fusion Fire Engineering

Fire Safety Strategy

For

Hotel Russell,
Bloomsbury

Reference: S14022819

Issue No: 01

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Client Details

Client:	EPR Architects
Client Address:	30 Millbank London SW1P 4DU
Project:	Hotel Russell, Bloomsbury

Validity

This report is produced on the basis of the information and experience available at the time of preparation. It is applicable to the above-mentioned project only in accordance with the client's instructions. It is only valid provided no other modifications are made other than those for which a formal opinion has been sought and given by **fusion** Fire Engineering.

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1 Introduction

Hotel Russell is located on Russell Square in Bloomsbury, London and is an existing listed building that is proposed to be refurbished. The refurbishment will mainly be on basement and ground floor, with numerous bedrooms on the upper floors also being internally refurbished. One existing stair is also being removed to allow the provision of three new lift shafts.

The building is served by 4 existing escape stairwells. The Lower Ground level allows for a variety of uses including meeting rooms, treatment rooms, staff changing rooms, as well as kitchen and plant. The Ground level includes lounge or dining space. The upper levels contain the bedrooms and suites.

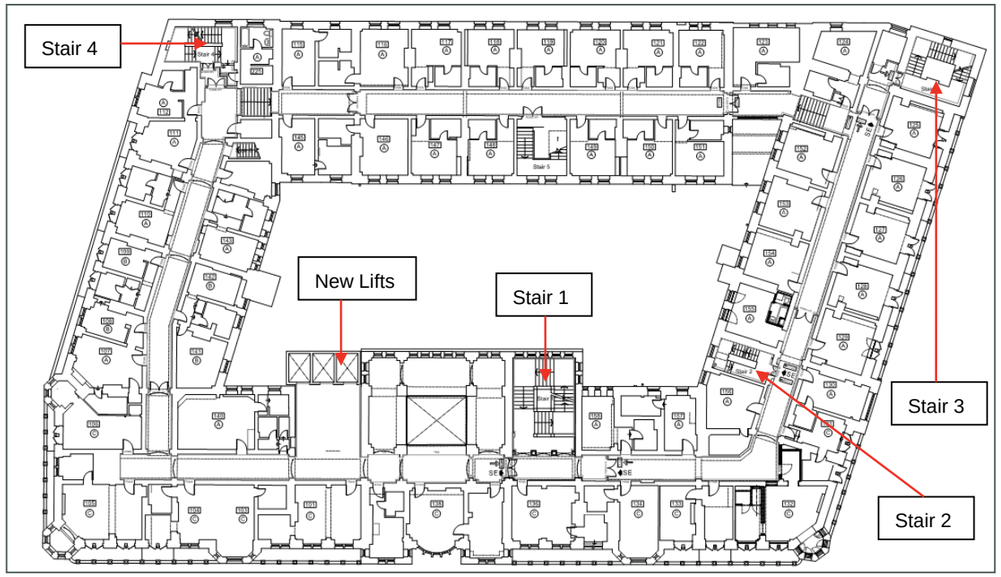

Figure 1: First floor layout

1.1 Purpose of this Report

This report details the fire safety strategy for the building and is intended to highlight the key design issues and the proposed solutions to meet the challenges of compliance with the Building Regulations 2010 (Section 2).

This document will therefore act as the basis of discussions between the design team and Approval Authorities, in order to obtain approval in principle for the design in respect to fire safety compliance.

1.2 Architectural Drawings

The information within this report is based on meetings and correspondence with the design team, and the most up to date drawings at the time this report was issued.

2 Statutory Requirements

2.1 The Building Regulations (England & Wales)

The proposed works are only a refurbishment of an existing building and therefore do not constitute a material change of use under the Building Regulations 2010. Therefore the works would not have to fully comply with the current requirements of the Building Regulations 2010, but only maintain the current standard within the building. This is provided that the works do not worsen the situation of the existing building.

2.2 Guidance

To assist in ensuring that the existing situation is not made any worse by the refurbishment the guidance of Approved Document B (AD: B) has been used and, where appropriate, supplementing this with fire engineering solutions when necessary to ensure that the key fire safety objectives for the design are achieved.

This legislation is primarily concerned with life safety and property protection is not specifically considered although the fire protection provisions to be provided for the building will offer some degree of property protection.

Furthermore, other issues such as insurer's requirements, cultural heritage, environmental, or continuity issues have not been specifically addressed or included within the development of the fire safety strategy.

2.3 The Regulatory Reform (Fire Safety) Order

Once the building is completed and occupied, the Regulatory Reform Order [RR(FS)O] becomes the controlling fire safety legislation. The Order came into force in 2006, revoking amongst other legislation the Fire Precautions Act and the Workplace Regulations.

It is necessary, among other things, under this order for the owner/occupier of the building to carry out and maintain a fire safety risk assessment. The building's management team will also be responsible under this order to ensure that the building's fire safety provisions are appropriately managed, maintained and tested over the whole life of the building.

2.4 Construction, Design and Management Regulations

Projects undertaken within the UK are subject to the requirements of the Construction, Design and Management Regulations (CDM).

This report defines the strategy for meeting the functional and performance requirements for fire safety in the finished building. Where any conclusions or recommendations have been arrived at which specify particular materials, products or forms of construction these will have been assessed, in accordance with CDM Regulation 11 and 18 (Duties for Designers). In the event that these involve significant residual risks or health and safety critical assumptions, this information will be made available, to the CDM Coordinator. Where the architect or other consultants use the standards put forward in this report to specify works, they are understood to be competent in alerting the Client, CDM Coordinator, Contractors and Building Occupiers of CDM issues.

3 Means of Warning and Escape

3.1 Means of Warning

3.1.1 Fire Alarm System

It is proposed to retain the existing fire alarm system and provide the same coverage. The existing coverage is considered to be equivalent to a category L1 fire alarm system, in accordance with BS 5839: Part 1.

The evacuation procedure is to be confirmed, but it is understood that the existing fire alarm system is a “double-knock” system, to reduce the risk of false evacuations. If a fire is detected then only the local room/area will be evacuated on the first knock. An investigation period will then begin (time to be confirmed) to allow staff to investigate whether the alarm is a confirmed fire.

The remainder of the building will then be evacuated simultaneously when one or more of the following occurs:

- A second detector activates.
- The investigation confirms that there is a fire and thus the staff instigates an evacuation.
- The investigation time elapses without confirmation or cancellation.

Manual call points are also provided and will be maintained in the refurbished design. If a manual call point is pressed then the building will go into immediate evacuation.

It is understood that flashing beacons and vibrating pillows are currently used in the building to raise the fire alarm alert to disabled persons, and it is proposed to maintain these facilities in the refurbished design.

3.1.2 Emergency Lighting and Signage

The existing emergency lighting system should be maintained to provide lighting in all escape routes, in accordance with BS 5266: Part 1.

The current escape and other fire safety signage should also be maintained in accordance with the recommendations of BS 5499: Part 1.

3.2 Means of Escape

3.2.1 Ground and Lower Ground Levels

The refurbishment/redevelopment works occurring on Ground and Lower Ground levels, and the impact these works will have on the existing means of escape are as follows:

- The provision of a gym at Lower Ground. This will incorporate a section of the existing escape corridor that connects the east and west parts of the building. However, a marked escape route will be created through the spa area (which will be kept clear of any furniture etc at all times) to maintain the existing escape route.
- The removal of existing mezzanine levels and the opening up of the main accommodation stair (Stair 1) from Ground to Lower Ground. This will have a minimal impact on the existing means of escape as Stair 1 is already open on the Ground Floor and is not considered to be an escape route. Fire rated construction around the new base of the stair at Lower Ground will be provided to maintain the compartmentation between floors (see Section 6.2).
- The removal of two exit doors. The removal of these doors will not unduly affect the existing means of escape, as there will still be more than sufficient escape width provided from Lower Ground.

The means of escape from the remainder of these levels will not be altered or worsened by the works, as the existing escape routes and storey/final exits will be maintained.

3.2.2 Upper Levels

The hotel bedroom levels are provided with a circulation corridor that provides a route to four escape stairs and to one accommodation stair. As part of the works, one escape stair is being removed to allow new lift shafts to be provided. This will leave the following stairs serving the upper levels:

- Stair 2: Unlobbied escape stair, 900mm wide, which provides capacity for up to 50 people (based on Table 6 of AD:B)
- Stair 3: Lobby protected escape stair, 1300mm wide, which provides capacity for up to 560 people over 7 floors (based on;
- Stair 4: Lobby protected escape stair, 1300mm wide, which provides capacity for up to 560 people over 7 floors.

Discounting one of the largest stairs, the maximum capacity of the remaining escape stairs is 610 people. This is considered to be more than sufficient for the estimated occupancy of the upper levels of the hotel; 570 people (based on 90 people per floor on Levels 1 to 6 and 30 people on Level 7).

It should also be noted that in the event of a fire blocking access to one of the escape stairs, the accommodation stair (Stair 1) can also be used for escape if required, as this stair will not be affected by the fire in this scenario.

3.3 Travel Distances

The travel distances to an exit or protected escape route are limited to reduce the risks to the occupants. From all new and refurbished areas, the following limits in Table 1 should be applied:

Table 1: Suitable Maximum Travel Distances

Area	One direction only	More than one direction
Within bedrooms (from bed-head to main door)	9m	-
Hotel corridors	9m	35m
Elsewhere	18m	35m
Places of special fire hazard	9m	18m

The travel distances in the majority of the refurbished areas are not affected by the proposed works and therefore the existing travel distances are considered acceptable. For the bedroom levels, the travel distances are also measured to the accommodation stair as an alternative escape route (see Section 3.2 above).

There are a number of new bedroom suites that will have longer travel distances than 9m. These areas are discussed further in Section 3.4 below.

3.4 Bedroom Layouts

As part of the refurbishment works it is proposed that a number of rooms be combined into large suites with only one exit. In many of these suites the 9m travel distance from the bed-head to the front door can be maintained. However, Table 2 below provides a list of the new suites where the travel distance is longer than 9m.

Table 2: Suites with Extended Travel Distance

Floor	Suite Number	Measured Travel Distance
First Floor	106-106	13.5m
	130-150	17.5m
	136-154	13.0m
Second Floor	205-206	13.5m
Third Floor	305-306	13.5m
Fourth Floor	405-406	13.5m
Fifth Floor	505-506	13.5m
Sixth Floor	605-606	13.5m
Seventh Floor	719-706	13.5m

In these suites one of the following options will be provided:

1. Provide a sprinkler system in the suite, installed to a Category 3 standard in accordance with BS 9251. This can be fed off the mains water supply, if sufficient pressures can be achieved. This is considered to be an acceptable design as the risk associated within the suites is considered comparable to an open-plan flat.
2. Provide a water mist system in the suite, installed to a residential standard as per the guidance of DD 8458-1 (similar justification to above).

3.5 Disabled Evacuation

It is understood that there are no existing facilities provided for the evacuation of disabled occupants from the upper levels to street. Therefore, a battery-back-up to one of the new lifts being installed in the building (the lift that serves all upper levels) will be provided, as will in-car controls, so that the lift can be used as part of a “managed evacuation”. A refuge and emergency voice communication (EVC) system will be provided in front of the on every floor (the EVC system will comply with BS 5839: Part 9 and consist of Type B outstations which communicate with a master station adjacent to Hotel fire alarm panel). In the event of a fire a trained member of staff can then operate the lift as a means to assist the evacuation of any persons in the refuges, rather than having to manually evacuate them down the existing stairs.

Additional refuges will also be provided in the lobbies of Stairs 3 and 4 on the upper floors, Stairs 2 and 3 on Lower Ground, and by the main exits from Hotel Russell in Stairs 1, 2 and 4 on Ground.

Each refuge will provide an area accessible to a wheelchair of at least 900m x 1,400mm and will be clearly identified by a blue mandatory sign worded “Refuge – keep clear”.

When the building is operational, the management of the Hotel will need to produce a general emergency evacuation plan (GEEP), as well as personal emergency evacuation plans (PEEP), to ensure an appropriately resourced response is provided and tailored, where necessary, to the individual needs of the disabled person and the specific features of the building. This plan will also need to consider the evacuation of disabled visitors.

The plans should ensure that reliance is not placed upon the fire service for the evacuation of disabled and wheelchair bound occupants. For now, it has been assumed that upon alarm a disabled person would make their way to the disabled refuge and alert management via the EVC system. Again, the PEEP is to be developed by the management of the building.

4 Internal Fire Spread: Linings

The interior wall and ceiling surfaces in a building may have a significant influence on how fast a fire may develop.

Building Regulations requires that internal linings shall adequately resist the spread of flame over their surfaces and, if ignited, have either, a heat release rate or a rate of fire growth, which is reasonable in the circumstances.

It is particularly important that in circulation spaces, where the rapid spread of fire is most likely to prevent occupants from escaping, the surface linings are restricted, by making provision for them to have low rates of heat release and surface spread of flame.

All new internal surface finishes or any alterations to existing internal linings will satisfy the following classifications given in AD: B as shown in Table 3 below, when tested under either the National classifications, in accordance with BS 476 or under the European classifications in accordance with BS EN 13501-1:2002.

Table 3: Wall and Ceiling Lining Requirements

Location	National Class	European Class
Small room of area not exceeding $4m^2$	3	D-s_3, d_2
Other Rooms	1	C-s_3, d_2
Circulation Spaces	0	B-s_3, d_2

Note: *when a classification includes ‘s3, d2’ this means that there is no limit on the production of smoke or flaming droplets/particles.*

4.1 Flame Retardant Finishes

All new materials used in all public areas and guestrooms, including but not limited to mattresses, box springs, bedding, window treatments, wall décor, soft furnishing and floor coverings, must be inherently flame retardant or treated to meet or exceed local code requirements for a “flame-resistant” rating.

Certificates of compliance must be available for inspection before a hotel is opened and thereafter on a regular basis.

5 Internal Fire Spread: Structure

5.1 Elements of Structure

The Hotel is greater than 18m to the top storey, but less than 30m. Therefore, any new elements of structure or modifications to existing structure are to be protected to the same standard as currently exists in the building. This is assumed to be a 90 minute standard of fire resistance following the guidance in AD: B.

5.2 Compartmentation

All bedroom floors within the Hotel should be compartment floors, in accordance with AD: B, with any protected shafts (e.g. stairs, lifts, service risers etc) fire rated to the same standard as currently exists. It assumed that this is at least 90 minutes, as per the structural rating, but only the existing standard needs to be maintained . It is possible that the shafts were protected to 60 minutes fire resistance, which would achieve the same compartmentation as the floors, as a fire would have to break through two 60 minute walls (one into the shaft and out of the shaft) before breaching the floor compartment.

Between Lower Ground and Ground the compartment floor would only need to be 60 minutes to comply with current guidance.

All existing bedrooms should be fire rated from the common corridor to at least 30 minutes fire resistance, with self-closing, smoke sealed fire doors therein (FD30S).

Any works to these areas will need to maintain the existing standard of fire resistance. Any new penetrations through the fire rated walls and floors will also require appropriate fire-stopping (see Section 5.6).

It is proposed to open up a void between the Ground and First Floors, to create a gallery/balcony area above the main entrance lobby. To maintain the compartmentation between floors, 90 minute fire rated shutters will be provided on the First Floor to separate the void from the circulation corridor. Alternatively, the required compartmentation will be provided by fire rated lobbies and doors.

5.3 Places of Special Fire Hazard

Places of special fire hazard, such as plant rooms, storage areas, etc. should be enclosed within 30 minutes fire resistance in accordance with BS 476: Parts 21 & 22.

5.4 Fire Doors

Table 4 below provides the typical type of fire doors that will be required in all new fire rated enclosures, and can be used as a guide if any existing doors are to be replaced.

Table 4: Fire Door Requirements

Position of Door Minimum fire resistance of door in terms of integrity	When tested in accordance with BS 476-22	When tested in accordance with BS EN 1634-1
Door into guestrooms	FD30S	E 30 Sa
Door to Escape Stair	FD60S	E 60 Sa
Cross Corridor Door	FD20S	E 20 Sa
Door to Protected Riser	FD60	E 60
Doors into rooms of special fire hazard	FD30	E 30

Fire doors are designated by reference to their recommended performance (in minutes) for integrity only, and whether they need to retard the passage of smoke at ambient temperature. The need to include insulation as part of the specification is dependent on the function of the door. For example, reference FD30 is to a door that should achieve not less than 30 minutes integrity when tested in accordance with BS 476-22 or BS EN 1634-1.

All fire doors that are used for means of escape should be either self-closing or on a hold open devices, which are de-activated by the alarm system.

Panic hardware will be provided for doors serving 100 or more occupants, when latching hardware is provided, and at all exit doors to the outside. Alternatively, if the doors are electronically locked, then these need to be unlocked on fire alarm activation, as well as fail-safe unlocked in the event of power-loss.

Opening forces for any door that is part of means of escape route will not exceed 67N to release latch/fully open and 133N to set in motion.

5.5 Concealed Spaces - Cavity Barriers

To remove a route for smoke and flame spread through concealed spaces within the building, fire resisting barriers will be placed at regular intervals and at joints within construction where there is the potential for unseen fire spread (this includes floor and ceiling voids).

The existing building is assumed to already comply with the following maximum dimensions of cavities specified in Table5 below. However, any new voids created in the refurbished areas will need to comply:

Table 5: Maximum Dimensions of Cavities

Location	Class of Surface Exposed	Max Dimension in any direction
Between a roof & a ceiling	Any Class	20m
Any other cavity	Class C-s3,d2 / Class 1	20m
	Any Class	10m

This will be achieved through utilisation of 30 minute fire resistant elements (i.e. 30 minutes integrity and 15 minutes insulation) which have been tested in accordance with the relevant part of BS 476.

Where a single room exceeds 20m in any direction, cavity barriers within the ceiling void (and within any floor voids) need only to be placed on the line of enclosing walls/partitions of any room with, provided that:

- The cavity barriers are no more than 40m apart; and
- The surface of the material/product exposed in the cavity being Class 0 or Class 1 (national class) or Class C-s3, d2 or better (European Class).

The “single room” definition can be applied to corridors, provided that cavity barriers are located above the walls enclosing the corridor and over any sub-dividing doors/partitions in the corridors.

If the walls of the corridor and/or over the sub-dividing doors run to the underside of the slab then no additional barriers will be required.

Cavity barriers may be formed by the following methods:

- Steel at least 0.5mm thick;
- Timber at least 38mm thick;
- Polyethylene sleeved mineral wool or mineral wool slab (both require to be under compression when used in cavity barrier construction); or
- Calcium silicate, cement based or gypsum plaster boards at least 12mm thick.

5.6 Openings for Pipes

Any new services breaching the compartment walls/floors and fire resisting elements will be appropriately fire stopped around the perimeter of the pipe or duct to ensure that the integrity of the element is not compromised.

For pipes breaching fire resisting construction, they will either be of a restricted diameter as shown in Table 14 of AD: B and indicated in Table 6 and Figure 2 below, or alternatively provided with a proprietary fire sealing system such as intumescent fire collars or other suitable rigid intumescent sealant.

Table 6: Restricted Pipe Diameter

Situation	Non combustible material	Lead Al, Al alloy, UPVC (See Note), Fibre Cement	Any other material
Structure enclosing a protected shaft	160mm	110mm	40mm
Any other situation	160mm	40mm	40mm

Note: *UPVC pipes complying with BS 4514:2001 and UPVC pipes complying with BS 5255:1989*

The building is designed to be a hotel and will be provided with simultaneous evacuation on activation of the L1 fire alarm system. Therefore, in accordance with AD: B, where ventilation ductwork breaches the fire rated enclosures or protected escape routes (excluding stairs or dead end corridors, which will require smoke dampers), fire dampers activated by thermal release mechanisms will be required.

Fire dampers should be tested to BS EN 1366: Part 2 and be classified to BS EN 13501: Part 3 and have an ES classification equal to or greater than 60 minutes.

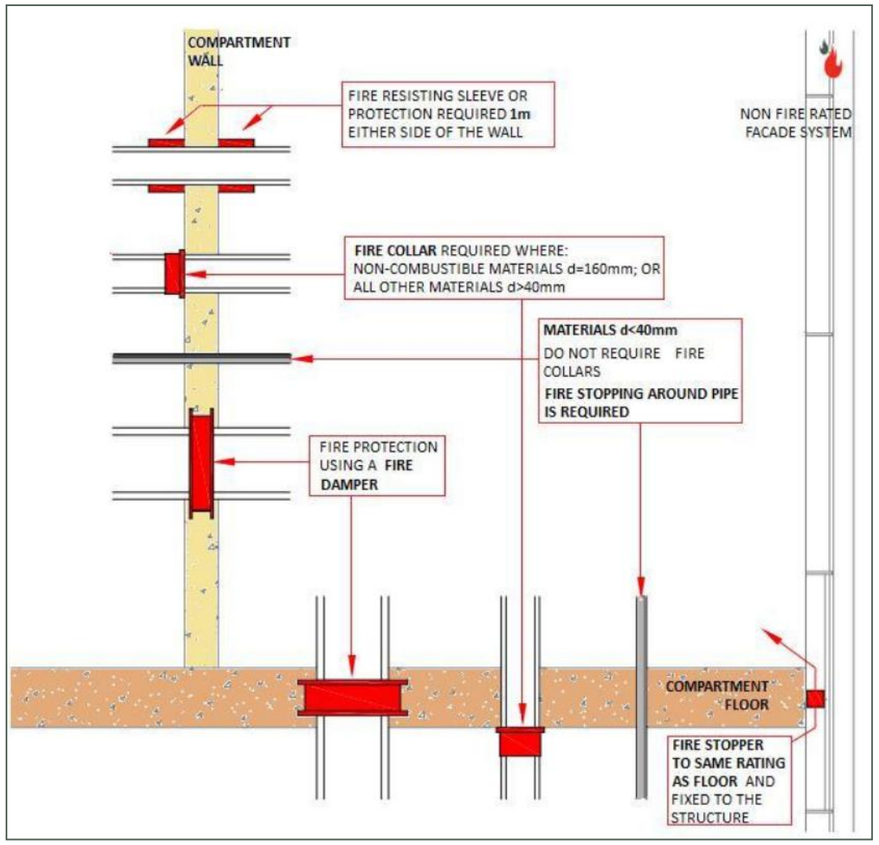

Figure 2: Fire Stopping

6 External Fire Spread

To prevent the risk of external fire spread to and from buildings opposite, the amount of unprotected area that is allowed on an elevation should be limited or the separating distance increased such that the risk is reduced.

The size and number of the windows on the upper levels will not be altered by the refurbishment works and therefore the risk of external fire spread is not being increased from these floors.

On Ground there are some minor changes where three windows are being converted into a door and another door is being converted to a window. However, these works will on the whole not increase the overall “unprotected area” of the building, and therefore the risk of external fire spread is not increased at this level.

The distance to adjacent buildings is greater than 1m and the height of the Hotel is below 18m; therefore, no external surface provisions are required for the Hotel. This will not be altered with the proposed works.

7 Access and Facilities for Fire-Fighting

The Hotel is currently provided with two rising mains for fire-fighting use, both of which are connected to the cold water booster tank and pumps. One main is located in Stair 2 to the southwest corridor of the building, with outlets located in the hotel corridor. The other main is located in Stair 4 to the northeast, however no outlet valves are provided on the upper floors. Despite the building having floors over 18m high, there is no fire-fighting lift provided.

The existing facilities would not be considered compliant with current legislation (which would require at least one full fire-fighting shaft with a fire-fighting lift and ventilated lobbies etc), but as the existing facilities are not being altered or worsened by the refurbishment works there is no requirement to upgrade nor provide “compliant” facilities as part of the works.

However, it should be noted that under the Regulatory Reform (Fire Safety) Order the testing and maintenance of these existing fire-fighting facilities will be required and should be documented. Therefore, there should be evidence on site of the testing and maintenance records for these rising mains, to show that they are operational and provide the required flow rates for fire-fighting purposes (as per BS 9990 or equivalent).

If this is not the case and the existing systems cannot achieve sufficient flow rates, then it is would be highly recommended to provide dry rising mains in the stairs, which are provided with outlets at every level and an inlet located externally at Ground. The dry rising mains could consist of the existing pipework (provided it is at least 100mm in internal diameter) but would not need to be connected to the internal water supply. The dry mains should be designed to comply with BS 9990.

8 Fire Safety Management

8.1 Management Level

Staff should have the required amount of training, trained in the use of extinguishers and have full coverage of the building, Clear lines of responsibility should be defined, Good communication should be supplied to all involved, Monitoring of all the fire safety systems. The fire service should be notified of any significant changes of occupancy, fire growth parameters, etc.

8.2 Fire Safety Manual

A fire safety manual should contain design information and operational records. The design information forms the basis of an on-going history document to which additional material is added when the building is occupied and at regular intervals thereafter. The contractor who will be passing on information to the end user is largely responsible for those parts of the fire safety manual that contain design information. The fire safety manager is responsible for those parts of the fire safety manual that contain operational records, the fire safety policy statement and the fire safety documentation.

The Fire Safety Manual should:

- Provide a full description of the assumptions and philosophies that led to the fire safety design, including explicit assumptions regarding the management of the building, housekeeping and other management functions;
- Explain the nature of the fire safety planning, construction and systems designed into the building, and their relationship to overall safety and evacuation management;
- Draw on the documentation produced at the design stage to describe the use of the various protection systems in each type of potential incident;
- Set out the responsibilities of management staff with regard to fire safety; and
- Provide a continuously updated record of all aspects of the building users that affect its fire safety.

Designers should inform their clients of the nature, function and capabilities of the fire precautions that have been designed into the buildings, especially those of which nature might be less evident.

It is then the responsibility of the client or management of the building to initiate and create a fire safety management plan for the development along with other statutory requirements under the RRO.

8.3 First-Aid Fire-Fighting

Hand-held first aid and fire fighting provisions, which are required under non-Building Regulations legislation, should be included in all areas of the building in accordance with end user requirements.