



Treatment of Solid Timber and Panel Products with Flame Retardant

Introduction

The purpose of this leaflet is to provide a brief insight into the effects of treating wood based materials with flame retardant formulations.

Much more detail can be found in the WPA Manual *Industrial Fire Retardant Treatment of Solid Timber and Panel Products* available from the WPA www.wood-protection.org. Other sources of information are listed later.

The Fire Properties of Timber

For centuries timber has been used both structurally and as a decorative material in buildings and many other uses. However, unlike some other traditional building materials, such as brick, concrete and steel, timber is naturally combustible and will burn if exposed to an ignition source under favourable conditions. Nevertheless, the fact that timber is combustible does not mean that its use will create an unacceptable fire risk. Frequently the opposite is true since, because of its good thermal insulation properties, high structural strength and slow charring rate, timber in large sections can often be used unprotected where non combustible materials, e.g. steel, would require special fire protection to prevent premature collapse in a fire.

The fire protection of timber is very complex and can be influenced by many different factors including size, species and moisture content. As a general rule, thin or small sections of timber, or timber based products, can be more easily ignited than thick sections.

In recent years, because of increasing costs and also the development of new manufacturing processes, there has been increasing use of timber in smaller sizes and in different forms, particularly panel products where enhanced fire performance is required. This can be provided by flame retardant chemicals at an economic cost, so that such materials will comply with the most stringent building regulation requirements in the relevant end uses.

Flame Retardant Chemicals and their Application

Specialist companies have for more than a century successfully treated solid timber and panel products with chemicals under controlled conditions to achieve high standards of flame retardancy. Products are classified by the WPA according to sensitivity to air humidity or water in one of three types:

Type DI (formerly Type A)

Dry Interior type - based on inorganic salts. The common feature is that the treated timber or board product is sensitive to high humidity, prolonged exposure resulting in salt efflorescence and/or migration. Their use is therefore only suitable for interior environments where humidity does not exceed 75%.

Examples: Thin plywood for exhibition works, scenery, hoardings, dry interior constructions e.g. dry wall linings, shop fitting.

Type HR (formerly Type B)

Humidity resistant type - based on blended organic and inorganic chemicals. Treated timber or board product is far less sensitive to high or fluctuating humidity due to the lower solubility in water of the chemicals and a degree of chemical interaction and can therefore be used in practically all interior situations and in some cases in certain weather-protected exterior situations.

Examples: Interior constructions dry and humid, internal and weather protected external e.g. wall linings, structural timbers, veneered panelling, external weather protected situations [material must be coated], swimming pools, storage and pallet systems, scaffold boards, rail industry.

Type LR (formerly Type C)

Leach resistant type -based on a polymeric resin system. The treated timber or board products can be used in all interior and exterior situations. Full exterior exposure will eventually lead to a reduction in effectiveness but at a much slower rate than with other types of treatment.

This leach resistance is brought about by high temperature curing of the complex chemical system in the treated wood following impregnation and re-drying.

Examples: Full exterior exposure with no finish applied e.g. cedar shingles, exterior cladding unprotected, scaffold boards.

Any of the three types can provide additional protection against fungal decay and/or insect attack or enhance the natural durability of the timber depending on their composition. If this additional protection is required the manufacturer should be consulted.

Application Techniques

- (a) For new-build situations the most widely used process for treating both solid timbers and panel products is vacuum-pressure impregnation. This is carried out by specialist companies in large pressure autoclaves under controlled conditions. The treated material is normally then re-dried to a moisture content compatible with end use providing permanent, maintenance-free protection.
- (b) For panel products such as particle board and medium density fibreboard (MDF) flame retardant chemicals are normally incorporated as an integral part of their manufacture.

Choice of Flame Retardant Treatment

Treated material has many diverse end use application such as wall or ceiling linings, roof shingles, in public transport vehicles such as buses, coaches and trains; mobile homes; oil rigs; exhibitions, studios, theatres, shop fitting and temporary structures where there is a need to comply with fire safety regulations. The choice of flame retardant treatment depends upon many different factors; the principal ones being the standard of performance required and the conditions in which the treated product is to be used.

Fire Performance Requirements

The fire performance for all materials that are to be used in buildings, including wood and wood based panel products, are stated in Building Regulations that apply in different areas of the UK.

The criteria specified in these regulations are usually defined in terms of a given performance when tested according to prescribed British Standard Test Methods. The principal standard that has been used for assessing the reaction to fire performance of wood building materials is BS 476 'Fire Tests on Building Materials and Structures.' Results from the traditional BS 476 fire test methods cannot be used to demonstrate compliance

with a European product standard. Instead, the European standards make reference to the new European fire test methods, the relevant ones for flame retardant treated construction products being EN ISO 11925 and EN 13823.

The test method most widely used for assessing the effectiveness of flame retardant treatments is BS 476 Part 7, which is used to classify a material in terms of the spread of flame across its surface under the test conditions. In general untreated timber or panel products fall into classes 3 or 4, i.e. a rapid surface flame spread. Treatment with flame retardant chemicals can upgrade such materials to class 1, i.e. a low surface flame spread. This level, the highest achievable with this test method, is the performance normally required for wall and ceiling linings.

In certain high risk areas, such as escape routes, some building regulations require a Class '0' standard of performance, i.e. limited combustibility. To comply, materials must have a class 1 surface spread of flame and a low fire propagation index (less than 12) when tested to BS 476 Part 6. Certain wood based substrates can meet this standard of performance when treated.

Following the introduction of harmonised European fire test methods, Euroclasses based on performance in those tests (known as Euroclass A, B, C, D, E and F) will eventually replace BS 476 classes. In the meantime in the UK, Building Regulations Approved Document B has been revised to include Euroclasses for fire performance alongside the equivalent BS 476 classes.

Adoption of the Construction Products Directive into UK legislation requires all products to meet the six Essential Requirements of that Directive. This is proved by demonstrating compliance with European Product standards when they become available and marking product with the CE mark as a declaration of compliance. This is done in conjunction with a Notified Body. Compliance with the requirements of the standard on wood based panels (BS EN 13986) is mandatory from 1st April 2004. The standard for solid timber will not be mandatory for several years.

Once a standard is mandatory, then compliance with Building Regulations is shown by use of the European tests alone, however, prior to this, compliance may be demonstrated by conducting either current national test methods such as BS 476 Part 7, or the European tests.

Conditions of Use

The environment in which the treated timber or panel product is to be used should govern the choice of flame retardant treatment. Thus high humidity or wet conditions can affect both the performance of certain treatments and have undesirable side effects on the wood. These include strength reduction, corrosion of metal fixings, over-painting problems and decay. The Wood Protection Association Manual provides recommendations for use and lists products supplied by WPA members. An approval scheme for flame retardant products was introduced in 1998 and approved products are shown in bold type in the list at the end of this leaflet. Products whose performance characteristics are declared by the manufacturer but which have not been assessed independently under the WPA Approval Scheme for Flame Retardants are in light type.

Quality Control

The final performance of the product is critically dependent upon the care and control exercised by the processor over the treatment process and also upon the quality of the chemicals used. Member companies of the WPA accept certain codes of practice and behaviour and may subscribe to third party quality assurance such as membership of the British Standards Institution Registration Scheme for Flame Retardant Treatments or third party product assurance such as British Board of Agrément Certification.

Timber and timber products which have a flame retardant treatment require Certification by a Notified Body to show compliance with the relevant product standard. One of the requirements of all product standards is for routine testing of product under a specified quality control system. All flame retardant treated wood will therefore in future be subject to such certification.

How to specify

(a) Type of wood based panel

If the material is capable of being impregnated with an aqueous solution of the flame retardant consider vacuum-pressure impregnation. Exterior grade plywoods can be impregnated safely.

If the structural integrity of the wood based panel will be reduced by impregnation with an aqueous solution, for example MDF, chipboard and OSB, use a manufactured FR product.

(b) Type of flame retardant

Consider the end use application in terms of exposure to weathering and humidity and select the minimum appropriate type of flame retardant.

(c) WPA or BBA approval

Certain products have WPA (listed in bold in the table) and/or BBA approval

(d) Ancillary properties of the treated timber

Contact the manufacturer for further, specific information on the properties of the timber.

(e) WPA Commodity Specifications

Five WPA Commodity Specifications cover most situations; see the WPA FR Manual for further details.

Model specification phrases

(a) Dry interior constructions (maximum 75% relative humidity): [insert material/species] to be treated to [Class 1 Surface Spread of Flame to BS 476 Part 7 or Class 0 BS 476 Parts 6 & 7, or Euroclass B or Euroclass C], using a * WPA Type DI dry interior process.

(b) Interior constructions (humidity resistant): [insert material/species] to be treated to [Class 1 Surface Spread of Flame to BS 476 Part 7 or Class 0 BS 476 Parts 6 & 7, or Euroclass B or Euroclass C], using a * WPA Type HR humidity resistant process.

(c) Full Exterior Exposure: [insert material/species] to be treated to [Class 1 surface Spread of Flame to BS 476 Part 7 or Class 0 BS 476 Parts 6 & 7, or Euroclass B or Euroclass C], using a * WPA Type LR leach resistant process.

** Where specifiers wish to specify the type or identity of fire retardant to be used, appropriate details can be inserted where an asterisk appears in the above sentences.*

Further Information

This information sheet is a brief introduction to this subject. There are many text books available on the subject of timber, its anatomy and treatment with chemicals. In addition processing companies or manufacturers can provide data sheets, test reports and further detailed information. Company information is available at www.wood-protection.org Finally, listed below is further reading in specific technical areas. It should be noted that many of these

are regularly updated and the latest version is implied in this listing.

1) General

TRADA Wood Information Sheet 2/3 - 3
'Flame Retardant Treatments for Timber'.

Warrington Fire Research Information Sheets.

2) Specification

WPA Manual *Industrial Fire Retardant Treatment of Solid Timber and Panel Products*

3) Regulations

3.1 The Buildings Regulations for England and Wales. Approved Document B

3.2 The Building Regulations (Northern Ireland)

3.3 The Building Standards (Scotland) Regulations.

4) Fire Tests

BS 476 Fire Tests on Building Materials and Structures.

BS EN ISO 13823 Single Burning Item (SBI) Test

BS EN ISO 11925:Part 2 - Ignitability using a small flame

5) Euroclasses

Official Journal of the European Communities (OJ L 50, 23.2.2000, p. 14)

BS EN 13501: Fire classification of construction products and building elements, Part 1-Classification using data from reaction to fire tests

6) Product Standard

BS EN 13986 Wood-based panels for use in construction. Characteristics, evaluation of conformity and marking

Wood Protection Association Manufacturer, Pretreater and Associate (supplier) Members

Company	Flame retardant impregnation products supplied
Arch Timber Protection Limited Wheldon Road, Castleford West Yorkshire WF10 2JT Tel: 01977 714000 Fax: 01977 714002 Email: advice@archchemicals.com Website: www.archtp.com	Dricon (WPA Type HR – WPA Approved) Non-Com Exterior (WPA Type LR) ATP Generic FR (WPA Type DI)
Osmose t/a Protim Solignum Fieldhouse Lane Marlow Bucks SL7 1LS Tel: 01628 486644 Fax: 01628 476757 Email: info@osmose.co.uk Website: www.protimsolignum.com/osmose/frames.htm	FirePRO (WPA Type HR)

Company	Flame retardant treated wood products supplied
Medite Europe Ltd. 10th Floor, Maitland House Southend-on-Sea Essex SS1 2JY Tel: 01702 619044 Fax: 01702 617162 Email: info@medite-europe.com Website: www.medite-europe.com	Medite Europe market the "Medite"® brand of Medium Density Fibreboard. Medite® FR (Flame Retardant) Euro Class B & C is an MDF panel developed specifically for use in situations where a Euro Class B or a Euro Class C flame retardant board is required under building regulations. Third party certification to these requirements and also CE conformity are available upon application. All Medite products possess third party audited FSC Chain of Custody. ISO 9001 conformity of production also applies to its manufacture. For specific requirements, please feel free to contact our technical sales staff.

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<p>Montague L. Meyer Bromford Gate, Bromford Lane Heartlands Birmingham B24 8DW Tel: 0121 326 3200 Fax: 0121 326 3230 Email: sales.Birmingham@mlmuk.com Website: www.mlmuk.com</p>	<p>Importer and distributor of wood based panels, including: Flame retardant panels, CPD compliant, with full system 1 attestation to BS EN 13986.</p> <p>Declarations of conformity upon request for Euroclass B & C performing panels.</p> <p>Structural wood based panels, FR and non-FR, meeting Building Regulations through BS 5268-2, sect. 4 and Eurocode 5.</p>
<p>Timbmet Silverman PO Box 39 Cumnor Hill Oxford OX2 9PP Tel: 01865 860641 Fax: 01865 864367 Email: oxfsales@timbmet.com Website: http://www.timbmet.com</p>	<p>Distributor of hardwoods, panel products and other added-value timber products. The company operates sites throughout the UK, and is committed to sustainability through the provision of responsible timber solutions with full Chain of Custody certification.</p> <p>Range includes hardwoods, clear softwoods, panel products, machined timbers, engineered solutions, flooring and doors.</p> <p>Timbmet Silverman supplies an extensive range of panel products including fire resistant and fire retardant materials.</p> <p>Flame Retardant Boards</p> <ul style="list-style-type: none"> <input type="checkbox"/> Chipboard FR Class 1 <input type="checkbox"/> Plywood Euro Class B & C <input type="checkbox"/> Melamine Faced Chipboard FR Class 1 <input type="checkbox"/> Medite MDF Euro Class B & C <p>Fire Resistant Door Blanks</p> <ul style="list-style-type: none"> <input type="checkbox"/> Lightweight block core <input type="checkbox"/> Halspan Prima & Optima <input type="checkbox"/> Blankfort Plus FD30 & FD60 <p>Fire Resistant Doors</p> <ul style="list-style-type: none"> <input type="checkbox"/> Viscount Plus FD30 & FD60 - a range of fully finished internal veneered fire doors with 10 year guarantee
<p>William T. Eden Enterprise Close, Medway City Estate, Frindsbury, Kent, ME2 4LY Tel: 01634 291010 Fax: 01634 291329 Email: sales.frindsbury@edens.co.uk Website: www.edens.co.uk</p>	<p>Special products and services available to order.</p> <p>Full environmental chain of custody systems: FSC Chain of Custody Number: TT-CoC-1670 PEFC Chain of Custody Number: BMT-PEFC-0057</p> <p>ISO 9001:2000 BMS approved, certificate No. 006.</p> <p>Nationwide stockholding and delivery service.</p>