

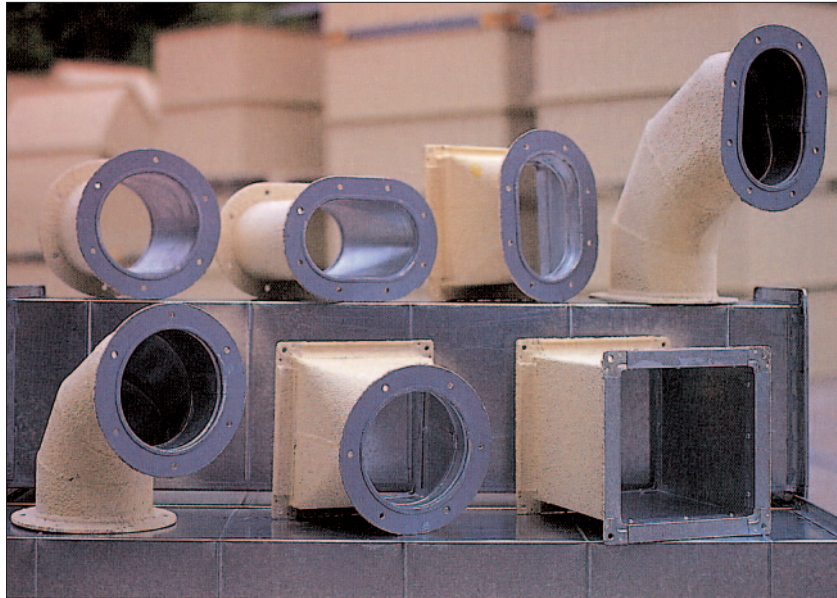


BW11 Fire Resistant Ductwork



Applications
Manual

Introduction



Initially fire resistant boards were used to form and clad ductwork systems to make them fire resistant. As time went by it became evident that there were many limitations with products being marketed as suitable for fire duct systems but which had not been specifically designed for that use.

In 1986 we introduced for the first time a duct system specifically designed to be fire resistant, which was capable of being successfully pressure tested and was available in rectangular, circular and flat oval form.

Since then the market has grown dramatically, but there is strong evidence that considerable confusion still arises over the whole issue of fire resistant duct systems.

The aim of this manual is to help eliminate any confusion by describing:

- **Why Fire Rated Ductwork is required**
- **Where Fire Rated Ductwork is required**
- **How Fire Rated Ductwork should be constructed and installed**

It also covers the dangers and possible pitfalls in not selecting a properly tested, certificated system and not having the fire rated ductwork installed by competent and fully trained contractors.

CAUTIONARY NOTE

This manual describes the requirements for fire rated ductwork in general terms. It is essential that system designers should always refer to local Building Regulations and submit designs to the relevant Fire/Building Control Authority for final approval, prior to commencement of construction.

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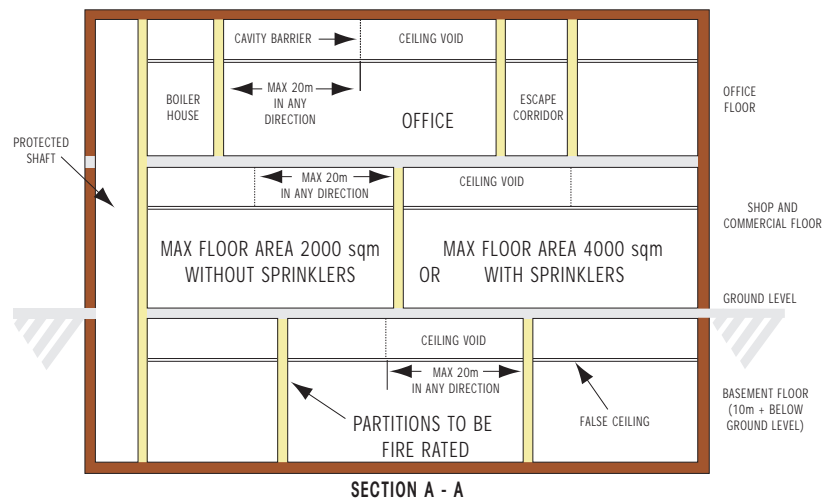
1. Basic Fire Principles

1.1. Compartmentation

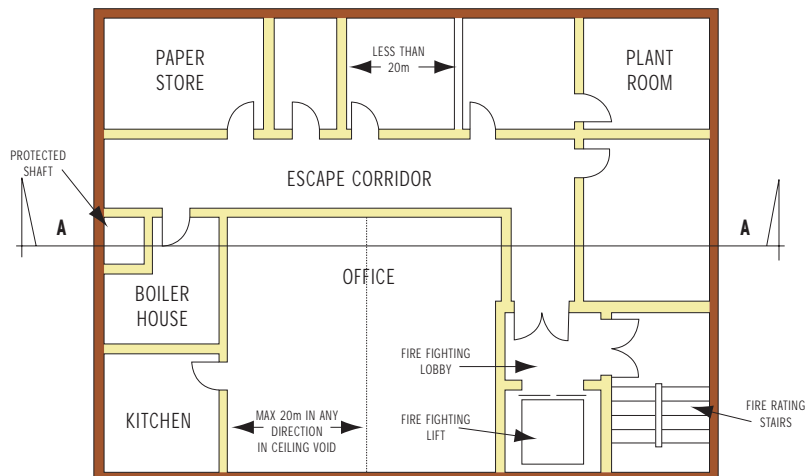
Buildings are usually sub-divided into compartments by walls and floors constructed to prevent the spread of fire to, or from, another part of the same building.

The intention is to contain the fire in the compartment in which it begins, thereby stopping its spread from one compartment to another. The Building Regulations describe the design considerations that are required to be adhered to by Architects and Designers, and these include the fire rating and the maximum size of those compartments. The illustration below shows the requirements for the United Kingdom. Similar limitations are imposed by regulations in other countries.

Typical Office Compartmentation



SECTION A - A

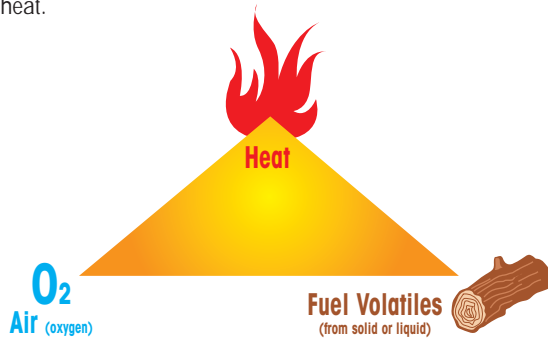


OFFICE PLAN

FIRE RATED WALLS
 FIRE RATED FLOORS
 NON-FIRE RATED WALLS

1.2. Fire Triangle

Fire is a complex set of chemical reactions in which fuel combines with oxygen and an ignition source to produce heat.



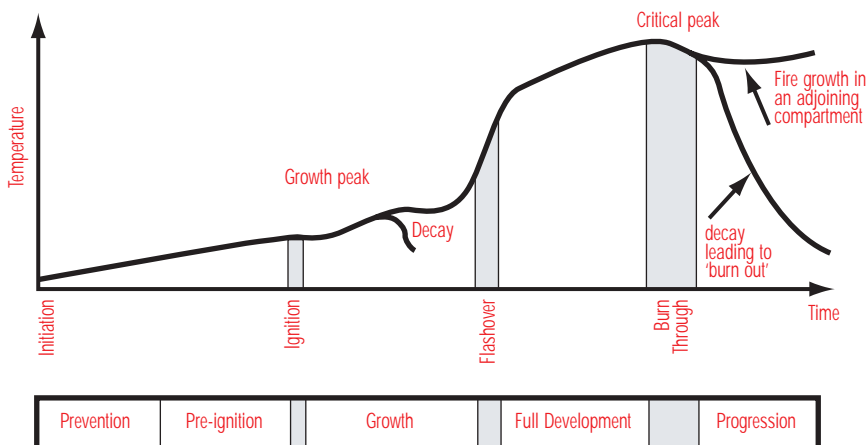
There is no such thing as a standard fire. The fire size will depend on the three elements of the fire triangle and the compartment size, which will govern how big the fire is allowed to grow.

1.3. Fire Growth

A fire goes through different stages of development, as shown below.

A small fire may develop and will either exhaust the fuel supply and go out (such as a fire in a small waste paper bin) or having started, ignite other materials and eventually reach a stage where all the flammable materials in the compartment have ignited. This is the moment in a fire known as a flashover. The temperature in the compartment will have risen rapidly and the purpose of the walls, floors and ceiling are to maintain the integrity, insulation and load bearing capacity of the structure, for the given period.

The fire resistant materials of the compartment should be designed and tested to ensure that they function correctly, providing they are properly installed.



2. Types and Testing of Fire Resistant Ductwork

2.1. Methods

The Building Regulations require that new buildings must be divided into fire compartments in order that the spread of fire in the building be inhibited, from one compartment to another.

There are obvious areas of weakness which include doors, windows and ventilation ductwork passing from one compartment to another. The ventilation ductwork system itself offers little or no protection against fire spread.

There are three methods of fire protection related to ductwork laid down in the UK standard BS 5588 Part 9 which should be followed.

Method One - Use of Fire Dampers

This covers the protection of ductwork by the provision of fire dampers located where the ductwork penetrates fire resistant compartments, such as walls and floors. It should be noted that normal ventilation ductwork is not fire resistant and that where ductwork passes over an escape corridor or stairway, as well as being protected by a fire damper, the ductwork must be fire resistant. It should also be noted that fire dampers must not be used in smoke extracts, kitchen extracts, car park extracts or pressurisation systems.

Method Two - Use of Builderswork Shafts

When ductwork passes through a fire rated builderswork shaft, it forms a compartment known as a protected shaft. In these circumstances, fire dampers must be used to protect all exits and entrances to the shaft if there are any other services within it. If there are no other services, fire dampers are not required.

Method Three - Use of Fire rated Ductwork Systems

Where the ductwork itself forms a protected shaft, the fire resistance may be achieved by the ductwork material or through the application of a different material applied to sheet steel ducts constructed to the standard under which the product was originally tested and certificated.

Use of properly constructed fire rated duct systems will:

- a. prevent fire entering or leaving the ductwork
- b. limit the spread of fire within the ductwork
- c. maintain the integrity of the compartment when penetrated by ductwork

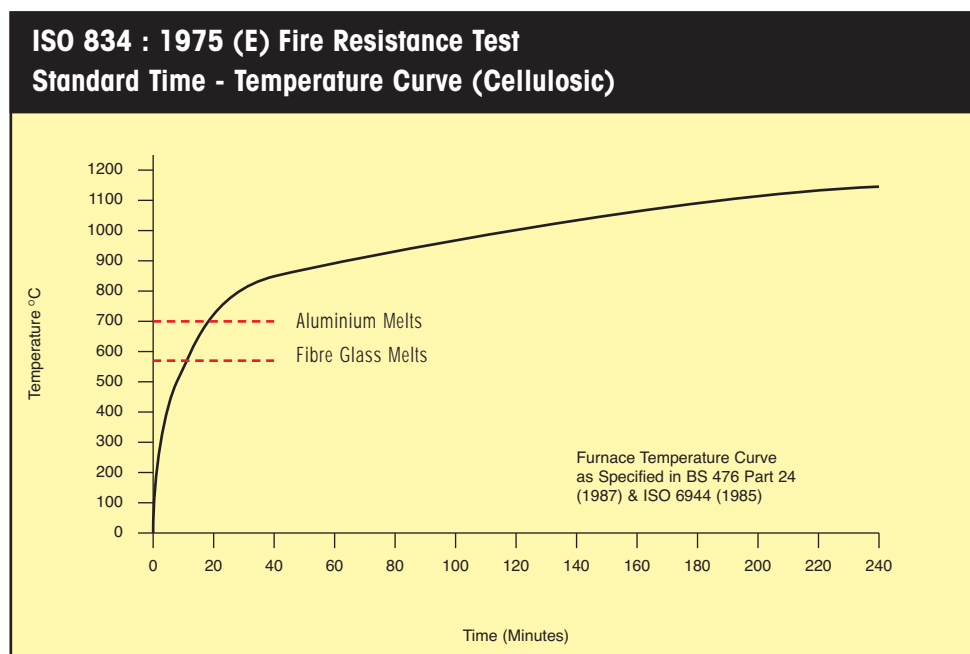
All ductwork must be tested to BS 476 Part 24/ISO 6944 or the appropriate recognised National Standard by a recognised NAMAS/UKAS Accredited Laboratory.

2.2 Test Requirements

British Standard 476 Part 24 (1987) ISO 6944 (1985)

- BS 476 Fire Tests on building materials and structures.
Part 24 (1987) Method for determination of the fire resistance of ventilation ducts.
- ISO 6944 (1985) Fire resistance tests - Ventilation ducts

The purpose of BS 476 Part 24 (1987) and ISO 6944 (1985) is to measure the ability of a ductwork system to resist the spread of fire from one fire compartment to another without the aid of fire dampers. It should be noted that the test relates to a complete ductwork installation and therefore **joints, supports** and the **fire stopping** through the furnace wall all form an integral part of the test.



Giving temperature rise as a function of time for all British Standard 476 Part 24 (1987) & ISO 6944 (1985) Fire Tests.

Requirements of British Standard 476 Part 24 (1987) and ISO 6944 (1985)

The fire resistance of Ventilation Ductwork shall, according to the Standard, be expressed in minutes of duration of heating until failure occurs according to one or more of the following criteria:

- 1. Stability. 2. Insulation. 3. Integrity.**

Criteria of Failure:

1. Stability: Stability failure shall be deemed to have occurred in duct type A within the furnace and in duct types A and B outside the furnace when the duct collapses in such a manner that the duct no longer fulfils its intended function. Included in this is the ability of a smoke extract duct to retain at least 75% of its cross sectional area along its whole length, both inside and outside of the furnace.

2. Insulation: Insulation failure shall be deemed to have occurred when the temperature rise above initial ambient temperature on the unexposed surface of the test specimen outside the furnace exceeds either:

1. 140°C as an average value, or
2. 180°C as a maximum value.

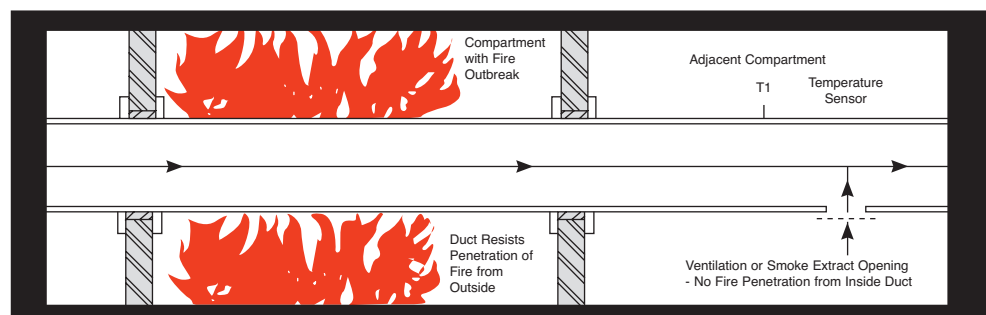
For kitchen extract duct type A, these temperatures rise limits also apply to the inside surface of the duct within the furnace.

3. Integrity: The presence and the formation of cracks, holes or other openings outside the furnace through which flames or hot gases can pass shall constitute integrity failure.

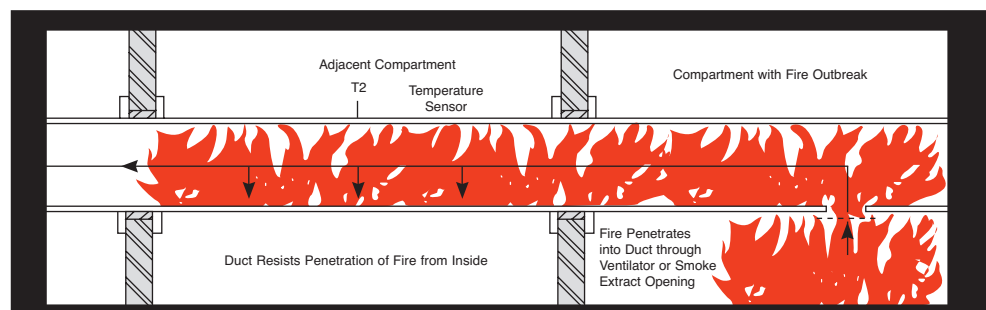
Definitions of Types A & B Fire Exposure

The testing standard differentiates between types of fire exposure; two classifications apply as detailed below.

**Fire Outside
-Duct Type A**



**Fire Inside
-Duct Type B**



2.3. Types of Fire Resistant Ductwork

There are four basic types of fire resistant ductwork that could be required or have special use under fire conditions. The following terms are used in identifying varying performance criteria for such ducts.

1. Ventilation Fire Ductwork: This ductwork is either supply or extract and needs to be fire rated where it passes from a fire compartment through, for example, an escape corridor. It needs to be tested for both type A fire outside and type B fire inside criteria. It is not necessary for the ductwork to maintain its cross sectional area in a fire for it to be acceptable.

2. Smoke Extract Fire Ductwork: This ductwork is for extracting smoke from the building and should be fire rated equal to the compartment walls or floors through which it passes for stability, integrity and insulation.

The duct must also be tested to prove that its cross sectional area does not reduce by more than 25% by area, both inside and outside the furnace, and to insure that it will achieve its primary function, of extracting smoke.

Stability and integrity ratings only are normally required within the area to be protected, ie. car parks, if the duct is contained within a dedicated shaft or there is at least 500mm separation between the ductwork and combustible materials.

3. Non Domestic Kitchen Extract Fire Ductwork: This is sometimes called grease ducting and should be tested for both type A fire outside and type B fire inside as a kitchen extract duct.

Both tests are required as it is important to prevent flammable grease from either catching fire when it passes through an adjacent area, or if the grease itself is already alight, causing a fire to start within the adjacent area by radiant heat. Fire dampers should not be used in kitchen extract ductwork.

4. Pressurisation Ductwork: Pressurisation is a method of restricting the penetration of smoke into certain critical areas of the building by maintaining the air within those areas at pressures higher than those in adjacent areas.

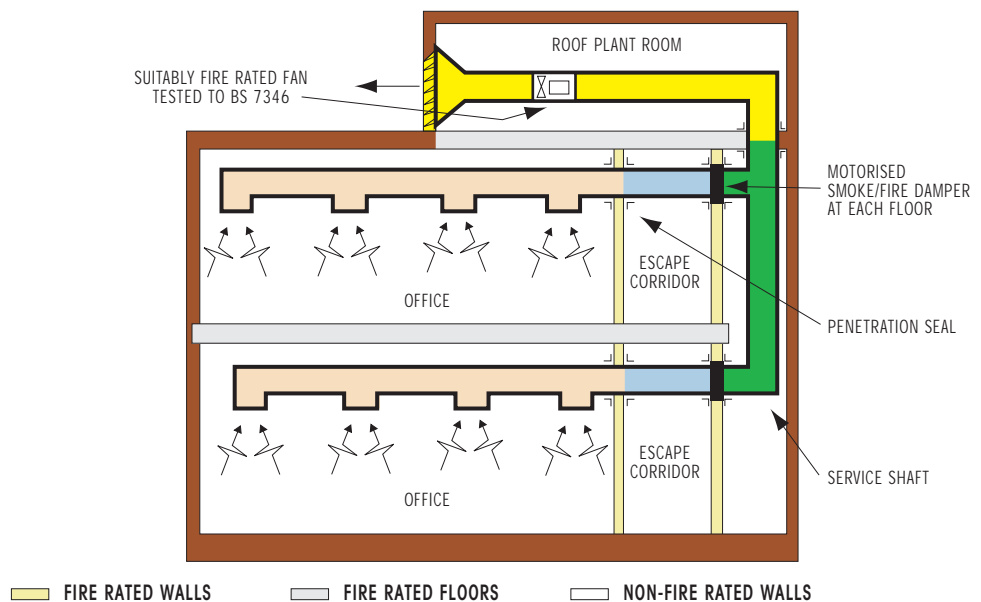
This particularly applies to protected stairways, lobbies and corridors as smoke inhibits escape, and to fire fighting shafts serving deep basements because of the difficulty in clearing smoke.

As the air supply creating the pressurisation must be maintained for the duration of the fire, fire dampers cannot be used within the ducting. The ducting should be tested to type A fire outside criteria.

3. Examples

3.1. Smoke Extract Ductwork Systems

- DUCTWORK USED IN SMOKE EXTRACT SYSTEMS SHOULD NORMALLY BE RATED FOR STABILITY, INTEGRITY AND INSULATION AT LEAST EQUAL TO THE COMPARTMENT WALL THROUGH WHICH IT PASSES. (APPROVED DOCUMENT B FIRE SAFETY, NOTES TO TABLE A1, APPENDIX A).
- SMOKE EXTRACT DUCTWORK MUST RETAIN AT LEAST 75% OF ITS CROSS SECTIONAL AREA, BOTH IN THE FIRE COMPARTMENT AS WELL AS IN ADJACENT COMPARTMENTS.



IN THE DIAGRAM;

Office extract ductwork shown must be suitable for clearing smoke within the compartments and normally rated for 1 hour for stability and integrity to resist hot smoke and fire from inside (Type B). Insulation fire rating is not required in the first compartment.

Where the office extract duct crosses the escape corridor shown it must maintain stability, integrity and insulation fire rating for the same period of time as the compartment through which it passes and this may be required for the remainder of the ductwork route through the building to outside.

In some circumstances insulation requirements may be waived or varied by the regulatory authority if there are no combustible materials within 500mm of the duct, such as in the plantroom shown (BS 5588 Part 9 Clause 7.4).

In order that the 75% cross sectional free area criteria be maintained, fire rated ductwork would be used within the service shaft requiring stability and integrity shown . However, if there are combustible materials within 500mm of the duct, insulation would still be needed.

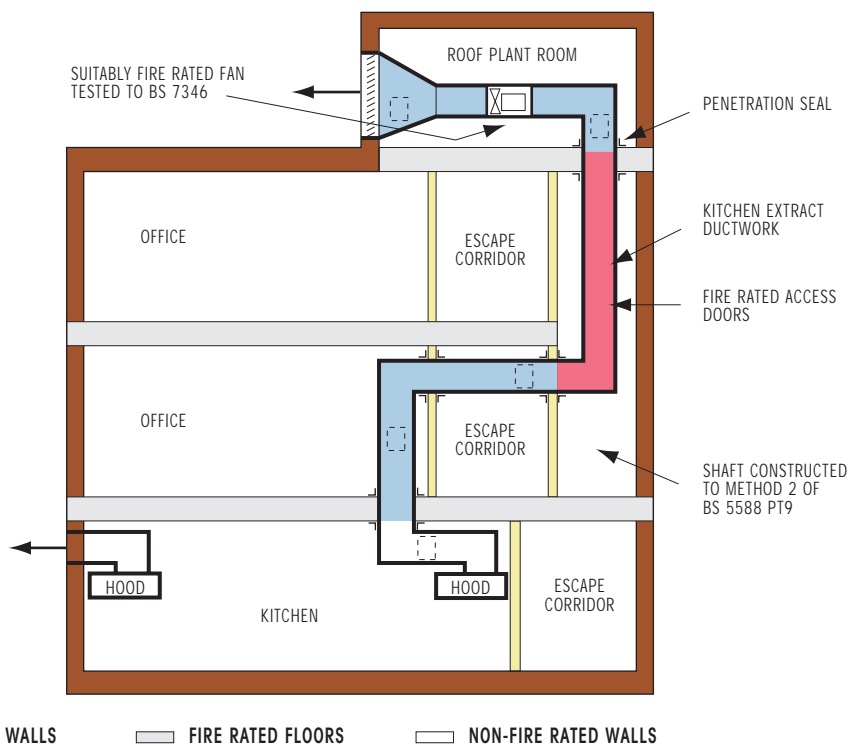
The building regulations and BS 476 Part 24/ISO 6944 require that all fire rated ductwork should be tested and installed to comply to the full "cellulosic" time/temp fire test curve (ISO 834 Fire Curve). However, a fire engineered solution designed by a qualified fire engineering consultant for lower smoke temperatures, may be allowed by the regulatory authority, thus reducing the insulation requirement. However, the duct must still be tested and installed to maintain stability and integrity to the full test temperature.

All Fire Rated Ductwork and Penetration Seals must be tested to BS 476 Part 24/ISO 6944 and manufactured and installed as tested or assessed by a NAMAS/UKAS Accredited Laboratory.

Note: Final approval must always be obtained from the Local Building Control Officer/Fire Department prior to commencement of construction.

3.2. Non Domestic Kitchen Extract Ductwork

- NON DOMESTIC KITCHENS MUST HAVE SEPARATE AND INDEPENDENT EXTRACT SYSTEMS (BS 5588 PT 9 CLAUSE 6.4.6.1).
- FIRE DAMPERS MUST NOT BE USED IN A KITCHEN EXTRACT SYSTEM (BS 5588 PT 9 CLAUSE 6.3.4.2).
- ACCESS DOORS MUST BE INSTALLED AT 3 METRE INTERVALS WHERE POSSIBLE (BS 5588 PT 9 CLAUSE 6.4.6.1) AND HAVE SMOOTH INTERNAL SURFACES TO ENABLE EASY CLEANING OF THE GREASE.
- CARE MUST BE TAKEN TO ENSURE COMBUSTIBLE DEPOSITS IN THE DUCT CANNOT IGNITE IN ADJACENT COMPARTMENTS.



IN THE DIAGRAM;

Kitchen extract ductwork presents a particular hazard in that combustible deposits such as grease are likely to accumulate on its internal surfaces. Therefore, the Ductwork should resist fire from inside (Type B) and must be rated for stability, integrity and insulation, for the same period of time as the compartment through which it passes shown ■. As a fire in an adjacent compartment through which the kitchen extract ductwork is passing, could initiate a fire within the ductwork, which in the absence of fire dampers might prejudice the safety of kitchen occupants, it should also be tested to fire outside (Type A) with the additional requirement that the internal surface of the ductwork within the compartment must meet the insulation criteria.

In some circumstances insulation requirements may be waived or varied by the regulatory authority, if the duct passes through an area where fire cannot be present shown ■ such as a protected shaft. However, stability and integrity must still be maintained for the relevant period of time.

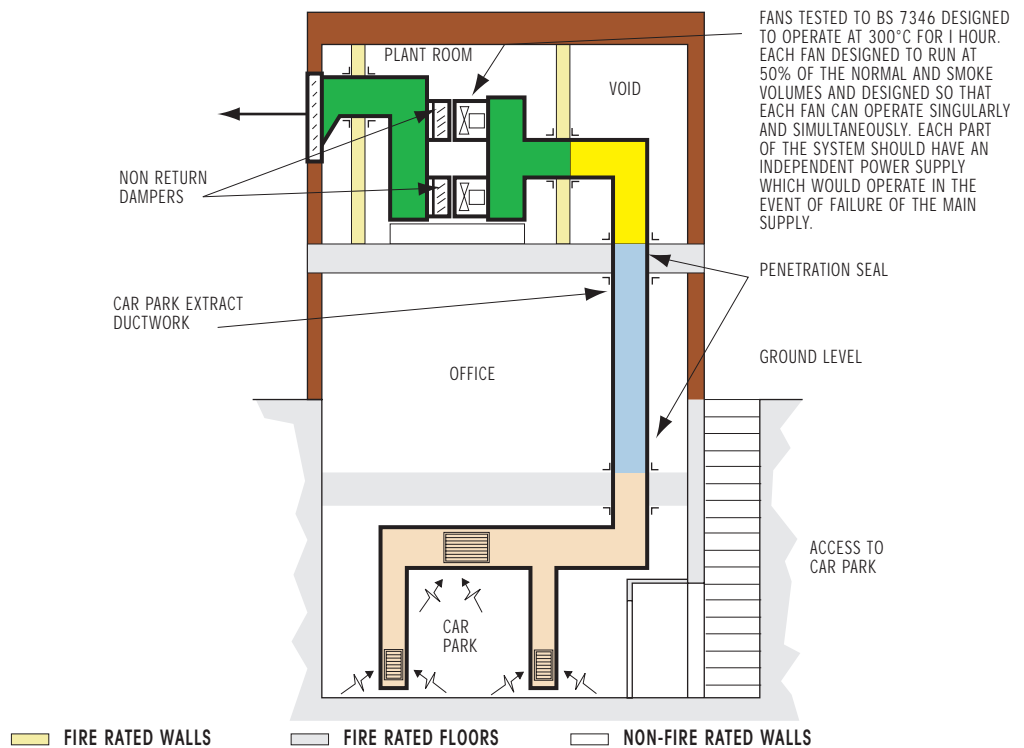
Ductwork within the kitchen (the first compartment) does not have to be fire rated (shown □ in the diagram).

All Fire Rated Ductwork and Penetration Seals must be tested to BS 476 Part 24/ISO 6944 and manufactured and installed as tested or assessed by a NAMAS/UKAS Accredited Laboratory.

Note: Final approval must always be obtained from the Local Building Control Officer/Fire Department prior to commencement of construction.

3.3. Basement and Enclosed Car Park Systems

- EITHER NATURAL OR MECHANICAL METHODS MAY BE USED TO VENTILATE CAR PARKS.
- NATURAL VENTILATION REQUIRES PERMANENT OPENING OF 2.5% OF FLOOR AREA TO PROVIDE A THROUGH DRAFT. (APPROVED DOCUMENT B, FIRE SAFETY, B3 SECTION 12.6).
- MECHANICAL VENTILATION MUST PROVIDE AT LEAST 6 AIR CHANGES/HOUR NORMAL AND 10 AIR CHANGES/HOUR IN A FIRE CONDITION. EXTRACT POINTS MUST BE ARRANGED SO THAT 50% ARE AT HIGH LEVEL, AND 50% AT LOW LEVEL (APPROVED DOCUMENT B, FIRE SAFETY, B3 SECTION 12.7).
- ALL COMPONENTS OF THE SYSTEM MUST HAVE A MINIMUM MELTING POINT OF 800°C. (APPROVED DOCUMENT B, FIRE SAFETY, B3 SECTION 12.7e)
- FIRE DAMPERS SHOULD NOT BE USED IN ANY CAR PARK EXTRACT SYSTEM. (BS 5588 PT 9 CLAUSE 6.3.4.2).
- DUCTWORK USED TO EXTRACT SMOKE MUST RETAIN AT LEAST 75% OF ITS CROSS SECTIONAL AREA, BOTH IN THE FIRE COMPARTMENT AS WELL AS IN ADJACENT COMPARTMENTS.



IN THE DIAGRAM:

The car park extract ductwork shown must be suitable for clearing fumes, and smoke from within the car park and normally rated for a minimum of 1 hour for stability and integrity to resist hot smoke and fire from inside (Type B). All components of the ductwork system must have a minimum melting point of 800°C and therefore aluminium grilles and fixings etc are not permitted.

Where the extract leaves the car park and crosses into another area shown it must maintain stability, integrity and insulation fire ratings for the same period of time as the compartment through which it passes. In some circumstances insulation requirements may be waived or varied by the regulatory authority if there are no combustible materials within 500mm of the duct, such as in the void before the plantroom shown (BS 5588 Part 9 Clause 7.4).

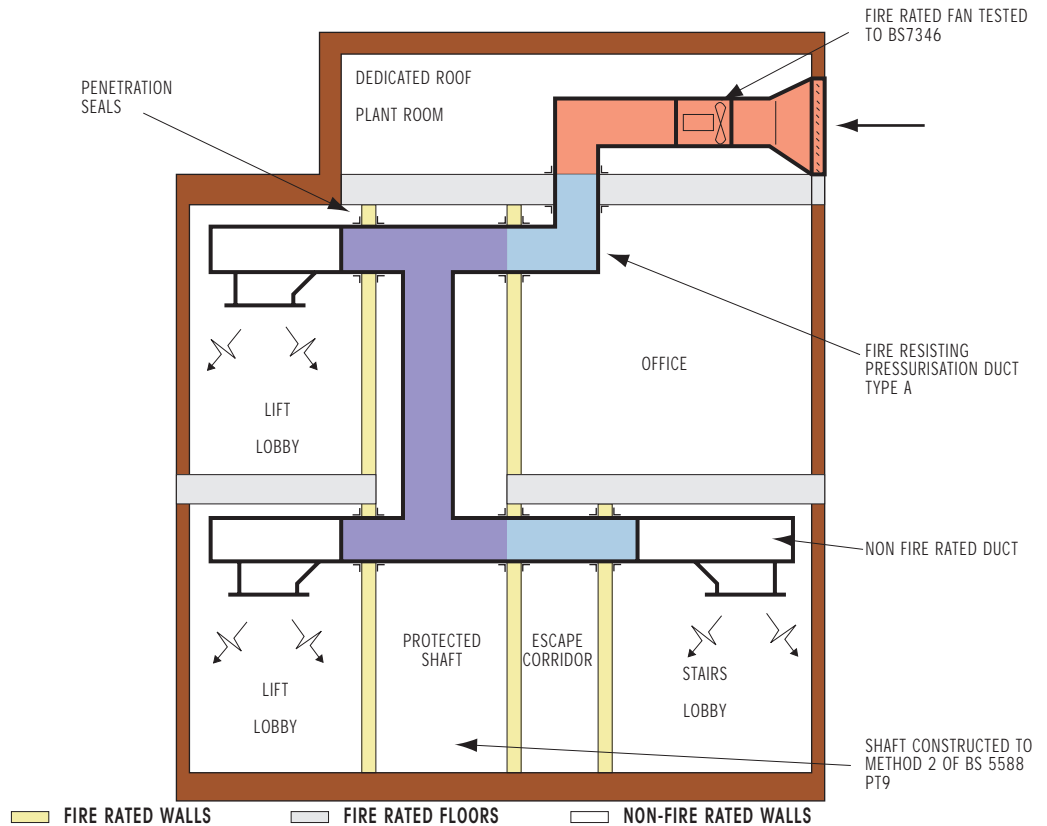
In the area shown the plantroom may have been constructed as a total fire rated compartment. However, in order that 75% cross sectional free area be maintained fire rated ductwork would be used requiring stability and integrity. If combustible materials were within 500mm of the duct insulation would also be required.

All Fire Rated Ductwork and Penetration Seals must be tested to BS 476 Part 24/ISO 6944 and manufactured and installed as tested or assessed by a NAMAS/UKAS Accredited Laboratory.

Note: Final approval must always be obtained from the Local Building Control Officer/Fire Department prior to commencement of construction.

3.5. Pressurisation Ductwork Systems

- PRESSURISATION DUCTS MUST BE ABLE TO MAINTAIN AN AIR SUPPLY TO CRITICAL AREAS FOR THE DURATION OF A FIRE.
- AIR SUPPLY MUST BE MAINTAINED IN A FIRE SO FIRE DAMPERS CANNOT BE USED (BS 5588 PART 4 CLAUSE 6.4.2)
- ALL DUCTWORK PENETRATING FIRE COMPARTMENTS MUST BE FIRE RATED, IN ORDER TO MAINTAIN COMPARTMENTATION
- PRESSURISATION PLANT SHOULD BE IN A DEDICATED PLANTROOM OR BE SEPARATED FROM OTHER EQUIPMENT BY A 1 HOUR FIRE RESISTANT ENCLOSURE. (BS 5588 PART 4 CLAUSE 6.3.4)



IN THE DIAGRAM:

A pressurisation system is a special form of mechanical ventilation which maintains a positive pressure in critical areas to stop smoke from entering from adjacent areas, typically used in protected stairways, lobbies, corridors and fire fighting shafts.

Ductwork shown ■ is passing through a dedicated plantroom supplying air and requires a minimum rating of 1 hour for stability and integrity to resist fire from outside (Type A).

Where it passes through the office shown ■ it must maintain stability, integrity and insulation fire rating for the same period of time as the compartment through which it passes and this may be required for the remainder of the ductwork route through the building to the pressurised lobbies. Ductwork within the lobby or corridor shown ■ need not be fire rated.

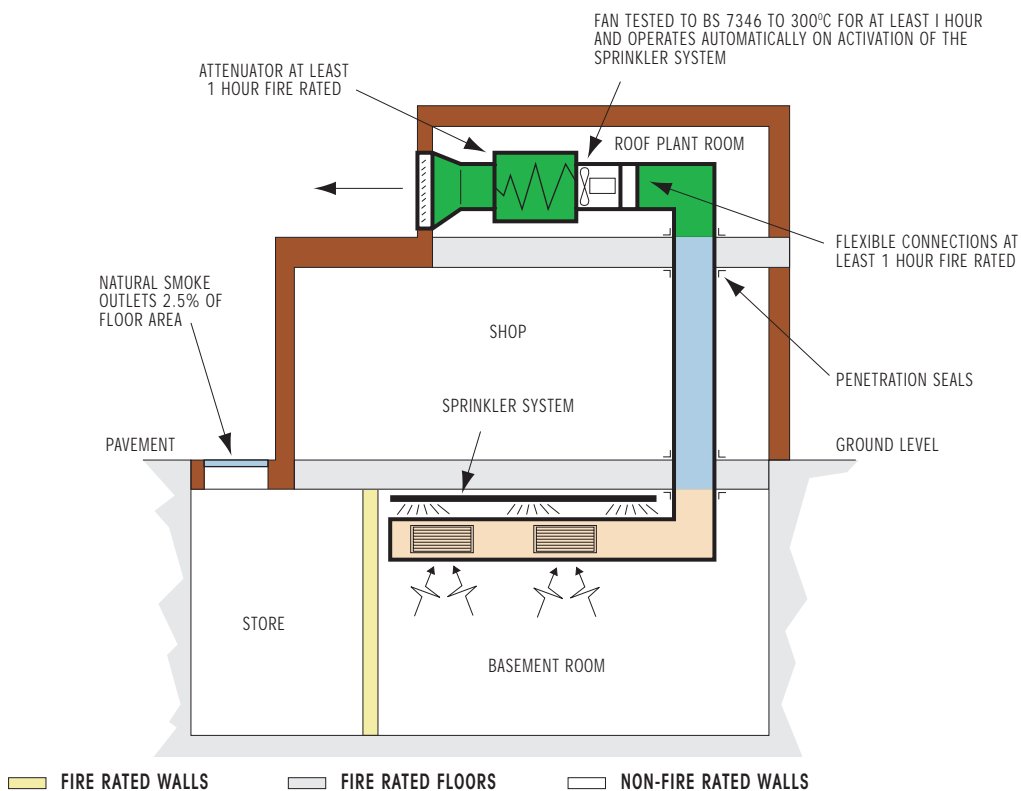
Ductwork shown ■ is in a protected shaft constructed to Method 2 of BS 5588 Part 9 with other services and in some circumstances insulation requirements may be waived or varied by the Regulatory Authority if there are no combustible materials or other services within 500mm of the duct (BS 5588 part 9 Clause 7.4).

All Fire Rated Ductwork and Penetration Seals must be tested to BS 476 Part 24/ISO 6944 and manufactured and installed as tested or assessed by a NAMAS/UKAS Accredited Laboratory.

Note: Final approval must always be obtained from the Local Building Control Officer/Fire Department prior to commencement of construction.

3.6. Basement Smoke Extract System

- EITHER A NATURAL OR MECHANICAL METHOD MAY BE USED TO VENTILATE SMOKE/HEAT FROM BASEMENTS.
- WHERE A SYSTEM OF MECHANICAL VENTILATION IS USED A SPRINKLER SYSTEM MUST BE FITTED (APPROVED DOCUMENT B, FIRE SAFETY B5 SECTION 19.13)
- THE AIR EXTRACTION SYSTEM SHOULD GIVE AT LEAST 10 AIR CHANGES PER HOUR (APPROVED DOCUMENT B, FIRE SAFETY B5 SECTION 19.14)
- THE FIRE DUCT MUST BE CONSTRUCTED TO RESIST WATER IMPINGEMENT FROM ANY SPRINKLER SYSTEM



IN THE DIAGRAM:

Smoke outlets/vents are needed to provide a route for heat and smoke to escape to the open air from basement levels, either using natural or mechanical means. Mechanical Extraction may be used provided that the basement levels are fitted with a sprinkler system, illustrated above the smoke extract duct shown . It must be suitable for clearing smoke within the compartments and normally rated for 1 hour stability and integrity to resist hot smoke and fire from inside (Type B). Insulation fire rating is not required in the first compartment.

Where the basement duct rises through the shop above shown it must maintain stability, integrity and insulation fire rating for the same period of time as the compartment through which it passes and this may be required for the remainder of the ductwork route through the building to outside.

In some circumstances the insulation requirements may be waived or varied by the Regulatory Authority if there are no combustible materials within 500mm of the duct, such as in the plantroom shown (BS 5588 Part 9 Clause 7.4).

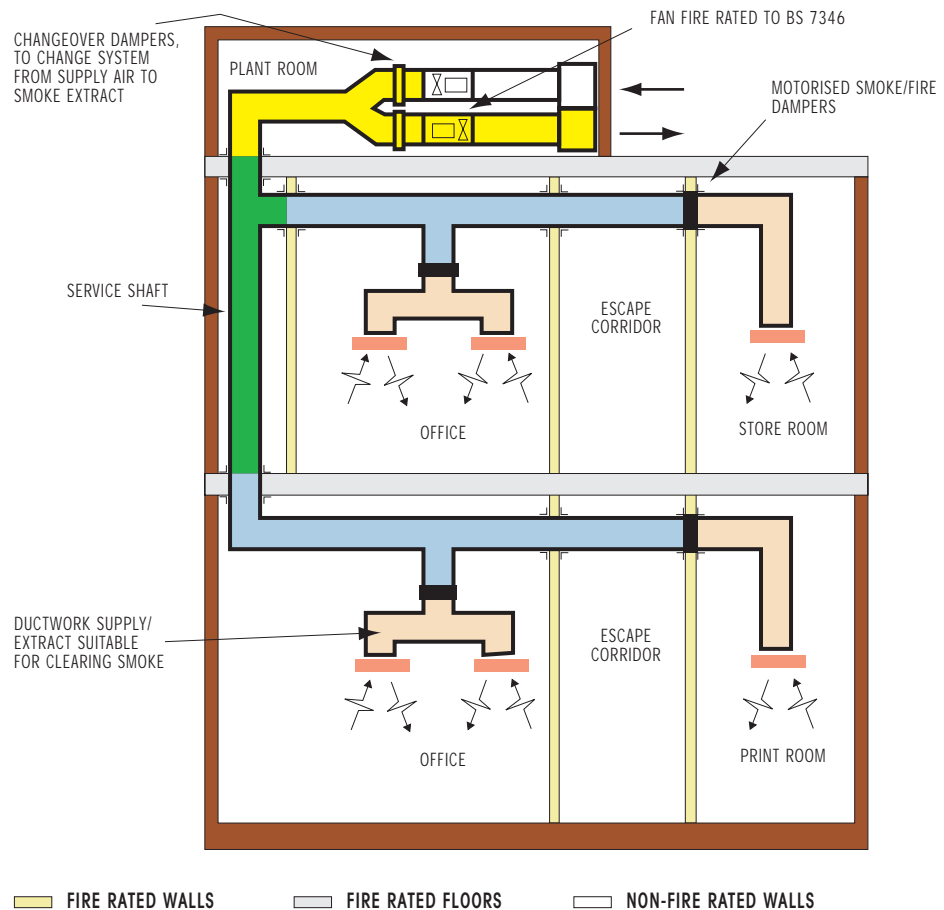
In all areas the duct must retain at least 75% of the cross sectional area, for the same period of time as the compartment through which it passes.

All Fire Rated Ductwork and Penetration Seals must be tested to BS 476 Part 24/ISO 6944 and manufactured and installed as tested or assessed by a NAMAS/UKAS Accredited Laboratory.

Note: Final approval must always be obtained from the Local Building Control Officer/Fire Department prior to commencement of construction.

3.7. Dual Ventilation/Smoke Extract Systems

- OPERATES AS A CONVENTIONAL DUCTWORK SYSTEM UNDER NORMAL CONDITIONS.
- OPERATES AS A SMOKE EXTRACT SYSTEM UNDER FIRE CONDITIONS.
- SMOKE EXTRACT DUCTWORK MUST RETAIN AT LEAST 75% OF ITS CROSS SECTIONAL AREA, BOTH IN THE FIRE COMPARTMENT AS WELL AS IN ADJACENT COMPARTMENTS.



IN THE DIAGRAM:

Systems that can operate in two different modes may offer economical solutions for smoke extraction. The ductwork shown ■ must be suitable for clearing smoke within the compartments and normally rated for 1 hour for stability and integrity to resist hot smoke and fire from inside (Type B). Insulation fire rating is not required in the first compartment.

Where the duct crosses the escape corridor shown ■ it must maintain stability, integrity and insulation fire rating for the same period of time as the compartment through which it passes and this may be required for the remainder of the ductwork route through the building to the outside.

In some circumstances insulation requirements may be waived or varied by the Regulatory Authority if there are no combustible materials within 500mm of the duct, such as in the plantroom shown ■. (BS 5588 Part 9 Clause 7.4). But, stability and integrity must still be maintained for the relevant period of time.

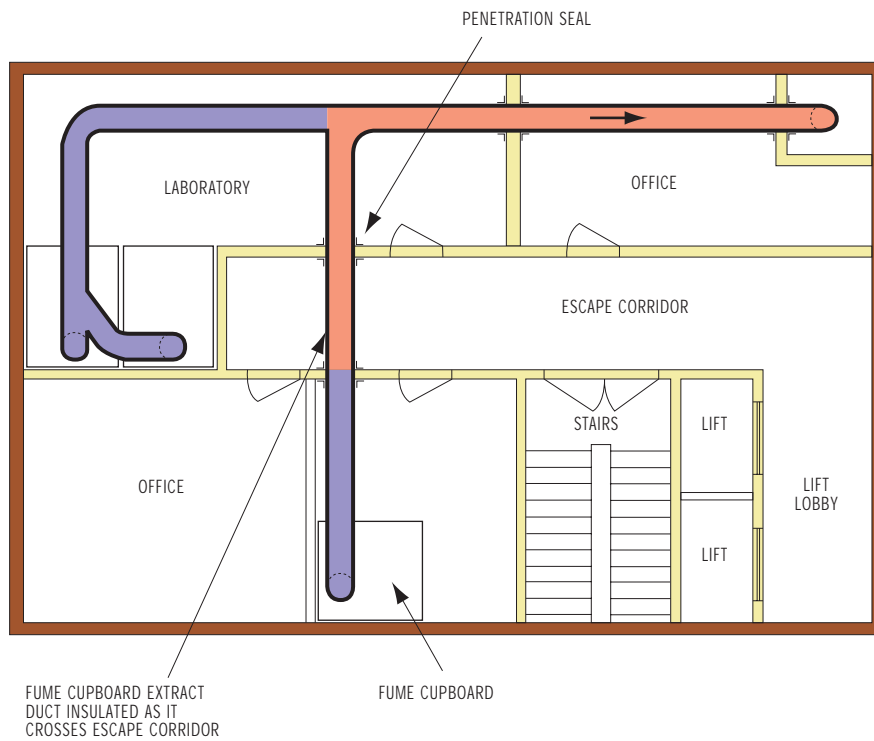
In order that the 75% cross sectional free area criteria be maintained, fire rated ductwork would be used within the service shaft requiring stability and integrity shown ■. However, if there are combustible materials within 500mm of the duct, insulation would still be needed.

All Fire Rated Ductwork and Penetration Seals must be tested to BS 476 Part 24/ISO 6944 and manufactured and installed as tested or assessed by a NAMAS/UKAS Accredited Laboratory.

Note: Final approval must always be obtained from the Local Building Control Officer/Fire Department prior to commencement of construction.

3.8. Fume Cupboard Extract Systems

- FIRE DAMPERS SHOULD NOT BE USED WHERE PLASTIC DUCTWORK IS INSTALLED TO RESIST ACIDIC FUMES AND SOLVENTS.
- ALTERNATIVE SOLUTIONS MUST BE FOUND FOR CROSSING MEANS OF ESCAPE AND GOING FROM ONE COMPARTMENT TO ANOTHER.
- DUCTWORK CONVEYING POLLUTED AIR MUST TAKE INTO ACCOUNT THE PARTICULAR HAZARD INVOLVED AND THE LIKELY CONTRIBUTION TO FIRE SPREAD (BS 5588 PT 9 CLAUSE 6.4.6.1.)



FIRE RATED WALLS
 FIRE RATED FLOORS
 NON-FIRE RATED WALLS

IN THE DIAGRAM

Plastic ductwork presents a particular problem where acidic fumes and solvents are extracted in fume cupboard systems. Fire dampers are impractical and alternative solutions must be used.

Duct shown ■ is a plastic duct installed inside an outer fire rated casing (duct within a duct).

The outer casing would resist fire from inside (Type B) and from outside (Type A) maintaining stability and integrity.

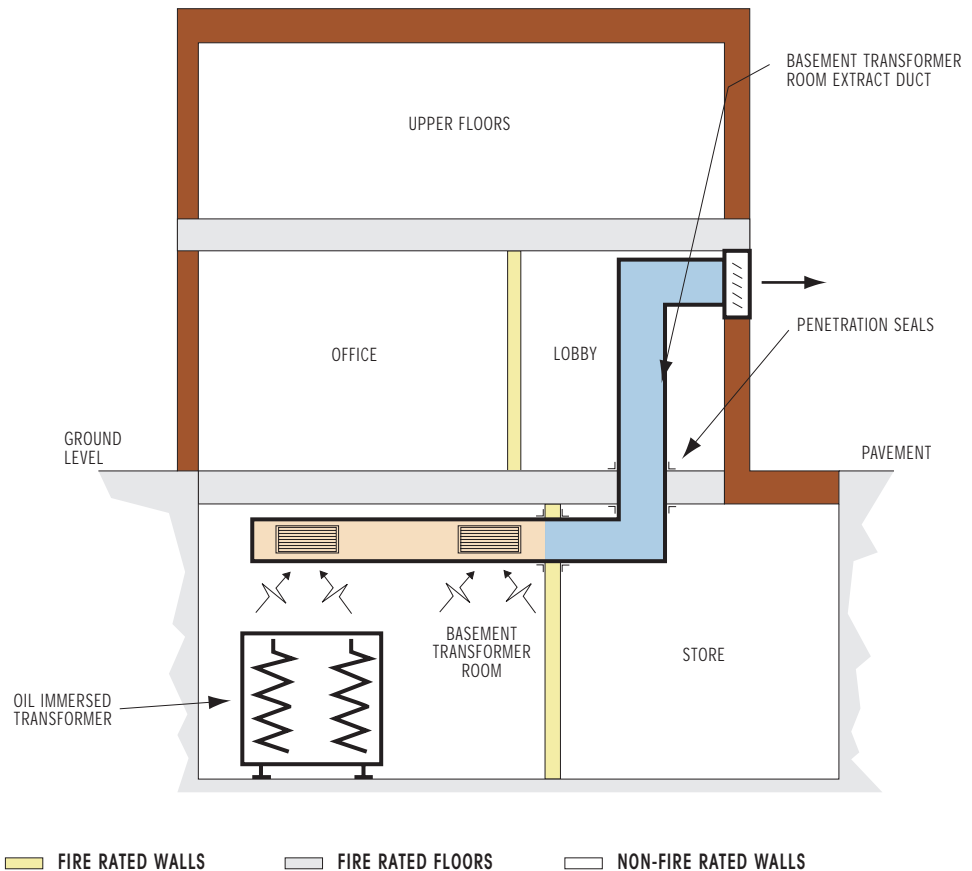
Where the fume extract duct crosses the escape corridor shown ■ the duct would require stability, integrity and insulation for the same period of time as the compartment through which it passes and this may be required for the remainder of the ductwork route through the building to the outside.

All Fire Rated Ductwork and Penetration Seals must be tested to BS 476 Part 24/ISO 6944 and manufactured and installed as tested or assessed by a NAMAS/UKAS Accredited Laboratory.

Note: Final approval must always be obtained from the Local Building Control Officer/Fire Department prior to commencement of construction.

3.9. Basement Transformer Extract Room

- HIGH RISK EQUIPMENT SUCH AS OIL IMMERSED ELECTRICAL PLANT REQUIRE ENTIRELY INDEPENDENT FIRE RATED DUCTWORK (BS 5588 PT 9 CLAUSE 6.4.6.2)
- DUCTWORK SHOULD BE IMPACT RESISTANT TO BS 5669 AND BS 5588 PART 9



IN THE DIAGRAM

Areas containing oil-immersed electrical plant, such as electrical transformers and switchgear are of special risk and must have an entirely independent ductwork system. Transformer room extract duct shown must be suitable for ventilating the transformer room to atmosphere, rated for stability and integrity to resist fire from inside (Type B). Insulation is not required in the first compartment.

Where the duct goes through the lobby shown it must maintain stability, integrity and insulation, for the same period of time as the compartment through which it passes to the outside.

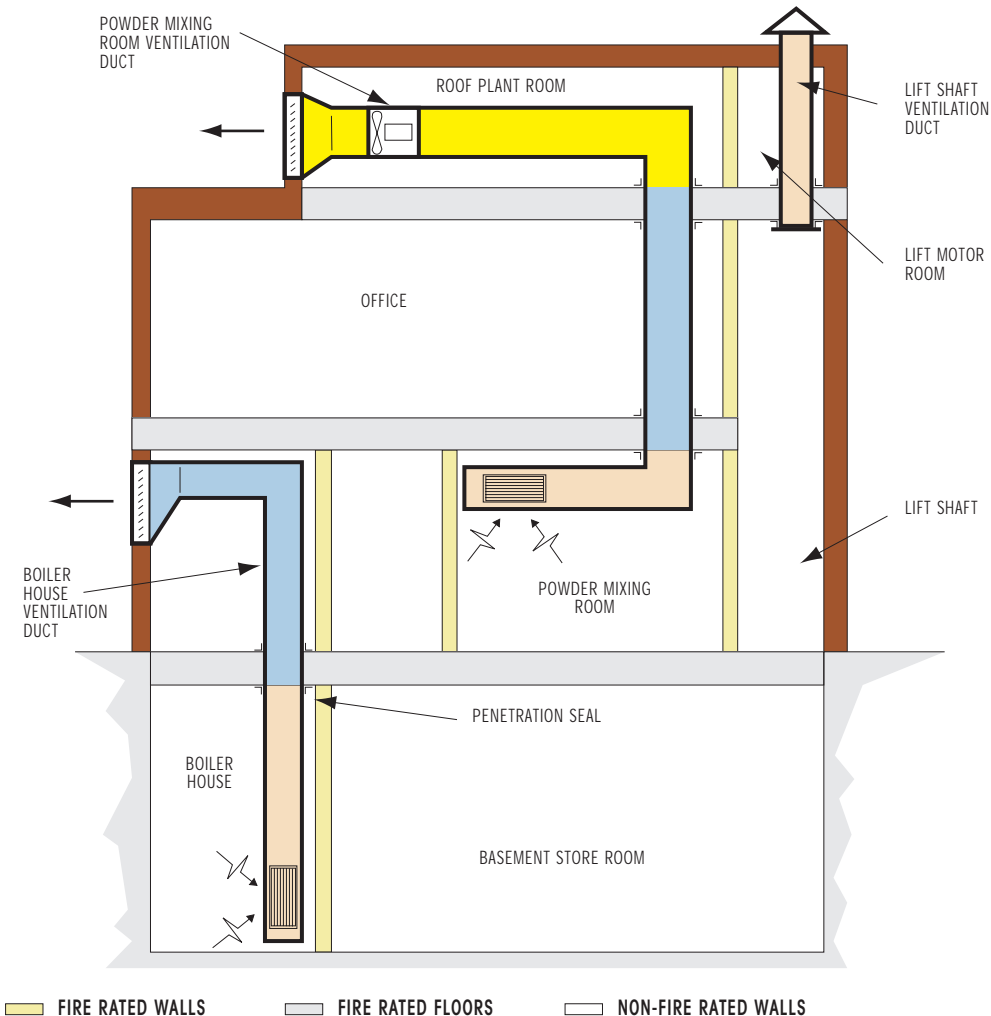
In some circumstances, insulation requirements may be waived or varied by the Regulatory Authority if there are no combustible materials within 500mm of the duct (BS5588 Part 9 Clause 7.4).

All Fire Rated Ductwork and Penetration Seals must be tested to BS 476 Part 24/ISO 6944 and manufactured and installed as tested or assessed by a NAMAS/UKAS Accredited Laboratory.

Note: Final approval must always be obtained from the Local Building Control Officer/Fire Department prior to commencement of construction.


3.10. High Risk Areas


- AREAS OF HIGH RISK WILL REQUIRE SEPARATE AND INDEPENDENT EXTRACT SYSTEMS (BS 5588 PT 9 CLAUSE 6.4.6.2 (A) & (C)).
- SUCH AREAS WOULD TYPICALLY INCLUDE: BOILER ROOMS: SOLVENT EXTRACTS: SPECIALIST DUST EXTRACTS: LIFT VENTILATION DUCTS.




IN THE DIAGRAM

Some ductwork systems extracting fine powders or chemical solvents are considered to have a high fire risk and are recommended to be independent of the ventilation system extracting from the building.

The duct systems shown  must all be suitable for resisting fire from inside (Type B) rated for stability and integrity. Insulation rating is not required in the first compartment.

In all the remaining areas the duct shown  must retain stability integrity and insulation fire rating for the same period of time as the compartment through which it passes and this may be required for the remainder of the ductwork route through the building to the outside.

In some circumstances insulation requirements may be waived by the Regulatory Authority if there are no combustible materials within 500mm of the duct, such as in the plantroom shown  (BS 5588 Part 9 Clause 7.4).

All Fire Rated Ductwork and Penetration Seals must be tested to BS 476 Part 24/ISO 6944 and manufactured and installed as tested or assessed by a NAMAS/UKAS Accredited Laboratory.

Note: Final approval must always be obtained from the Local Building Control Officer/Fire Department prior to commencement of construction.

4. Design Criteria

Design of all fire rated ductwork, including the gauges of ductwork used, flange depth, stiffening centres and materials, bolt centres and other component parts are governed absolutely and specifically by the results and data obtained from the fire tests.

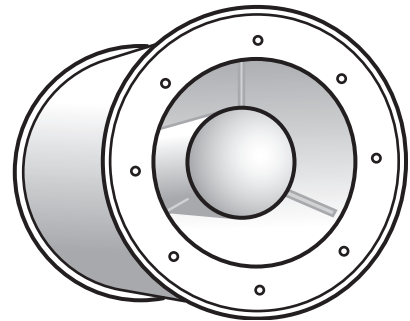
All of this information is clearly detailed and enumerated in the formal fire certificates issued by the accredited testing authorities following a successful fire test.

4.1. Ancillary Components

All ancillary inline components of a ductwork system must have the same fire integrity as the system as a whole.

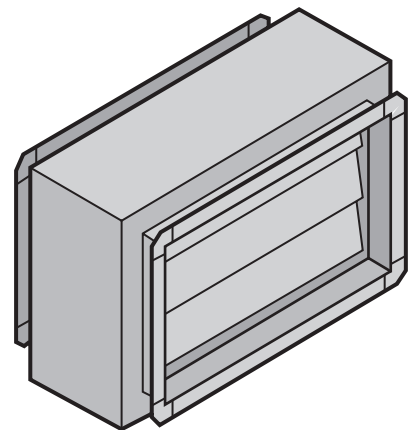
Attenuators

May be fire protected provided the casing is constructed to the same standard as the particular system being installed for the project. This standard would also include the use of steel rivets and screws to the correct centres with the correctly sized flanges and stiffeners. (A full range of *Flamebar* attenuators is available upon request). The attenuation material should have a minimum rating of Class '0'.



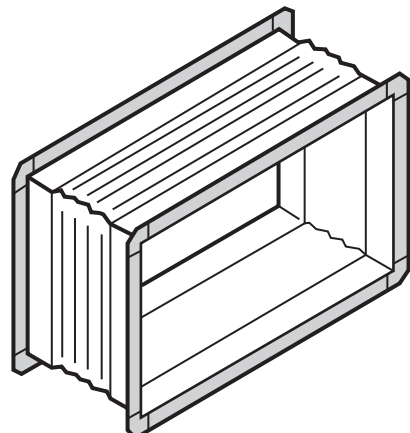
Volume Control Dampers

Only volume control dampers that have been tested or assessed and approved by a NAMAS certifying authority should be used in a fire rated duct system. The use of uncertificated dampers is likely to compromise the integrity of the system.



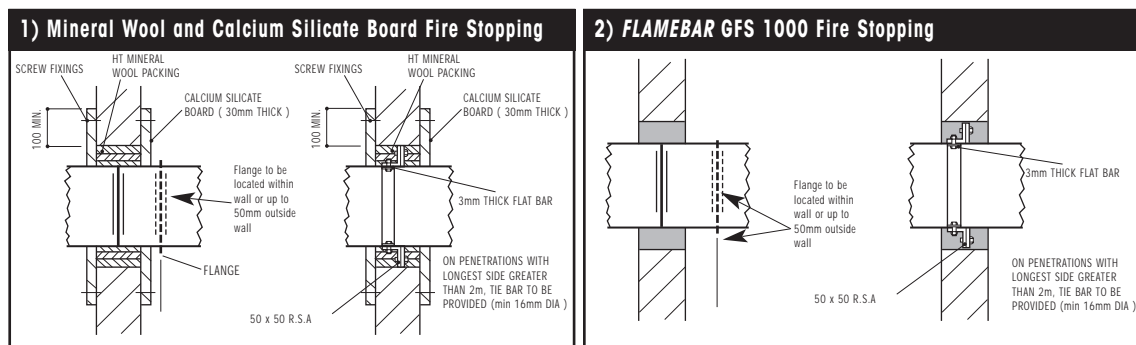
Flexible Connections

Any flexible connections that are attached to fire rated ductwork, must have the same integrity as the system. Materials are available with fire certification to BS 476 Part 20.



4.2. Penetration Seals Between Fire Compartments

Fire stopping must be carried out between compartments. Detailed here are two typical fire rated ductwork stoppings, as tested to BS 476 Part 24 (1987) and ISO 6944 (1985), with the **FLAMEBAR** duct system.



It is very important that the fire duct is adequately stiffened within or adjacent to the penetration seal to prevent delamination of the duct in a fire situation which would compromise the integrity of the fire compartment.

4.3. Pressure Testing and System Balancing

Velocity Pressure Testing

Fire rated systems are designed to either low, medium or high velocity/pressure and must be capable of being successfully tested to the correct velocity/pressure standard (in UK: HVCA DW 143).

Pressure Loss in Fire Rated Ductwork

It is important that the fire rated ductwork has a smooth internal surface in order to minimise the pressure loss within the fire rated ductwork system and thereby reduce the power requirements of the extract fans. A smooth surface is also important in order to facilitate proper cleaning of the ductwork.

System Balancing

Most ductwork systems require to be balanced upon completion and test holes will have to be cut in the positions specified by the commissioning engineer. These holes must be suitably sealed upon completion of the commissioning by an engineer to ensure that the system integrity is maintained.

Duct Velocities

From information previously shown in this manual under the headings Dual Duct Systems and Car Park Extract Systems it will be noticed that a duct may be required to have two working velocities/pressures. It is essential that the fire rated ductwork is designed to take into account the greatly increased volumes under smoke extract conditions, and that the system be capable of velocity/pressure testing to the increased velocity/pressure.

4.4. Drop Rod and Bearer Requirements

Too frequently, insufficient or no thought is given to the design and sizing of the drop rods and bearers in relationship to fire rated ductwork. To enable a complete system to retain its integrity the weight of ductwork, insulation and supports must be considered as a whole.

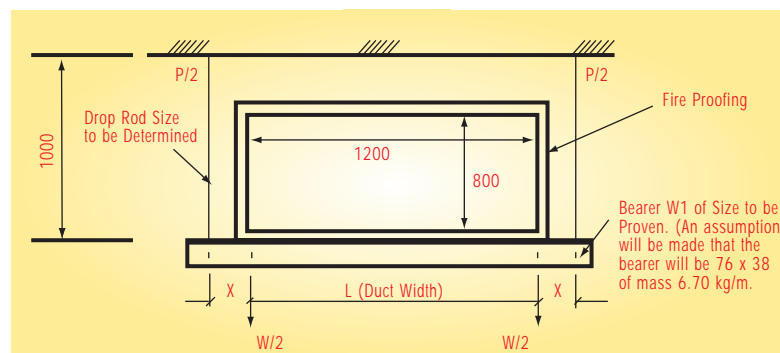
The drop rods and hangers must be sized to take into account the fact that the tensile strength of steel in a fire situation reduces to approximately 2% of its normal strength. Failure to observe this design criteria will result in premature collapse of the whole duct system.

Method of Calculation

Unprotected drop rods and bearers made of steel may be sized such that the calculated stresses do not exceed the values given in the chart below.

Fire Duration	σ _{Max Allowable Tensile Stress}	Fire Duration	σ _{Max Allowable Tensile Stress}
1/2 Hour 1 Hour	30 N/mm ² 15 N/mm ²	2 Hour 4 Hour	10 N/mm ² 6 N/mm ²

For example: Assume a duct 1200 x 800 x 10m long requiring a 2 hour fire duration as shown in the load diagram below with supports at 2500 centres.



From the chart above determine maximum allowable tensile stress to be used (in Newtons/mm²).

From Load Diagram above Where:-

- D = Distance between bearers = 2.5m
- σ_{max} = Maximum allowable Tensile Stress = 10N/mm²
- M_{max} = Maximum bending moment of Bearer
- Z = Section Modulus of Bearer
- W = Weight of Duct including Fire Cladding on each Bearer in Newtons = 1922 N.
- W₁ = Weight of Bearer in Newtons = 1.5 x 6.7Kg/m x 9.81 = 99N.
- W₂ = Weight of Drop Rod in Newtons = 1 x 1.53Kg/m x 9.81 = 15N.
- P = Weight of Duct & Bearers + Drop Rods = W + W₁ + 2W₂ = 2051N.
- X = Distance from centre of Drop Rod to Side of Duct = 0.125m
- A = Cross Sectional area of drop Rod in mm².

To Calculate Cross Sectional Area of Drop Rod

$$A = \frac{W + W_1 + 2W_2}{2 \text{ Drop Rods} \times \sigma_{\text{mm}}} = \frac{P}{2 \times 10} = \frac{2051}{20} = 103\text{mm}^2$$

•• Area of Rod 103mm² •• root dia of Threaded Rod = 11.5 = M16 Threaded Rod at 2500mm Bearer Centres

If the centres of the Hangers/Bearers were reduced to 1500 crs the load would reduce 632N and the rod size would reduce to a root dia of 8.9mm requiring a M10 Threaded Rod.

To Calculate Bearer Size

Bearer size can be calculated from the following equation.

$$M_{\text{max}} = \frac{P}{2} \left(\frac{L}{2} + X \right) - \left(\frac{W}{2} \times \frac{L}{2} \right) - W_1 \left(\frac{L}{2} + X \right) \left(\frac{L}{4} + \frac{X}{2} \right)$$

Substituting the figures in the equation.

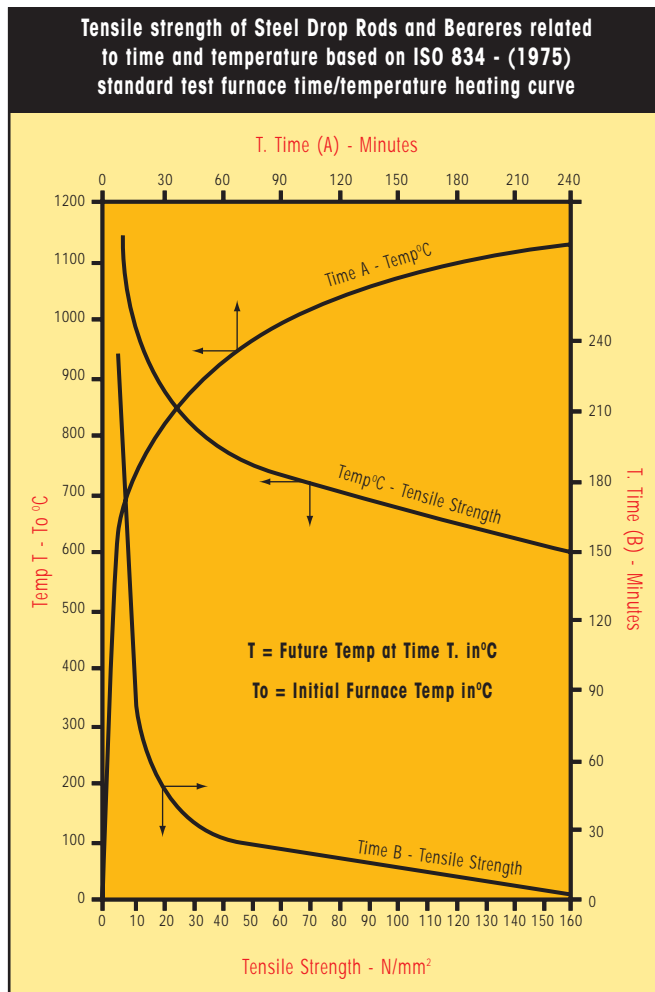
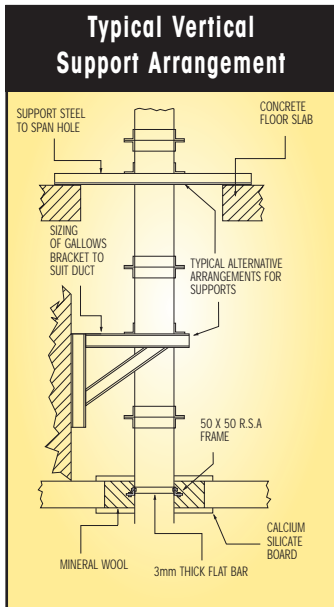
$$M_{\text{max}} = \frac{2051}{2} \left(\frac{1.2}{2} + 0.125 \right) - \left(\frac{1922}{2} \times \frac{1.2}{2} \right) - 99 \left(\frac{1.2}{2} + 0.125 \right) \left(\frac{1.2}{4} + \frac{0.125}{2} \right) = 143 \text{ Nmm}$$

σ_{max} for 2 Hour Fire Duct = 10 N/mm²

Now Z section modulus for Bearer required = $\frac{M_{\text{max}}}{\sigma_{\text{max}}} = \frac{143}{10} \text{ cm}^3 = 14.3 \text{ cm}^3$

•• Z section modulus = 14.3 cm³ which confirms the need for a 76 x 38 Channel Bearer at 2500 mm Bearer centres.

If the Bearer Centres are reduced to 1500crs, load on each Bearer reduces to W = 1153N W1=50N(60RSA) Z section modulus would then be 7.7 m³ which confirms the need for 60 RSA Bearer.



5. Specifiers Guidance Notes

When fire rated ductwork is specified it is vitally important that all of the elements which make up a fire rated ductwork system are understood and checked, and that any other requirements pertinent to the system have also been satisfied.

5.1 Single Source Responsibility

In order to ensure that the fire rated ductwork is installed and manufactured correctly, one company should take the responsibility for ensuring that the ducting design, manufacture and installation is carried out correctly and that the necessary information is issued so that any safety authority, building control or fire authority can check for themselves that the tested standards have been maintained to ensure that the fire rated ductwork performs as required.

5.2 Construction Standards

- Fire rated ductwork must be constructed as tested or assessed, because ductwork constructed to DW144 or equivalent national standards has no tested fire resistance. It should be noted that general purpose ventilation/air conditioning ductwork does not have a fire rating and cannot either be utilised as or converted into a fire rated ductwork system unless the construction materials of the whole system, including the supports and penetration seals have been proven by test or assessment in accordance with BS 476 Part 24/ISO 6944.
- In the case where galvanised sheet steel ductwork is clad by the application of a protective material, the ductwork construction must be tested and comply with the protective material manufacturers recommendations, ie. gauge of ductwork, frequency of stiffeners and non use of aluminium or low melting point fasteners or rivets.
- Sealants, gaskets and flexible joints must be non-flammable and as tested and certificated in accordance with BS 476 Part 24/ISO 6944 and comply fully with the manufacturers recommendations.
- Careful consideration must also be given to the maximum certificated size tested or assessed to BS 476 Part 24/ISO 6944. The manufacturers recommendations should always be followed and these should be backed by full Test Certification by a NAMAS/UKAS Accredited Test House.

The **FLAMEBAR** system uses published construction standards for all of their fire ductwork systems, each standard having a certificating authority approval.

LONGEST SIZE		OVER LENGTH BENDING	STD. STRAIGHTS	DIFFERENCE MAXIMUM SPACING	STANDING ANGLE BETWEEN	CROSS JOINTS	JUNCTIONAL JONES		RADIUS BENDS	STABILITY, INTEGRITY AND INSULATION RATING						
							CORNER	SUITS		120 min STABILITY AND INTEGRITY 15 min INSULATION FIRE CLIPST 4 min INSULATION FIRE INSIDE	120 min STABILITY AND INTEGRITY 120 min INSULATION FIRE CLIPST 40 min INSULATION FIRE INSIDE	120 min STABILITY AND INTEGRITY 120 min INSULATION FIRE CLIPST 120 min INSULATION FIRE INSIDE	HANGER SIZE	BEARER SIZE	BEARER SIZE	
1 FT TO 4 FT	1.0	1260 BENDING @ 1510	300 CRS	NIL	NIL	20 mm SLIDE-ON FLANGE	R.A.S. OR PITTSBURGH LOCK	NIL	150	UP TO 100 NOSE OVER 300	8	40 x 40 x 15 mm SLOTTED CHANNEL	8	40 x 40 x 15 mm SLOTTED CHANNEL	8	40 x 60 x 25 mm SLOTTED CHANNEL
4 FT UP TO 50 FT	1.0	1260 BENDING @ 1510	300 CRS	260 CRS	RATING S3 FIG. 44 OR FIG. 45	20 mm SLIDE-ON FLANGE	R.A.S. OR PITTSBURGH LOCK	NIL	150	UP TO 500 MAX 700	8	40 x 40 x 15 mm SLOTTED CHANNEL	8	40 x 40 x 25 mm SLOTTED CHANNEL	10	40 x 60 x 25 mm SLOTTED CHANNEL
60 FT UP TO 80 FT	1.0	1260 BENDING @ 1510	300 CRS	000 CRS	RATING S3 FIG. 44 OR FIG. 45	20 mm SLIDE-ON FLANGE	R.A.S. OR PITTSBURGH LOCK	GROOVED SEAM OR WELD	150	7	8	40 x 40 x 25 mm SLOTTED CHANNEL	10	40 x 60 x 25 mm SLOTTED CHANNEL	10	76 x 38 RSC
80 FT TO 100 FT	1.0	1260 BENDING @ 1510	300 CRS	800 CRS	RATING S4 FIG. 44 OR FIG. 45	40 mm SLIDE-ON FLANGE	R.A.S. OR PITTSBURGH LOCK	GROOVED SEAM OR WELD	150	2	10	40 x 60 x 25 mm SLOTTED CHANNEL	10	40 x 80 x 25 mm SLOTTED CHANNEL	12	76 x 38 RSC
100 FT UP TO 150 FT	1.0	1260 BENDING @ 1510	300 CRS	625 CRS	RATING S4 FIG. 44	40 mm SLIDE-ON FLANGE WITH THERID	R.A.S. OR PITTSBURGH LOCK	GROOVED SEAM OR WELD	150	3	12	76 x 38 RSC	12	76 x 38 RSC	16	102 x 51 RSC
50 FT UP TO 200 FT	1.0	1260 BENDING @ 1510	300 CRS	625 CRS	RATING S5 FIG. 44	40 mm SLIDE-ON FLANGE WITH THERID	R.A.S. OR PITTSBURGH LOCK	GROOVED SEAM OR WELD	150	3	16	102 x 51 RSC	16	102 x 51 RSC	20	127 x 64 RSC
200 FT UP TO 250 FT	1.2	1260 BENDING @ 1485	300 CRS	500 CRS	RATING S6 FIG. 44	50 x 50 RSC WITH THERID	R.A.S. OR PITTSBURGH LOCK	GROOVED SEAM OR WELD	150	3	20	102 x 51 RSC	20	127 x 64 RSC	25	152 x 76 RSC

<p>DETAIL OF JOINT CONNECTION</p> <p>16 mm SELF FLANGE FASTENING FIRE SEAL FIRE SEAL SEALANT DUCT ALL SIDES AND BRANCHES TO BE WELDED AT CORNERS</p>	<p>GROOVED CORNER SEAM</p> <p>FLAMEBAR Baffle FIRE PROOFING FIRE SEAL SEALANT</p>	<p>PITTSBURGH LOCK SEAM</p> <p>FLAMEBAR Baffle FIRE PROOFING FIRE SEAL SEALANT</p>	<p>ROLLED STEEL ANGLE HANGING JOINT</p> <p>5mm CERAMIC FIBRE FLAMEBAR Baffle FIRE PROOFING FASTENING FOR DRILLING DETAILS SEE STANDARD DRAWING No. STD1000</p>	<p>FOR 70 min INSULATION WITH FIRE CLIPST AND 60 min INSULATION WITH FIRE INSER 50mm THICK AT 105 kg/m² INSULATION</p> <p>FOR 120 min INSULATION WITH FIRE CLIPST AND 20 min INSULATION WITH FIRE INSER 260mm THICK AT 105 kg/m² INSULATION</p> <p>INSULATION FLAMEBAR Baffle DUCT WITH INSULATION RATINGS</p>
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<p>PAINT</p> <p>SPOT WELDS AND AREAS WHERE GALVANISING OF SHEET IS DAMAGED ARE TO HAVE ONE COAT OF GALVANOID PAINT. FLANGES AND STIFFENING FRAMES ARE TO HAVE TWO COATS OF ZINC-PHOSPHATE PRIMER UNDERCOAT TO BE RED AND TOP COAT GREY PRIMER THICKNESS TO BE NOT LESS THAN 30 MICRONS. STIFFENERS ARE TO BE PAINTED BEFORE TAKING TO DUCT</p>	<p>FIG. 44</p> <p>RATING 4 T S3 75 3 S3 30 4 S4 40 4 S5 50 5 S6 60 5</p>	<p>FIG. 45</p> <p>RATING 4 T S2 30 1.6 S3 40 1.4 S4 50 2.0</p>	<p>SLIDE-ON FLANGE</p> <p>DUCTS OVER 400 TO HAVE INTERMEDIATE 15° CHAIRS OR 10mm MIN SPACERS AT 400mm MAX SPACING</p> <p>FASTENING FLAMEBAR Baffle FIRE PROOFING FIRE SEAL SEALANT 5mm CERAMIC FIBRE DRAWING FOR SPOT WELD CORNERS OF PROFILE TO PROFILE</p>
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5.3. Installation Training

Fire rated ductwork systems that are correctly designed and manufactured can still fail in a real fire situation if they are not installed to the correct standard, i.e. as tested or assessed. It is, therefore essential that the fire rated ductwork systems are installed on site by properly trained operatives who are knowledgeable about the system and aware of the importance of carrying out their work precisely to the construction standards of the project. In the United Kingdom a training and accreditation scheme for installers of passive fire protection systems has been introduced by the HVCA and Warrington Fire Research under the name FIRAS. (Fire Accreditation Scheme). This provides reassurance to the specifiers, building control, fire authorities and regulators that the installation has been carried out by knowledgeable and competent people and that the system will perform as anticipated.

5.4 Quality Control to ISO 9000

Fire Rated Ductwork Systems should be manufactured and installed to an approved quality control system to ensure that there is no deviation from the construction and installation standards and that the ductwork will perform correctly in a fire situation. In the United Kingdom the **FLAMEBAR** system is manufactured and installed to ISO 9002 as certified by the LPCB.

5.5 Certificate of Conformity

As has been stated previously, it is vital and essential that the fire rated ductwork performs to its designated fire ratings in a fire situation. It is therefore important that the necessary quality control procedures are in place to ensure that, at completion of a project, a certificate of conformity can be issued to the client and fire authorities, confirming that the system has been manufactured and installed correctly.

CERTIFICATE OF CONFORMITY				FIRE PROTECTION LTD		
Project:		PASSIVE FIRE PROTECTION ENGINEERS				
Client:		FIRE RATED DUCTWORK • FIRE STOPPINGS				
Contract No.:		MILLERS & SOUTHILL ROAD, BIRNOPS STORFORD, HEAT, CV22 3DH TEL: 01223 420211 FAX: 01223 420214				
Drawing No.	Item Nos.	Fire Protection Std No.	BS No.	Rating		
				Stability	Integrity	Insulation

IT IS HEREBY CERTIFIED THAT THE SUPPLIES / SERVICES OBTAINED HEREON, AND AS THE ATTACHED CHECK SHEET, HAVE BEEN INSPECTED AND TESTED IN ACCORDANCE WITH THE CONDITIONS AND REQUIREMENTS OF THE CONTRACT OR PURCHASE ORDER, AND UNLESS OTHERWISE NOTED ABOVE, CONFORM IN ALL RESPECTS TO THE SPECIFICATION(S) AND DRAWING(S), RELEVANT THERETO. THIS CERTIFICATE IS CORRECT AT THE DATE OF ISSUE, BUT ANY MODIFICATIONS OR DAMAGE THAT MAY SUBSEQUENTLY OCCUR WILL INVALIDATE OUR GUARANTEE.

SIGNED: _____ DATE: _____
FOR AND ON BEHALF OF FIRE PROTECTION

CERTIFICATE No. _____






5.6 Pro-Forma Specification Example

FLAMEBAR BW11 fire resistant ductwork to be manufactured by Fire Protection Limited (or other authorised licensee) for our ventilation/smoke/kitchen extract/supply system to comply with BS 476 Part 24 (1987) & ISO 6944 (1985). for Hours Stability Hours Integrity and Hours Insulation. Ductwork to be rectangular/flat oval/circular construction.

The duct to be composite fire rated ductwork manufactured to method 3 of BS 5588 Part 9 factory produced. Once erected, to be pressure tested, if required by the client, to HVCA Standard DW 143, Pressure Classification Class

On kitchen extract ductwork, access doors to be installed at a minimum distance between doors of 3 metres as required by BS 5588 Part 9 (1989).

6. System Advantages and Standards

Testing

The range of **FLAMEBAR** BW11 fire rated ductwork has been tested by the Loss Prevention Council in accordance with BS 476 Part 24 (1987) and ISO 6944 (1985), for vertical and horizontal ductwork, with fire inside and outside the duct, in excess of 4 hours stability and integrity and up to 4 hours insulation, for ventilation ductwork, smoke extract ductwork or kitchen extract ductwork.

FLAMEBAR BW11 fire rated ductwork has also been tested by the Loss Prevention Council in accordance with BS 476 Part 6 (1989) for fire propagation, confirming that the product can be defined as a Class 'O' Material in accordance with the Building Regulations 1991.

FLAMEBAR BW11 fire rated ductwork has also been tested by the Loss Prevention Council in accordance with BS 476 Part 7 (1987) for surface spread of flame in accordance with the flamespread classification given in the standard.

FLAMEBAR BW11 fire rated ductwork has also been tested by LUL to BS6853 and satisfied the fire safety code of practice requirements for smoke emission and toxic fume emission.

FLAMEBAR BW11 fire rated ductwork has the USA Underwriters Laboratory UL classification for up to 4 hours fire and smoke ductwork.

FLAMEBAR BW11 has been tested by Underwriters Laboratory in the USA to determine compliance with NFPA 90A (Installation of Air Conditioning and Ventilation Systems) for flame spread and smoke development with the following results:

NFPA Stipulation	Flame Spread not to exceed 25	Smoke Development no higher than 50
BW11 Results	9.4	0.2

Test conducted in accordance with UL standard 723 "Test for Surface Burning Characteristics of Building Materials" (ASTM-E84).

FLAMEBAR BW11 fire rated ductwork has also passed the hose stream test of ASTM - E119 with water pressure of 207 Kpa (30 psi) for 2½ minutes.

Impact Test of **FLAMEBAR** BW11 fire rated ductwork to BS 5669, in which a dart imparts 44.15 joules (32.5ft pound force) of maximum drop, resulting in a small indentation which passes under the criteria of BS 5669. **FLAMEBAR** BW11 fire rated ductwork also has undergone impact testing to the requirements of appendix A BS 5588 part 5.

Flexural Strength

FLAMEBAR BW11 has a flexural strength of 468 N/mm².

Moisture Absorption

Exterior weathering of FLAMEBAR BW11

Duplicate samples were placed on the exterior weathering frame and left totally exposed from January 1993. The results so far show:

1. Some dirt pick-up which can be washed off.
2. No mould growth
3. No chalking
4. Material has remained totally intact. Considering the length of time the samples have been exposed, the material is in good condition.

Artificial Weathering of FLAMEBAR BW11 - OUV Weatherometer

The samples undergoing artificial weathering have undergone over 22000 hours of alternate UV and condensation cycling. Normally 1000 hours is sufficient to predict whether a material is suitable for exterior/semi-exposed conditions. 22000 hours is equivalent to 60 years external exposure.

Chemical Resistance of FLAMEBAR BW11

The coating has been tested in:

Standard 10% solutions of the following acids:

Hydrochloric, Nitric and Sulphuric.

Standard 10% solutions of the following Alkalies:

Sodium Hydroxide and Potassium Hydroxide.

The following solvents: Xylene and Acetone.

After 10 days total immersion, all the above chemicals failed to cause a breakdown of the product structure.

Air Leakage Testing

The construction and sealing of **FLAMEBAR** BW11 fire rated ductwork systems allows the ductwork to be tested up to high pressure, if required by the clients specification, which has a leakage limit of .0001 xP^{0.65} litres per second per square metre of duct surface area, as laid down by the HVCA specification DW143.

Higher pressures and lower leakage rates can be achieved if required by the clients specification.

Expansion

As all steel expands with temperature, there will naturally be an expansion of fire ductwork under fire conditions as follows:

At 1100°C an expansion of 0.01562 mm per mm (0.016 in per in)

At 600°C an expansion of 0.00852 mm per mm (0.008 in per in)

At 430°C an expansion of 0.06106 mm per mm (0.006 in per in)

Thermal Properties

'U' value - thermal transmittance.

BW11 without insulation = 5.0 w/m²k

(0.88 Btu/ft²h°F)

BW11 with 50mm insulation = 0.833 w/m²k

(0.147 Btu/ft²h°F)

BW11 with 100mm insulation = 0.48 w/m²k

(0.08 Btu/ft²h°F)

System Friction Pressure Loss

As **FLAMEBAR** BW11 is based on a GSS duct construction, it has the advantage of the same friction pressure loss as for normal DW144 ducting and the same calculations can be used.

Shape

FLAMEBAR BW11 fire rated ductwork can be manufactured in rectangular, flat oval or circular form.

Weight

FLAMEBAR BW11 fire rated ductwork is the lightest fire duct system available.

Size

FLAMEBAR BW11 fire rated ductwork is fully certificated for any size of ductwork in the vertical and horizontal plane up to 25m x 3m (82' x 10') cross sectional area.

Anti-Drumming

FLAMEBAR BW11 fire rated ductwork has a damping co-efficient to BS AU125 (1996) of 19db per second decay rate.

In-line Plant

In-line Plant can be treated with **FLAMEBAR** BW11, if suitably constructed.

Acoustic Properties

FLAMEBAR BW11 fire rated ductwork achieves a sound reduction index to BS 2750 part 3 (1980) as tabled below:

Systems	Frequency (Hz)								
	63	125	250	500	1K	2K	4K	8K	
B.W11	10.2	11.7	16.7	21.7	27.7	32.7	37.7	43.7	dB
BW11 + 60kg/m³, 50mm insulation	11.0	12.5	17.5	22.5	28.5	33.5	38.5	44.5	dB
BW11 + 105kg/m³, 50mm insulation	13.4	14.9	19.9	24.9	30.9	35.9	40.9	46.9	dB

Single Source Responsibility

1. The design of all **FLAMEBAR** BW11 systems are to a certified standard.
2. All **FLAMEBAR** BW11 fire rated ductwork is manufactured and sprayed to QA ISO 9002 standard.
3. All **FLAMEBAR** BW11 fire rated ductwork is erected to QA ISO 9002 standard.
4. A certificate of conformity is issued following final inspection, certifying compliance with all necessary regulations.

Cleaning

The smooth internal finish of **FLAMEBAR** BW11 systems enable easy cleaning of the ductwork therefore it is ideal for kitchen extract duct installations.

Colour

FLAMEBAR BW11 fire rated ductwork without insulation has a monolithic spray texture with natural buff finish. **FLAMEBAR** BW11 systems can also be overpainted or sprayed with water based paint to obtain any desired colour.

