Westfield Shopping Centre, Derby

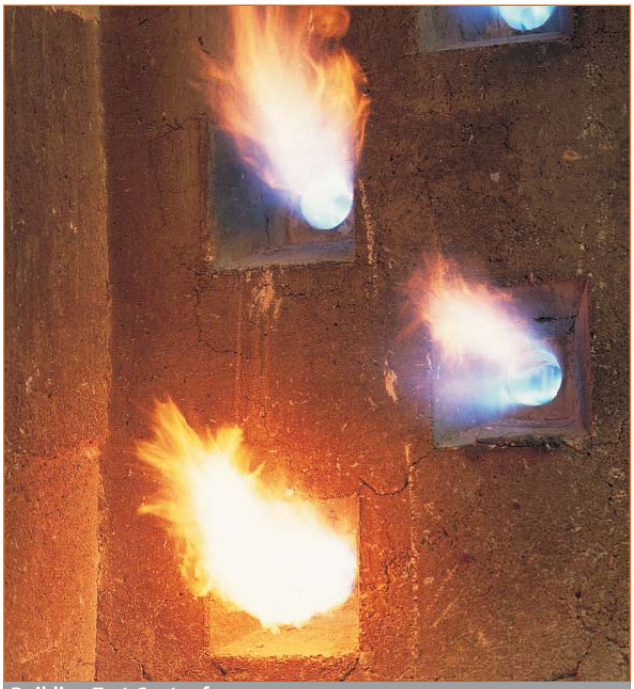
4 Appendices

Fire testing and certification

Fire research and testing at British Gypsum

British Gypsum regards the contribution made by its products to the structural fire protection of buildings with the utmost importance. The Building Test Centre at East Leake in Leicestershire houses one of the most sophisticated fire resistance test furnaces in the UK, as well as small scales reaction to fire testing equipment.

The Building Test Centre operates as an independent test house and holds UKAS accreditation for a wide range of fire, acoustic and structural tests. Its stature has grown to the point where it is now one of the most highly respected testing facilities in the country.



Building Test Centre furnace

Fire resistance furnace

The furnace is one of the most flexible of its kind in the UK, with only the side walls permanently fixed. The end walls consist of refractory lined steel closers which can be moved as required. This enables walls and partitions up to a maximum of 5m high x 3m wide or floor and ceiling constructions up to 4m long x 3m wide to be tested using the same furnace. A system of hydraulic rams above the furnace provides loading for both horizontal and vertical specimens that need to be tested under load.

The furnace is fired by a maximum of 26 propane burners with automatic ignition from a remote console in the control room, and has a range of protection devices to ensure fail-safe operation.

Control of the furnace is completely automatic, and utilises two computers working in conjunction with each other. The first is the control which continually compares the actual furnace temperature with the time / temperature curve defined in the test standard, and automatically adjusts the gas and air supplies to the burners as necessary. Computer control gives much better approximation to the standard curve than the manual control of gas common on older furnaces, and is therefore reproducible. The pressure inside the furnace is simultaneously controlled by the computer, by opening and closing a damper in the exhaust flue. The second computer provides a backup to the main computer to prevent against any loss of data in the unlikely event of a failure.

The first computer also acts as the main data logger, which can record up to several hundred channels of data. This includes furnace and specimen temperatures, specimen deflection, applied load and furnace pressure. The data is stored in a format that allows graphs and tables to be quickly produced for inclusion in the test report.

Fire resistance test

Observations during the testing

In order to derive the maximum amount of information from each test, the specimens are monitored more closely than is required by the test standards. For example more thermocouples are used both inside and outside the test specimen. Continuous visual observations are made of the behaviour of the specimen from both the exposed and unexposed faces on every test, and the observers are helped if necessary by video equipment which records both what happened, and, most importantly, when it happened.

Construction of specimens

In order that the furnace can be used more fully, specimens to be tested are not built in the furnace but in frames in a nearby construction area. They are then moved into place using an overhead crane. A racking system allows several specimens to be stored while they await testing. This also permits the specimen to be removed from the furnace for inspection immediately after the test.

Ceiling specimens are constructed at a convenient height on a raised framework, which allows them to be built from the underside as they would be in practice.

Small scale fire resistance furnaces

There are two small scale ($1m^2$) fire resistance furnaces, one vertical and one horizontal, to carry out exploratory tests before using the full scale furnace.

Reaction to fire tests

The Building Test Centre has invested in the full range of new European reaction to fire test equipment and can offer the following Euroclass testing:

BS EN ISO 1182: 2002
Reaction to fire tests for building products – Non-combustibility test

BS EN ISO 1716: 2002
Reaction to fire tests for building products – Determination of the heat of combustion

BS EN 13823: 2002
Reaction to fire tests for building products – Building products excluding floorings exposed to the thermal attack by a single burning item

BS EN ISO 11925-2: 2002
Reaction to fire tests for building products – Ignitability of building products subjected to direct impingement of flame. Single flame source test

UKAS accreditation

The United Kingdom Accreditation Service (UKAS) is the UK's national accreditation body responsible for assessing and accrediting the competence of measurement, testing, inspection and certification of systems, products and personnel.

Subject to its stringent requirements, UKAS accredited laboratories are authorised to issue formal reports for specific types of measurements and tests. The Building Test Centre holds UKAS accreditation (No. 0296) for a wide range of BS, EN and ISO fire test methods, which means that test reports issued by the Building Test Centre carry the same weight as those from other accredited testing houses. The Building Test Centre can undertake tests on a commercial basis for other companies.

Fire testing liaison

The Building Test Centre is a founder member of the Fire Test Study Group (FTSG) which draws its membership from those UK laboratories which undertake fire tests primarily for building control purposes. The main aims of the group are to improve the quality of fire testing services, and achieve a common interpretation of all relevant standard test methods.

The laboratory is also a notified body for carrying fire tests to EN standards.

Testing experience

The fire resistance furnace at East Leake has now been in operation for more than twenty five years, in which time over 3,000 full scale fire tests have been carried out. This makes the Building Test Centre the most experienced in the world with regard to testing gypsum-based products and systems.

British Gypsum continues to build up a data bank of fire test performance information to make a major contribution to the development of new British, European and International standard fire tests and revisions to new tests.

The scale of investment in fire testing is a guarantee of British Gypsum's dedication to structural fire protection.

Certification bodies and schemes

Association for Specialist Fire Protection (ASFP)

ASFP is the foremost trade association for passive fire protection. It publishes a range of technical publications containing third party certificated systems such as fire protection to structural steelwork, penetration seals, fire rated and smoke outlet ductwork, and fire rated partitions. The ASFP is recognised in the Building Regulations Approved Document B.

British Board of Agrément (BBA)

The BBA is principally concerned with the testing, assessment and approval of products for the construction industry. This ensures the ready acceptance of the products concerned and their safe and effective use. Assessment by the BBA relates primarily to new or innovative products, for which no British Standard normally exists, and where architects and other building professionals will look for the assurance provided by Agrément Certificates.

The BBA issues Agrément Certificates which give an independent opinion of the performance of a product, component, material or system. All relevant performance factors are assessed. The manufacturers of products awarded an Agrément Certificate are subjected to quality control surveillance by the BBA or its agents during the period of validity of the Certificate. These Certificates are published documents, and are freely available in the public domain. The BBA is also authorised to issue European Technical Approvals (ETAs).

BM TRADA Certification

BM TRADA Certification Ltd is an independent, UKAS accredited, third-party certification body operating in the public and private sectors across a wide range of manufacturing and service industries. It provides certification services to *ISO 9000* and *ISO 14001* and operates a number of product conformity schemes, including QMark Fire Door Scheme. Its sister company, Chiltern International Fire, provides UKAS accredited fire resistance testing of doorsets and other fire safety engineering services. BM TRADA Technology Ltd, provides a wide range of research, project management, consultancy and technical and expert witness services to the building and allied industries.

Firas

Firas is an independent, third party accreditation and training scheme for installers of passive fire protection products and systems and is part of Warrington Fire Research Certification. All schemes are developed in a partnership of Firas with the trade association most representative of the installer's interest. Firas Accreditation Schemes cover the installation of a wide range of fire protection products including glass and glazing, steelwork protection, ducts and dampers, cavity barriers, penetration sealing systems, timber and steel doorsets.

Loss Prevention Certification Board (LPCB)

LPCB conducts certification and approval activities in the fire and security sectors and carries out product, systems and service approvals for companies worldwide. LPCB is governed by an independent board which includes representatives from industry, regulatory bodies, insurers, trade associations and end users, and is constituted so that no single interest predominates. In addition, technical panels prepare and maintain certification schemes in defined product areas. LPCB operates within the framework of the Loss Prevention Council (LPC), a leading international authority on loss prevention and control. LPC is supported by the Association of British Insurers and Lloyds, and aims to improve the protection of people and property by improving loss prevention practice.

European Organisation for Technical Approvals (EOTA)

The EC Construction Products Directive introduced the concept of European Technical Approval (ETA) which is one of two types of technical specification, the other being a harmonised European Standard. All EC Member States have designated bodies to issue ETAs and these bodies form the EOTA. This has enabled a common approach to methods of working by the individual Member States. In the field of passive fire protection, EOTA has been given a mandate to develop two European Technical Approval Guidelines (ETAG); one for fire stopping and fire sealing products, and the other for fire protective products. Products that are not covered by CEN harmonised product standards will be able to obtain approval by the EOTA route.

British Standards Institute (BSI)

ISO 9000

ISO 9001, *ISO 9002* and *ISO 9003* have been adopted primarily to assure timely delivery of products and services which meet agreed customer requirements. The approach is to rely on the supplier's own management, generally referred to as his quality management system (QMS).

Kitemark

The Kitemark is an independent third party certification scheme for the assessment of product quality and safety. The Kitemark symbol indicates that the product conforms with the specifications within the scheme. The Kitemark is the UK's most widely recognised certification mark.

Useful contacts

Certification bodies

British Board of Agrément (BBA)
Bucknalls Lane
Garston
Watford
WD25 9BA

Tel: 01923 665300
Fax: 01923 665301
www.bbacerts.co.uk

BM TRADA Certification
Chiltern House
Stocking Lane
Hughenden Valley
High Wycombe
Buckinghamshire
HP14 4ND

Tel: 01494 569700
Fax: 01494 569701
www.bmtrada.com

Certifire
Holmesfield Road
Warrington
Cheshire
WA1 2DS

Tel: 01925 444851
Fax: 01925 234962

Firas
Holmesfield Road
Warrington
Cheshire
WA1 2DS

Tel: 01925 630438
Fax: 01925 234962

Loss Prevention Certification Board (LPCB)
BRE Global
Bucknalls Lane
Watford
Hertfortshire
WD25 9XX

Tel: 01923 664100
Fax: 01923 664994
www.redbooklive.com

Testing bodies

Building Test Centre
British Gypsum
East Leake
Loughborough
Leicestershire
LE12 6NP

Tel: 01159 451564
Fax: 01159 451562

Bodycote Warrington Fire
Holmesfield Road
Warrington
Cheshire
WA1 2DS

Tel: 01925 655116
Fax: 01925 655419
www.warringtonfire.net

Building Research Establishment (BRE)
BRE Global
Bucknalls Lane
Watford
Hertfortshire
WD25 9XX

Tel: 01923 664000
www.bre.co.uk

Chiltern International Fire
Chiltern House
Stocking Lane
Hughenden Valley
High Wycombe
Buckinghamshire
HP14 4ND

Tel: 01494 569800
Fax: 01494 564895
www.chilternfire.co.uk

Darchem Flare
Stillington
Stockton-on-Tees
Cleveland
TS21 1LB

Tel: 01740 632778
Fax: 01740 632 911
www.darchem.co.uk

Trade associations

Association for Specialist Fire Protection (ASFP)
Tournai Hall
Evelyn Woods Road
Aldershot
Hampshire
GU11 2LL

Tel: 01252 357832
Fax: 01252 357831
www.asfp.org.uk

Passive Fire Protection Federation (PFPF)
Tournai Hall
Evelyn Woods Road
Aldershot
Hampshire
GU11 2LL

Tel: 01252 357841
Fax: 01252 357831
www.pfpf.org

Steel Construction Institute (SCI)
Silwood Park
Ascot
Berkshire
SL5 7QN

Tel: 01344 636525
Fax: 01344 636570
www.steel-sci.org

Gypsum Products Development Association (GPDA)
PO Box 35084
London
NW1 4XE

Tel: 020 7935 8532
Fax: 020 7935 8532
www.gpda.com

Construction Products Association (CPA)
The Building Centre
26 Store Street
London
WC1E 7BT

Tel: 02073 233770
Fax: 02073 230307
www.constructionproducts.org.uk

Association of Interior Specialists (AIS)
Olton Bridge
245 Warwick Road
Solihull
West Midlands
B92 7AH

Tel: 01217 070077
Fax: 01217 061949
www.ais-interiors.org.uk

Federation of Plastering and Drywall Contractors (FPDC)
1st Floor
8/9 Ludgate Square
London
EC4M 7AS

Tel: 02076 349480
Fax: 02072 489263
www.fpdc.org

Other sources

British Standards Institution (BSI)
389 Chiswick High Road
London
W4 4AL

Tel: 02089 969001
Fax: 02089 967001
www.bsigroup.co.uk

UKAS
21-47 High Street
Feltham
Middlesex
TW13 4UN

Tel: 02089 178400
Fax: 02089 178500
www.ukas.com

Fire Test Study Group (FTSG)
c/o Holmesfield Road
Warrington
Cheshire
WA1 2DS

Tel: 01925 655116
Fax: 01925 655419

Glossary of fire terms

Compartment wall
A fire resisting wall used to separate one fire compartment from another.

Composite beam
A beam comprising a steel I section connected via shear connectors to a reinforced concrete or composite floor slab where the steel section and floor slab are designed to act together.

Cotton pad
A cotton wool pad supported in a metal holder used to determine integrity failure.

Critical temperature
The temperature at which failure of the structural steel element is expected to occur against a given load level.

Design temperature
The temperature determined by calculation at which failure of the structural steel element is expected against a given load level at a particular location in a building.

Drylining
Creating a wall or ceiling lining using plasterboard as an internal finish instead of solid plaster treatment.

Drywall
A partition, separating wall or wall lining which uses plasterboard as a lining instead of solid plastering (can be skim plastered however).

Exposed face
The side of the element being tested that is exposed to the heating conditions of a fire.

Field of board
The surface of board (as opposed to the edges or ends).

Fire door
A door that provides fire resistance.

Fire protection material
Material or combination of materials applied to the surface of a steel member for the purpose of increasing its fire resistance.

Fire resistance
The ability of a test specimen of an element of building construction to maintain its function, expressed in times to failure against specified criteria, when subjected to standard heat, pressure and mechanical test conditions.

Fire separating element
A compartment wall, compartment floor, cavity barrier and construction enclosing a protected escape route and/or a place of special fire hazard.

Fixed partition
A partition which cannot be demounted without destroying, partially or totally, the integrity of the components.

Framed partition
A partition consisting of a continuously supported frame with facings or infillings. It may take the form of a stud and sheet, frame and sheet or frame and panel partition e.g. GypWall CLASSIC.

Gap gauge
A 25mm diameter or 6mm x 150mm steel rod used to determine integrity failure.

Glass mineral wool
Mineral wool manufactured from glass used for improved thermal or acoustic insulation e.g. Isover insulation.

GRG board
A gypsum board having a glass fibre reinforced core and continuous glass fibre membranes just below each surface e.g. Glasroc F FIRECASE and Glasroc F MULTIBOARD.

Gypsum
Calcium sulphate dihydrate ($CaSO_4.2H_2O$). A natural mineral deposit and the main raw material from which gypsum plaster is made.

Insulation performance
The ability of a test specimen of a separating element of building construction, when exposed to fire on one side, to restrict the temperature rise of the unexposed face to below specified levels.

Integrity performance
The ability of a test specimen of a separating element of building construction, when exposed to fire on one side, to withstand collapse and to prevent the passage through it of flames and hot gases and to prevent the occurrence of flames on the unexposed side.

Jointing
The process of using hand or mechanical systems for achieving a flush seamless surface on dry construction based on tapered edge plasterboard and applicable to walls and ceilings.

Load bearing capacity
The ability of a test specimen of a load bearing element to support its test load, where appropriate, without exceeding specified criteria with respect to the extent and rate of deformation.

Load bearing element
An element that is intended for use in supporting an external (applied) load in a building and maintaining this support in the event of a fire.

Masonry partition
A partition of brickwork or blockwork complete with any specified surface finishes such as a drylining or plaster.

Metal stud partition
A non-loadbearing partition consisting of a metal stud / channel framework and lined both sides with sheet materials such as plasterboard. This is a form of stud and sheet partition e.g. GypWall CLASSIC.

Nogging
Cross member between main members of a framed construction.

Passive fire protection materials
Materials which do not change their physical form on heating, providing fire protection by virtue of their physical or thermal properties.

Plasterboard
A building board, complying with *EN 520*, composed of a core of aerated gypsum plaster bonded between two sheets of strong paper e.g. Gyproc WallBoard.

Plate thermometer
A 100 x 100mm insulated thin steel plate to which a thermocouple is attached, used to measure the fire test furnace temperature(s).

Protected corridor/lobby
A corridor or lobby which is adequately protected from fire in adjoining accommodation by fire resisting construction.

Security partitions
Constructions specifically designed to be resistant to ballistic and physical attack and explosions, such as those from letter or car bombs e.g. GypWall SECURE or BlastWall.

Soffit
The underside of a building element, including semi-exposed situations.

Stone wool
Mineral wool manufactured from stone, used to improve fire resistance performance.

Stud
Vertical member in framed wall or partition.

Sustained flaming
Continuous flaming for a period of time greater than 10 seconds, used to determine integrity failure.

Test specimen
An element (or part) of building construction provided for the purpose of determining either its fire resistance or its contribution to the fire resistance of another building element.

Timber stud partition
A partition consisting of a timber frame lined on each side with materials such as plasterboard.

Notes