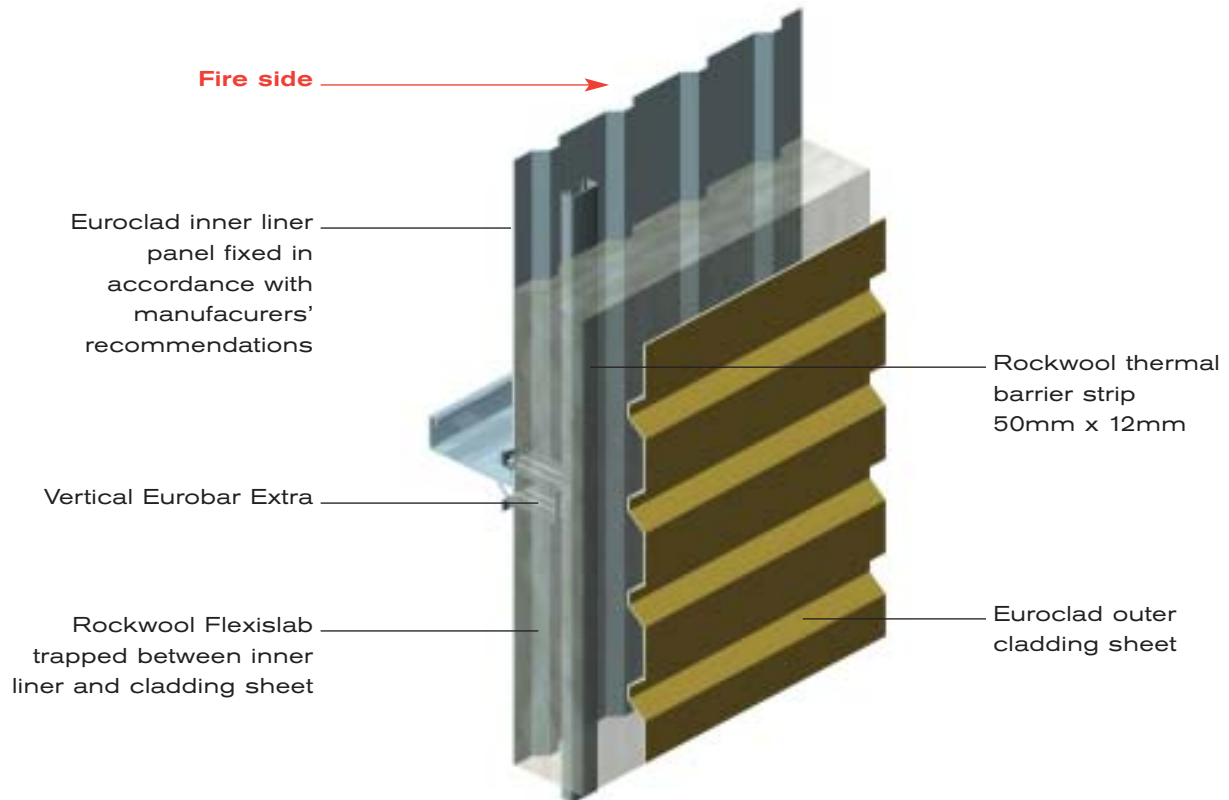
THERMAL PERFORMANCE (based on 1.8m purlin spacings with brackets @ 1.0m centers)	
Bracket height	135mm*
Insulation	120mm
U-value	0.35
Bracket height	135mm*
Insulation	150mm
U-value	0.28
Bracket height	185mm*
Insulation	160mm
U-value	0.26
Bracket height	185mm*
Insulation	180mm
U-value	0.24
Bracket height	200mm*
Insulation	200mm
U-value	0.24
Bracket height	200mm*
Insulation	220mm
U-value	0.21

*Plus 12mm depth of thermal barrier strip

The Euroclad firewall details above may include a proprietary cross-linked butyl mastic sealant, to provide a vapour check at both end and side laps of the liner profile joints. However, proprietary cross-linked butyl mastic sealants must not be used on the external profile.

EUROBAR EXTRA OVER RAIL SYSTEM

MINERAL FIBRE INSULANT HORIZONTAL FLEXISLAB 4 HOUR FIRE WALL



Note: This Fire wall has been designed and amended to incorporate the insulation requirements of the Building Regulations Approved Documents Part L2A and L2B Conservation of fuel and power and the Building (Scotland) Regulations Part 6 Energy. The amendments have been approved by the Warrington Fire Research Centre as satisfying the stability, integrity and insulation criteria of BS 476 : Part 8 : 1972.

Euroclad has tested an external wall assembly using mineral wool insulant at Warrington Fire Research Centre reference 150008 AR* from which further assessments* have been determined.

Warrington's conclusion was that if subjected to a fire resistance test in accordance with BS 476 Part 8 : 1972, be capable of complying with the integrity and insulation criteria of the standard for periods. This applies only to the application where the external wall has the internal lining facing the fire side. All other details are to remain the same as in the original report.

A section of the assembly is illustrated and labelled to assist in a clear understanding of the construction.

*An independent laboratory approved by the D.O.E. (A copy of the complete report and subsequent assessments are available on request).

Eurobar Extra over rail system – Mineral fibre insulant components Flexislab

EXTERNAL CLADDING SHEET (laid horizontally)	
Trade name	Euroclad SF500, 914/38, MW5, 1000/32, 914/20 and 13 ¹ / ₂ /3
Pre-finished steel	Corus Colorcoat® products: HPS200®, Celestia®, Armacor®, Prisma® and PVDF. Plastisol
Gauge	0.5mm (minimum)
Supplier	Euroclad Limited

LINER PANEL	
Trade name	Euroclad MW5, 1000/32, 914/20 and 1000/19
Substrate	Galvanised sheet
External finish	Polyester
Internal Finish	Backing coat
Gauge	0.4mm (minimum)
End lap	100mm (minimum)
Supplier	Euroclad Limited
Fixing method	Temporarily fixed to sheeting rails then retained fixing of Eurobar Extra bracket and pop rivet stitched together
Temporary fixings	i. Manufacturer : SFS Intec ii. Reference : SD3 –T15– 5,5x25
Stitch Fixings (not now required for 15 minutes insulation)	i. Manufacturer : SFS Intec ii. Reference : TSPD 46 BS iii. Type : Steel pop rivets vi. Centers : 300mm (for 30 minutes insulation)

SPACER SYSTEM (installed vertically)	
Manufacturer	Euroclad
Reference	Eurobar Extra
Material	i. Bracket : Galvanised steel 1.5mm ii. Rail : Galvanised steel 1.5mm
Fixing method	Through screwed to sheeting rails, at 1000 mm centers
Fixings	i. Manufacturer : SFS Intec ii. Reference : SD3 –T15–5,5x25

THERMAL BARRIER STRIP	
Manufacturer	Rockwool
Reference	Thermal barrier strip
Type	Mineral fibre based insulation
K-value	(0.038λ)
Thickness	12mm
Density	175 kg/m ³
Fixing method	Bonded to Eurobar Extra rails

INSULATION CORE	
Manufacturer	Rockwool
Reference	Flexislab
Type	Mineral fibre based insulation
K-value	0.038λ
Density	35 kg/m ³
Fixing	Friction fitted between liner sheet and back face of rails of the Eurobar Extra

THERMAL PERFORMANCE (@ 1.8m)	
Bracket height	135mm*
Insulation	120mm
U-value	0.34
Bracket height	135mm*
Insulation	140mm
U-value	0.29
Bracket height	185mm*
Insulation	150mm
U-value	0.27
Bracket height	185mm*
Insulation	180mm (90+90)
U-value	0.23
Bracket height	200mm*
Insulation	200mm (100+100)
U-value	0.22

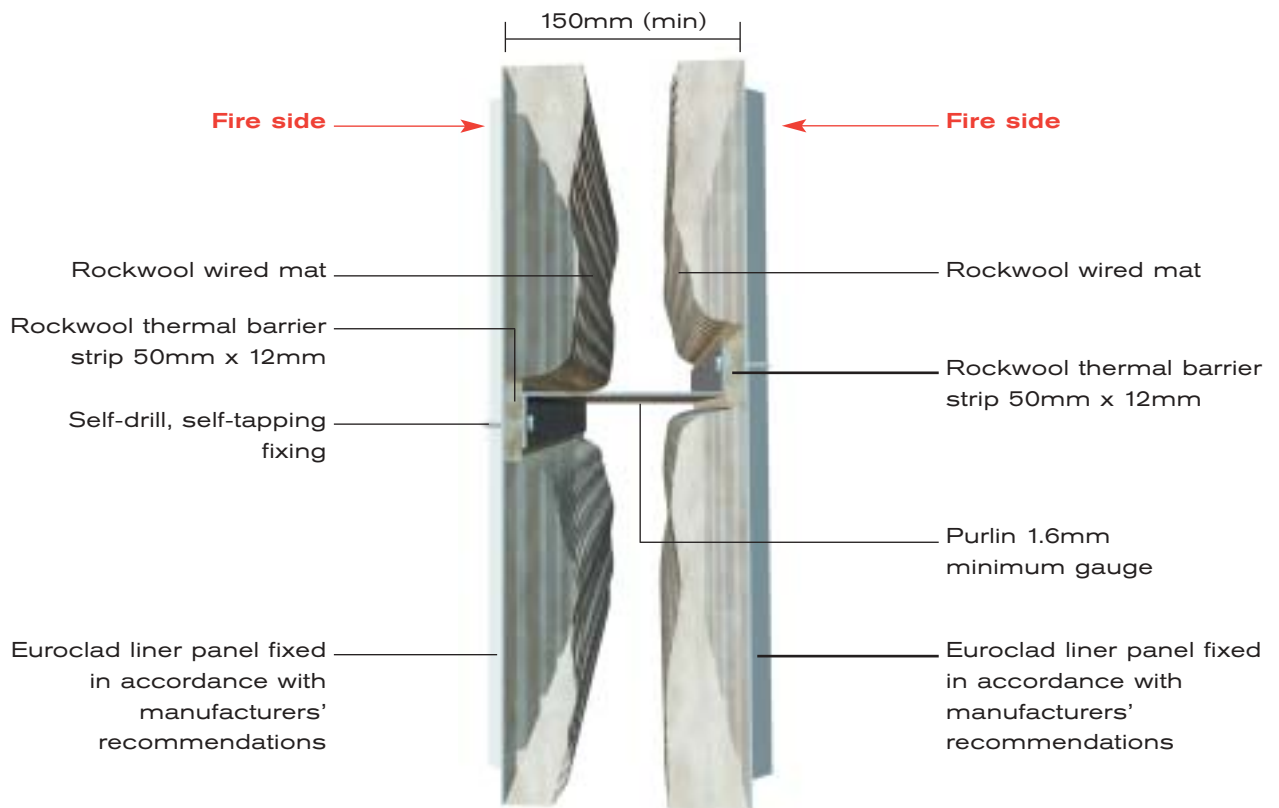
*Plus 12mm depth of thermal barrier strip

EUROBAR EXTRA BASE SUPPORT BRACKET	
Material	Galvanised mild steel
Thickness	1.6 mm
Overall size	60 mm wide
Fixing method	Screwed to bottom sheeting rail and base of Eurobar Extra rail
Details of screws	i. Manufacturer : SFS Intec ii. Reference : SD3-T15-5.5x25 iii. Type: Self drilling self tapping steel screws (no washer) iv. Quantity per bracket : 2 no. screws to sheeting rail

The Euroclad firewall details above may include a proprietary cross-linked butyl mastic sealant, to provide a vapour check at both end and side laps of the liner profile joints. However, proprietary cross-linked butyl mastic sealants must not be used on the external profile.

INTERNAL WALL

WITH 1 HOUR FIRE RESISTANCE (FROM BOTH SIDES)



In conjunction with Rockwool Limited, Euroclad requested Warrington Fire Research Centre to assess a construction of steel purlins and liner panel which, in an internal wall position would have a performance sufficient to satisfy the criteria for fire resistance for a period of 60 minutes.

Using the information contained in the reports referenced WRCSI No. 36337 and WRCSI No. C48807 an assessment was made on the construction, a section of which is illustrated above. The illustration is clearly labelled and all aspects of the construction have to be strictly adhered to.

A summary of components is included opposite.

The conclusion of the Research Centre personnel was that:

“A non-load bearing internal wall assembly which utilises similar materials and design principals to a previously fire tested assembly reported in reference WRSCI No. 36337, should, if subject to a fire resistance test in accordance with BS476 : Part 22: 1987 be capable of satisfying each of the criteria for integrity and insulation for the required period of 60 minutes”.

Internal wall with 1 hour fire resistance components

LINER PANEL	
Trade name	Euroclad 20mm or 19mm liner
Substrate	Galvanised sheet
External finish	Polyester
Internal finish	Grey Alkyd
Gauge	0.4mm
End lap	100mm (minimum)
Supplier	Euroclad Limited

INSULATION	
Trade name	Rocksil wired mat
Thickness	50mm
Density	105Kg/m ³
Supplier	Knauf

FIXINGS	
Self-drill, self-tap fixings 0.5mm to 3.5mm	
Code	TC43 (or equivalent)
Application	Fixing liner to sheeting rail
Self-drill, Self-tap fixings 4.0mm to 12.5mm	
Code	TL52 (or equivalent)
Application	Fixing liner to sheeting rail

THERMAL BARRIER	
Material	Rockwool thermal barrier strip
Dimensions	50mm x 12mm
Supplier	Rockwool

POP RIVETS	
Reference number	TSPD 44 BS (or equivalent)
Application	A. Fixing of side laps on liner panel at 450mm centers B. Fixing of end laps on liner panel C. Fixing of flashing on liner panel

BOLT, NUT AND STEEL WASHER	
16mm diameter bolt and nut with steel washer	

PLASTIC WASHER	
To suit 16mm diameter bolt	

STRUCTURAL STEEL	
1. Sheeting rails	A. must be supplied with slotted holes which combined with the use of plastic washers assists thermal expansion B. must be supplied shorter than normal to assist thermal expansion
2. Main Frame needs to be protected by suitable material to provide a period of protection equal to the wall itself.	

STRUCTURAL STEEL FIRE PROTECTION

1. TYPES OF PRODUCT

Structural steel fire protection, is required to preserve the stability of the building in the event of a fire. Section B3, Internal fire spread (structure), of the 1991 Building Regulations, states that: "The building shall be designed and constructed so that, in the event of fire, its stability will be maintained for a reasonable period.

Approved Document B, which provides guidance to meeting the requirements of the Building Regulations, states that the requirements of Section B3 will be met in part 'if the loadbearing elements of structure of the building are capable of withstanding the effects of fire for an appropriate period without loss of stability".

There are three generic types of fire protection for structural steel:

- A. Cementitious products
- B. Board and casing systems
- C. Intumescent coatings.

A. Cementitious products

Cementitious products, based on gypsum or portland cement binders, are normally applied by low pressure spray techniques to the profile of the steel section to be protected.

These materials contain low density aggregates and rheological aids to help the application characteristics. Fire protection is provided to the steel by these materials in two ways, the first being the 'cooling effect' as the trapped moisture (physically and chemically bound) evaporates as the temperature of the surrounding fire increases.

Once all the moisture has turned to steam, the product then behaves as a thermal insulation material. Low density mineral and synthetic aggregates are used in these products since they are efficient in allowing the steam to escape, while denser materials might impede its progress and cause the product to spall.

B. Board and casing systems

Board and casing systems use materials such as ceramic wool, mineral wool, fire resistant plasterboard, calcium silicate and vermiculite to provide fire protection to steel.

These products provide fire protection in much the same way as the cementitious products and are dry fixed around the steel using clip, pin, noggin and screw systems.

C. Intumescent coating

Intumescent coatings derive their name from the Latin verb tumescere, which means to begin to swell. In a fire situation, these thin film products swell up to form a char which protects the steel, thanks to its insulating properties.

Using various types of industrial coating equipment, these materials are applied as a thin film and are often available with a range of topcoats in different colours, so that the designer can achieve his or her aesthetic needs, as well as those of fire protection on visible steel. Intumescent coatings are particularly effective for steel that requires up to 90 minutes protection.



2. DESIGN AND INSTALLATION ISSUES

The use of any product can be undermined by poor application. Any work that is not of the correct quality could lead to premature collapse of a building in a fire situation. This, in turn, could threaten the lives of the occupants and firefighters. Thus it is imperative that contractors who have the appropriate credentials for the work install passive fire protection products for steel fully in accordance with the manufacturers' instructions.

Third-party accreditation schemes are in operation for installers of passive fire protection. These ensure that the installing companies and their operatives have the required level of expertise to properly carry out the job. These are recognised in Approved Document B to the Building Regulations 1991, 2000 Edition, which states: "Since the performance of a system, product, component, structure is dependent upon satisfactory site installation, testing and maintenance, independent schemes of certification and registration of installers and maintenance firms of such will provide confidence in the appropriate standard of workmanship being provided.

Third-party accreditation and registration of installers of systems, materials, products or structures provide a means of ensuring that installations have been conducted by knowledgeable contractors to appropriate standards, thereby increasing the reliability of the anticipated performance in fire".

Each type of product is susceptible to particular problems, which should be checked during installation:

A. Cementitious products

Spray-applied cementitious products should be checked for thickness, sagging and recoat time. If the installed product has a high pH - such as, materials based on portland cement - any primer on the steel should be considered for compatibility, since some primers will undergo saponification to form a soap, which in turn will lead to a lack of bond between the fire protection product and the substrate.

Cementitious fire protection products are particularly suitable for large jobs with good access – thus allowing high production rates – and where the steel needs to be protected for two hours or more.

B. Board and casing systems

Board systems for structural steel may have different fixing systems for different ratings and the inspector should make sure that the appropriate one is being used. In particular, it should be ensured that all fixings are installed at the appropriate centres and, if noggins are required, determine if they need adhesive, or if friction fitting is sufficient.

Noggins are generally required to be cut to size from the board material and will need to be of a certain thickness, and the inspector should ascertain that this requirement has been adhered to. In addition, the inspector should make sure that any adhesive used is of the correct grade as specified by the board manufacturer. Dense board systems lend themselves to areas where moderate levels of abuse may be expected, whereas the lower density products may be reserved for beam protection only. Being dry systems, boards can be applied to the steel in all temperatures.

C. Intumescent coatings

For Intumescent coatings, the wet and dry film thicknesses should be checked. The recoat times should also be monitored to see that they conform to the manufacturer's application instructions. Some intumescent require special primers and topcoats and the inspector should make sure that the correct ones are being used. Any substitutions should be compatible with the intumescent. Much intumescent coating is now applied to steel off-site. The same inspection regime would apply for steel coated off-site as for that installed at the construction site.

3. MAINTENANCE

Building managers will need to be aware of the Fire Precautions (Workplace) Regulations 1997 (as amended) and the ramifications of the impending Regulatory Reform (Fire Safety) Order. The provision and maintenance of the structural steel fire protection within a building should form part of the risk assessment carried out under the Workplace Regulations (and, in future, the Reform Order) for the building. Managers need to be aware that there may be liability issues related to a failure to comply with regulations.

Where structural steel products have to be removed or have become damaged, they must be made good as soon as possible. Ideally, where the operation and maintenance data for a building is available and the 'as-built' products can readily be procured, any changes and repairs should be carried out with the materials originally specified. Suitably skilled, experienced and accredited personnel must carry out such works in accordance with the manufacturer's recommendations.

4. RELEVANT STANDARDS AND OTHER DOCUMENTS

In the UK, fire tests on elements of building construction are typically carried out in accordance with the methods of BS 476: Fire tests on building materials and structures. It is likely that eventually the new European fire testing standards will replace the BS 476 series. The two standards are generally similar but differ in a number of details. Results from one standard may sometimes be able to be interpreted in terms of the other. The adoption of the European standard is intended to remove technical barriers to trade within Europe.

The general procedures used for determining the fire resistance of loadbearing elements of structure are specified in BS 476: Part 20: 1987: Fire tests on building materials and structures. Method for determination of the fire resistance of elements of construction (general principles) and Part 21: 1987: Fire tests on building materials and structures. Methods for determination of the fire resistance of loadbearing elements of construction. Part 20 is concerned with general principles and covers requirements which are common to the other Parts. Part 21 covers the testing of beams, columns, floors and loadbearing walls.

Some European fire testing standards have been published. In assessing the performance of fire protection materials, the relevant part is ENV 13381 : Test methods for determining the contribution to the fire resistance of structural members: Part 4: Applied protection to steel members. This standard makes reference to the EN 1363 : Fire resistance tests series of standards' which contain general information about conducting fire resistance tests.

In conjunction with the Fire Test Study Group and the Steel Construction Institute, the Association for Specialist Fire Protection (ASFP) publishes Fire Protection for Structural Steel in Buildings. This publication, available as a book (or CD-ROM), is known as the 'Yellow Book' and is recognised as the industry guide to both testing and product approval.

The 'Yellow Book' contains third-party reviews of test reports and assessments for passive fire protection products. The 'Yellow Book' is referenced in Approved Document B of the Building Regulations 1991 for England and Wales, 2000 Edition as a source of information.

5. OTHER ISSUES

If the product has not been fire tested, or offers test data that is not appropriate to the application for instance, where it is not possible to subject a construction or a product to a fire test because of its size, or where the test data applies to a similar but not identical system - an assessment carried out by a competent fire engineer will be required. Guidance is available from the Passive Fire Protection Federation, which has published a booklet, Guide to Undertaking Assessments in Lieu of Fire Tests, available as a free download from the ASFP's website (www.asfp.org.uk) or by calling: +44 (0)1252 739 142. This document classifies assessments into three levels: simple, intermediate and complex. It also discusses the requirements of assessors and identifies four levels of experience. These levels are then related to the complexity of the required assessment.

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