

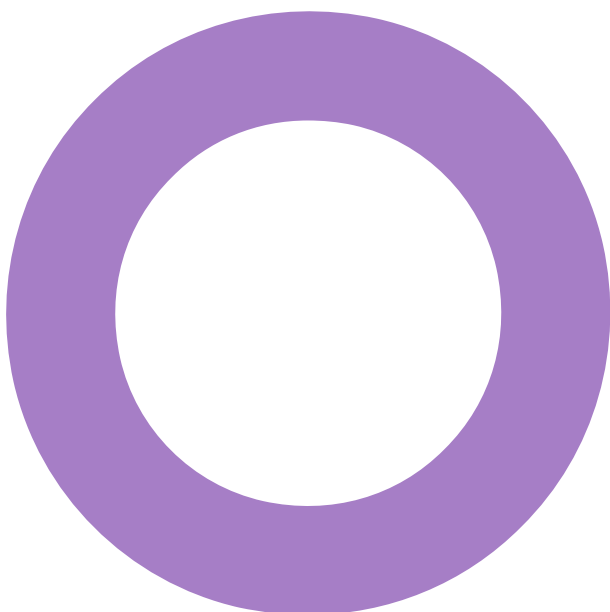
Crown Street Primary School. Manchester.

Renaker Build Limited.

FIRE ENGINEERING
OUTLINE FIRE STRATEGY REPORT

REVISION 01 – 24 MARCH 2022

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Audit Sheet.

Rev.	Date	Description of change / purpose of issue	Prepared	Reviewed	Authorised
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01	24/03/2022	Minor updates to reflect latest plans	ShB	AS	SB

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Executive Summary.

The purpose of this report is to provide an outline fire strategy for the proposed Crown Street Phase 2 Primary School building. The report will address issues relating to means of warning and escape, internal fire spread (linings and structure), external fire spread, and access and facilities for the Fire Service. The building has been principally designed under the guidance of Building Bulletin 100: *Design for fire safety in schools* (2007).

The school will be provided with a sprinkler system in accordance with BS EN 12845, incorporating the Annex F additional measures to improve system reliability and availability.

As a minimum, the building is to be provided with a Category L2 automatic fire detection and alarm system in accordance with BS 5839-1. Upon activation of a detector or manual call point, all areas of the school will undergo a simultaneous evacuation.

As the doors from the classrooms leading into the internal circulation area of the building open against the direction of occupant escape, the classrooms are limited to a maximum capacity of 60 persons.

The maximum permitted occupancy of the main hall is to be limited to 220 persons, although this is also the overall occupancy limit for First floor.

The maximum permitted occupancy of the Third floor rooftop play area is to be limited to 220 persons, albeit the actual occupancy is not expected to exceed 200 persons (i.e. all Years 1 to 6 pupils plus staff).

All three upper floors are provided with two means of escapes and are limited to an occupancy of 220 persons at any one floor level. However, the total vertical escape capacity of the escape stairs is 330 persons and, therefore, the maximum total occupancy of the upper floors is 330 persons.

The Ground floor is limited to 625 persons, based on four communal exits (i.e. doors which do not require occupants to pass through a room), two of which also serve as the final exits from the staircases.

As the school building may be used by the local community outside of school hours, building management policies and procedures will need to be developed by the operator in order to ensure that the occupancy limits stated within this report are never exceeded.

Whilst the school will be less than 30m in height, 60 minute compartment floors will be provided for external fire spread purposes. Therefore, all shafts passing through the compartment floors (i.e. stairs, lifts, service risers) will form 60 minute protected shafts, accessed via 30 minute fire doors.

It is noted that, as the lift will be located outside of the stair at the upper floor levels, but within the stair enclosure at Ground floor, the lift landing doors at First, Second and Third floors will be provided with automatic smoke curtains (i.e. activated via the building fire alarm system), in order to prevent smoke spread into the protected escape stair via the lift doors.

For a sprinklered multi-storey school, 60 minute compartment walls should be used to limit the maximum compartment size at any floor level to 2000m². However, as each floor level is shown to be less than 2000m², there is no requirement for further compartment walls within the school. Higher risk rooms/areas will be enclosed in fire-resisting construction.

The East elevation of the building contains a canopy which is less than 2m away from the relevant site boundary. However, it has been considered reasonable for the external fire spread calculations to be undertaken from the main external wall of the building (i.e. rather than the edge of the canopies) due to the provision of sprinklers within the building, the open-sided nature of the external canopies, and the low fire loading under the canopies. This will be subject to agreement with Building Control.

The building should be provided with Fire Service vehicle access to 50% of the perimeter.

Subject to the incorporation of the recommendations made within this report, it is considered that the building meets the functional requirements of the Building Regulations.

All recommendations made within this report are subject to discussion with, and approval by, the Statutory Authorities.

1. Introduction.

The purpose of this report is to provide an outline fire safety strategy for the Crown Street Phase 2 School development, Manchester. This report will address issues relating to means of warning and escape, internal fire spread (linings and structure), external fire spread, and access and facilities for the Fire Service. The building has principally been designed in accordance with the guidance of Building Bulletin 100: *Design for fire safety in schools* (2007), which will be referred to as BB 100 (2007).

It is intended that this report is read in conjunction with the following architectural drawings by Arkilab Design Studio:

Table 1- Architecture Plans

Drawing Reference	Drawing Name
C3-AKL-G200-PL-00-0400-X05	Ground Floor GA
C3-AKL-G200-PL-00-0401-X05	First Floor GA
C3-AKL-G200-PL-00-0402-X05	Second Floor GA
C3-AKL-G200-PL-00-0403-X09	Third Floor GA
C3-AKL-G100-PL-00-A-0500	Proposed Site Plan

Where not explicitly described within this report, it is assumed that, in all other respects, the building will be designed to comply with the relevant section of BB100 (2007), or the supporting British Standards referenced therein.

It is envisaged that this document will be developed at detailed design stage and provided as part of the formal Building Regulations submission (in support of Regulations 38 and Part B – Fire Safety).

It is important that the building operators/management have a clear understanding of the fire strategy adopted and of the operation and maintenance of the fire safety systems and equipment within the development that are designed to protect lives and property.

Any recommendations within this report are subject to issue to, and approval by, the Statutory Authorities.

2. Building Description.

The Crown Street Phase 2 School will consist of four storeys of accommodation (Ground, First, Second and Third Floor), which will be served by two protected escape stairs.

The Ground floor will provide classrooms for under 2's, 2 years, 3-5 years, nursery and reception pupils, staff room, kitchen, WC facilities, cloakrooms, SEN therapy, SEN resource, storage rooms, office areas and sick bay. First floor will provide classrooms for Years 1 and 2, LRC, small group room, kitchen, staff room, storage areas, server room, external teaching area, and main hall. Second floor will provide classrooms for Years 3, 4, 5 and 6, LRC, WC facilities and food bay/practical resources area, and storage areas. Third floor consists of an external play area, WC facilities, external store, and external sprinkler plant area.

2.1 Occupancy Management Plan

The school design occupancy is 236 school children and 25 day care children, plus staff.

Due to the provision of dedicated Ground floor external play areas for day care, nursery and reception children, they are not expected to use the rooftop play area at Third floor (i.e. only children in Years 1 to 6 will use the rooftop play area on a timetabled basis).

On occasions, there may be a requirement for all children in Years 1 to 6 to be present on the roof, however, in this scenario, the total occupancy of the rooftop space would not exceed 200 persons (180 children + 20 staff).

Sections 4.5 and 4.6 of this report set out the horizontal and vertical occupancy limits for building, which should be reflected within the timetabling and building management policies and procedures (albeit due to the proposed pupil numbers and separation of age groups, these limits are expected to be inherently adhered to).

Notwithstanding, as the school building may be used by the local community outside of school hours, building management policies and procedures will need to be developed by the operator in order to ensure that the occupancy limits stated within this report are never exceeded.

2.2 Building Height.

The height of the building, measured from external ground level to the top finished floor level (Third floor) will be approximately 11.4 m.

2.3 Sprinkler Protection.

As the building does not have a storey greater than 30m in height, there is no requirement to provide a sprinkler protection system to meet the functional requirements of the Building Regulations. However, the school will be provided with a sprinkler system in accordance with BS EN 12845, incorporating the Annex F additional measures to improve system reliability and availability, and the guidance within BB 100 (2007) for a sprinklered school will be followed accordingly.

3. Statutory Guidance.

The building will be subject to a range of fire related Statutory Legislation. The principal fire related considerations include:

- The Building Regulations 2010,
- The Regulatory Reform (Fire Safety) Order 2005.

3.1 The Building Regulations 2010.

The building will be subject to the requirements of the Building Regulations 2010. It will be necessary, therefore, for it to meet the requirements of Schedule 1 of the Regulations relating to:

- B1 (Means of warning and escape),
- B2 (Internal fire spread (linings)),
- B3 (Internal fire spread (structure)),
- B4 (External fire spread),
- B5 (Access and facilities for the fire service).

In England guidance on how to satisfy these functional requirements can be found in BB 100 – *Design for Fire Safety in Schools* (2007). BB 100 (2007) has been used as basis for the outline fire strategy presented within this report, however, whilst BB 100 (2007) provides guidance for some of the more common building arrangements, there is no obligation to adopt any particular solution contained in the document, as alternative solutions are acceptable, provided that an equivalent level of fire safety to that provided by the standard solutions can be demonstrated.

3.2 Regulatory Reform (Fire Safety) Order.

The Regulatory Reform (Fire Safety) Order (the RRO) is based on risk-appropriate compliance and requires a fire risk assessment to be carried out. The fire service will conduct inspections of premises to enforce the regulations. Whilst a guidance document has been produced by the government to assist in the preparation of the risk assessment, it should be noted that this document should not be used to design the building – the building design should be focused on satisfying the functional requirements of the Building Regulations.

The fire strategy detailed in this report does not, therefore, explicitly address the management requirements of the RRO. It will be necessary for effective fire safety management regimes to be developed by the building occupier, and a risk assessment of the premises to be conducted (and updated on an on-going basis).

3.3 Construction, Design and Management Regulations.

Design projects undertaken in the UK are subject to the requirements of the Construction (Design and Management) Regulations 2015 (CDM 2015), the objective of which is to ensure that health and safety issues are properly considered during a project's design and development so that the risk of harm to those who have to construct, use and maintain the building is reduced.

As a designer, in accordance with Regulation 9 of the CDM regulations, Hoare Lea Fire have taken into account the general principles of prevention in the preparation of this report and where reasonably practicable, have eliminated, minimised and/or controlled foreseeable hazards associated with the design.

Where elimination has not been reasonably practicable, Hoare Lea Fire is required to provide 'pre-construction' information in respect of any significant and/or unusual project-specific hazards that remain.

Following our design process, Hoare Lea Fire confirm that there are no significant and/or unusual residual hazards associated with this particular design.

3.4 Materials and Workmanship.

Regulation 7(1) of the Building Regulations requires that all building work should be carried out in a workmanlike manner, with adequate and proper materials that are appropriate for the circumstances in which

they are used, are adequately mixed and prepared, and are applied, used or fixed so as to perform the functions for which they are designed.

Further guidance is provided in the Approved Document supporting Regulation 7.

Independent certification schemes exist to provide additional confidence that products are manufactured and installed to an appropriate and consistent standard. Such schemes can assist in ensuring that the Material and Workmanship requirements of Regulation 7(1) are satisfied. It is therefore suggested that, where appropriate, manufacturers and installers that are subject to independent certification schemes are specified on this scheme.

3.5 Property Protection.

This report deals only with Statutory Requirements, and property protection is not, therefore, explicitly addressed, unless otherwise stated. As such, it is recommended that the building insurers are consulted at an early stage to ensure that any additional needs are satisfied.

4. Means of Warning and Escape.

4.1 Means of Detection and Warning.

In accordance with Section 4.2 of BB 100 (2007) and BS 5839-1, the minimum fire alarm standard required for a school with more than 160 pupils is a Category M system (i.e. manual call points and sounders only).

However, as the building contains inner rooms, it is recommended that the building be provided with a Category L2 automatic fire detection and alarm system, designed in accordance with BS 5839-1, in order to provide comprehensive automatic fire detection and provide occupants with means of warning at the earliest possible stage of fire development.

Upon activation of a detector or manual call point within any area of the building, the whole school will undergo a simultaneous evacuation, whereby all occupants within the building will evacuate.

4.1.1 Void Detection.

Any areas of ceiling void with a depth greater than 800mm should include automatic detection to the same standard of coverage as the rest of the building (i.e. Category L2), in accordance with BS 5839-1.

4.2 Means of Escape – General Requirements.

4.2.1 Travel Distances.

In accordance with Table 1 of BB 100 (2007), the travel distances are limited based on the type of accommodation, as shown below.

Table 1- Maximum travel distances permitted

Location	Maximum travel distance where travel is possible in	
	One direction only (m)	More than one direction (m)
Place of special fire hazard	9	18
Areas with seating in rows	15	32
Other areas	18	45

Where escape is available in more than one direction, the travel distance should be measured from the most remote point in a room to a storey exit. Where escape is available in only one direction, travel distance should be measured from the most remote point in a room to a storey exit, or to a point where escape is available in more than one direction.

It is noted that the school includes external terrace spaces, as well as external roof plant at Third floor. As there is no guidance for external travel distances within BB 100 (2007), the travel distances in these areas have been evaluated on a worst case basis of the conventional limits of 18m in single direction and 45m in multi-direction, set out in Table 1 above, even though these spaces are located in open air and the risk is significantly reduced compared to internal accommodation.

4.2.2 Escape Widths.

The door leaf of any doorway or exit should open in the direction of escape, where reasonably practicable, and should always do so if the number of persons that might be expected to use the door during an evacuation is more than 60.

Where the occupancy load within a space is greater than 60 persons, but less than 600 persons, two means of escape routes are required. Where the occupancy is expected to be greater than 600 persons, a minimum of three means of escape routes are required.

The minimum clear widths based on Table 4 of BB 100 (2007) are noted below and diagrams showing how to measure the clear width can be found in Appendix E of BB 100 (2007).

Table 2- Escape route width and exit capacity

Maximum number of persons	Minimum clear width (mm)
60	750
110	850
220	1050
More than 220	50 mm for each additional 10 persons or part of 10

It is noted that doors widths may need to be greater than the minimum required to meet the requirements of Approved Document M.

4.2.3 Corridors.

In accordance with Section 4.3.2.16 of BB 100 (2007), every corridor more than 12m long that connects two or more storey exits should be sub-divided by self-closing FD 30S (or FD 20S) fire doors, located within 30 minute fire-resisting construction, positioned approximately mid-way between the two storey exits.

BB 100 recommends that corridors should be at least 1900mm wide in new schools when serving more than two teaching spaces, increasing to 2700mm if the corridor contains lockers. Smaller corridors (serving no more than two teaching areas) should achieve a minimum width of 1200mm. Dead end-corridors should achieve a minimum width of 1600mm unless serving a single room with an occupancy less than 60 persons, for which the minimum width is 1200mm.

4.2.4 Inner Rooms.

A room from which the only escape route is through another room is called an inner room. There is a risk if a fire starts in the other room, called the access room.

An inner room arrangement should therefore not be provided unless all of the following conditions are met:

- The occupant capacity of the inner room should not exceed 60 persons;
- The inner room should be entered directly from the access room;
- The escape route from the inner room should not pass through more than one access room;
- The travel distance from any point in the inner room to the exit(s) from the access room should not exceed the single direction travel distance limit;
- The access room should not be a place of special fire hazard;
- One of the following arrangements should be made:
 - i. The enclosures (walls/partitions) of the inner room should stop at least 500mm below the ceiling; or
 - ii. A suitably sited vision panel not less than 0.1m² is located in the door or walls of the inner room, to enable occupants to see if a fire has started in the access room; or
 - iii. The access room should be fitted with a suitable automatic fire detection and alarm system to warn the occupants of the inner room of the outbreak of fire in the access room.

As the school is to be provided with an L2 automatic fire detection and alarm system, the inclusion of inner rooms meets the recommendations of BB 100 (2007).

4.2.5 Security Controls on Escape Routes.

In general, doors on escape routes should either not be fitted with lock, latch, or bolt fastenings, or they should only be fitted with simple fastenings that can be readily operated from the side approached by people making an escape. The operation of these fastenings should be readily apparent; without the use of a key and without

having to manipulate more than one mechanism. This is not intended to prevent doors being fitted with hardware to allow them to be locked when the rooms are empty.

4.3 Emergency Lighting.

Suitable lighting should be provided to all premises to enable the safe movement of persons along escape routes to a place of relative or ultimate safety. Emergency escape lighting should be provided in accordance with Section 4.5.5.5 of BB 100 (2007), BS 5266-1 and BS EN 1838.

4.4 Signage.

Every doorway or other exit providing access to a means of escape, other than exits in ordinary use, should be distinctively and conspicuously marked by an exit sign in accordance with BS ISO 3864-1 and BS 5499-4.

4.5 Horizontal Means of Escape.

4.5.1 Room Occupancy Limits.

4.5.1.1 Classroom.

The occupancy of the classrooms on the upper floor is limited to 60 persons due to only being served by a single exit. However, the design occupancy for each classroom is less than 60 persons.

4.5.1.2 Reception and Nursery.

Each classroom is provided with an exit into the internal circulation area and an exit to external air. Where an area has two or more exits it should be assumed that a fire might prevent occupants from using one of them.

Therefore, when discounting one of the exits, the occupancy of each room is limited to 60 persons due to the inward opening doors into the circulation area. However, the design occupancy for each classroom is less than 60 persons.

4.5.1.3 Day-care.

The day-care accommodation is provided with a main entrance/exit door, an exit into the adjacent internal circulation area, and an exit from each of the 2 years and 3-5 years classrooms to external air. Where an area has two or more exits it should be assumed that a fire might prevent occupants from using one of them. Therefore, when discounting one of the exits, occupants are left with three escape routes.

Based on a door width of at least 850mm, the two external doors have a capacity of 110 persons each. It is noted that the internal circulation doors swing in the direction opposite to escape so is limited to 60 persons. Therefore, the occupancy of the day-care accommodation is limited to 280 persons.

4.5.1.4 Main Hall.

The hall is provided with double doors into the circulation area and leaf and a half doors directly into the main escape stair.

Where an area has two or more exits it should be assumed that a fire might prevent occupants from using one of them. Therefore, when discounting the largest exit, the 1050mm clear width of the remaining exit permits a maximum occupancy within the hall of 220 persons (NB - this is also the overall occupancy limit for First floor).

4.5.1.5 Rooftop External Play Area.

The Third floor external play area is provided with escape into the two escape stairs via double doors into the secondary escape stair and leaf and a half doors into the main escape stair.

Where an area has two or more exits it should be assumed that a fire might prevent occupants from using one of them. Therefore, when discounting the largest exit, the 1050mm clear width of the remaining exit permits a maximum occupancy of 220 persons on the external play area (NB - this is also the overall occupancy limit for Third floor).

4.5.2 Horizontal Capacity.

4.5.2.1 Ground Floor.

The building is provided with multiple exits at Ground floor, with some providing an exit from a particular room rather than a communal exit. For the purpose of this assessment, the escape capacities will be calculated for all of Ground floor based on communal doors (i.e. doors which do not require passing through a classroom or occupied room to access).

There are four communal final exits at Ground Floor; entrance/exit doors with a clear width of 1700mm (i.e. escape capacity of 350 persons each) and escape via the base of the two escape stairs.

The merging flow calculation from BB 100 (2007) can be used to calculate the maximum Ground floor escape capacity of the final exit doors from the stairs.

The first stair has a width of $S=1200\text{mm}$, whilst the final exit has a clear width of $W=1700\text{mm}$.

$$N = 2.5(80W - 60S) = 2.5(80 \times 1.7 - 60 \times 1.2) = 160 \text{ persons}$$

This means that 160 persons from Ground floor can evacuate via this stair.

The second stair has a width of $S=1500\text{mm}$, whilst the final exit has a clear width of $W=1700\text{mm}$.

$$N = 2.5(80W - 60S) = 2.5(80 \times 1.7 - 60 \times 1.5) = 115 \text{ persons}$$

This means that 115 persons from Ground floor can evacuate via this stair.

Where an area has two or more exits it should be assumed that a fire might prevent occupants from using one of them. Therefore, when discounting the largest exit, the maximum capacity of the Ground floor communal exits is 625 persons, which exceeds the proposed design occupancy. However, it is noted that additional exits direct from some classrooms will provide additional escape capacity.

4.5.2.2 First, Second and Third Floors.

First, Second and Third floors are provided with escape via the two protected escape stairs.

The doors leading into the two stair enclosures have a clear width of at least 1050mm, thus giving an escape capacity of 220 persons each.

Where an area has two or more exits it should be assumed that a fire might prevent occupants from using one of them. Therefore, when discounting one of the exits, the maximum horizontal escape capacity of each floor is 220 persons. However, the overall escape capacity from the upper floors is limited by the vertical escape capacity of the stairs, as detailed in Section 4.6 below.

4.6 Vertical Means of Escape.

The building is provided with two escape stairs, with a clear escape width of 1500mm and 1200mm, respectively. In accordance with Table 6 of BB 100 (2007) and based on each a stair serving three floors, the 1500mm stair can accommodate 420 persons and the 1200mm stair can accommodate 330 persons.

However, as the stairs are not lobbied, it is necessary under the guidance of BB 100 (2007) to assume a worst-case assumption that the largest escape stair is discounted due to fire.

Therefore, the total vertical escape capacity from the upper floor levels is 330 persons and, as such, the total occupancy of the upper floors should not exceed 330 persons.

As noted within Section 2.1 above, it will be necessary to manage the occupancy of each upper floor level to consider both the horizontal escape capacity (as discussed in Section 4.5.2 above) and the vertical escape capacity.

It is noted that the lift will be located outside of the adjacent main escape stair at the upper floor levels, but will be within the stair enclosure at Ground floor. Therefore, the lift landing doors at First, Second and Third floors will be provided with automatic smoke curtains (i.e. activated via the building fire alarm system), in order to prevent smoke spread into the protected escape stair via the lift doors.

4.6.1 Disabled Evacuation.

Fire safety management needs to take into account the full range of people who might use the premises, paying particular attention to the needs of disabled people with permanent or temporary impairment.

In line with the guidance of BB 100 (2007), there is no requirement to provide evacuation lifts, however, a disabled refuge should be associated with each escape stair at every floor level above discharge level.

Therefore, it is proposed to provide a disabled refuge at First, Second and Third floors within the protected stair enclosure (or associated Third floor protected lobby), sized at 900mm x 1400mm and located such that they do not obstruct escape routes.

An emergency voice communication system will be provided to each refuge. The EVC system should comply with BS 5839:2003 Part 9 and consist of Type B outstations which communicate with the master station adjacent to the fire alarm panel.

Procedures for the managed evacuation of disabled occupants from these refuges will need to be developed and implemented by the building operators/management.

5. Internal Fire Spread (Linings).

5.1 Wall and Ceiling Linings.

In accordance with Table 7 of BB 100 (2007), the wall and ceiling linings should be designed to satisfy the surface spread of flame classifications summarised below:

Table 3- Internal Fire Spread (Linings) Requirements

Location	National Class	European Class
Small rooms not exceeding 30m ²	3	D-s3, d2
Other rooms	1	C-s3, d2
Circulation spaces	0	B-s3, d2

The National classifications used are based on tests in BS 476: *Fire tests on building materials and structures*, namely Part 6: *Method of test for fire propagation for products* and Part 7: *Method of test to determine the classification of the surface spread of flame of products*. However, Part 4: *Non-combustibility test for materials* and Part 11: *Method for assessing the heat emission from building products* are also used as one method of meeting Class 0.

The European classifications are described in BS EN 13501-1:2007, *Fire classification of construction products and building elements, Part 1: Classification using data from reaction to fire tests*.

For the purpose of the classification, a wall is deemed to include:

- The surface of glazing (except glazing in doors); and
- Any part of a ceiling that slopes more than 70° to the horizontal.

A wall is not deemed to include:

- Doors and door frames;
- Window frames and frames in which glazing is fitted;
- Architraves, cover moulds, picture rails, skirting and similar narrow members; or
- Fireplace surrounds, mantle shelves and fitted furniture.

A ceiling is deemed to include:

- The surface of glazing;
- Any part of wall which slopes at an angle of 70° or less to the horizontal;
- The underside of a mezzanine or gallery; and
- The underside of a roof exposed to the room below.

A ceiling is not deemed to include:

- Trap doors and their frames;
- The frames of windows or rooflights and frames in which glazing is fitted; or
- Architraves, cover moulds, picture, exposed beams and similar narrow members.

6. Internal Fire Spread (Structure).

6.1 Sprinklers.

As the building does not have a storey greater than 30m in height, there is no requirement to provide a sprinkler protection system to meet the functional requirements of the Building Regulations. However, the school will be provided with a sprinkler system in accordance with BS EN 12845, incorporating the Annex F additional measures to improve system reliability and availability.

6.2 Loadbearing Elements of Structure.

In accordance with Table A2 of BB 100 (2007), for a multi-storey sprinklered school with a height of less than 18m, loadbearing elements of structure are to be provided with a minimum fire resistance period of 60 minutes.

Loadbearing elements of structure include the structural frame, floors, and loadbearing walls. Structure which only supports a roof does not require fire resistance unless the roof performs the function of a floor (i.e. supporting rooftop plant or play area), supports a rooftop means of escape route, or the structure is essential for the stability of a fire-rated element of external wall.

6.3 Compartmentation.

Reference should also be made to Appendix A of this report which provides indicative fire resistance lines for each floor level of the building, based on the below guidance.

Whilst the school will be less than 30m in height, 60 minute compartment floors will be provided for external fire spread purposes (see Section 7 below).

Therefore, all shafts passing through the compartment floors (i.e. stairs, lifts, service risers) will form 60 minute protected shafts, accessed via 30 minute fire doors (i.e. FD30S for stairs, FD30 for the lift, and FD30 for service risers). It is noted that, as the lift will be located outside of the stair at the upper floor levels, but within the stair enclosure at Ground floor, the lift landing doors at First, Second and Third floors will be provided with automatic smoke curtains (i.e. activated via the building fire alarm system), in order to prevent smoke spread into the protected escape stair via the lift doors.

In accordance with Table 9 of BB 100 (2007), for a sprinklered multi-storey school, 60 minute compartment walls should be used to limit the maximum compartment size at any floor level to 2000m². However, as each floor level is to be less than 2000m², there is no requirement for further compartment walls within the school. However, higher risk rooms/areas will be enclosed in fire-resisting construction, as noted below.

6.4 Fire-Resisting Construction.

In addition to the compartmentation requirements stated above, fire-resisting construction is also required to enclose higher fire risk areas.

6.4.1 Place of Special Fire Hazard.

A place of special fire hazard is defined in BB 100 (2007) as a place that may be high hazard (e.g. the source of 'hot' activities) or may represent a valuable resource that is difficult to replace. Places of special fire hazard that require additional protection in order to satisfy the life safety requirements include the following:

- Boiler rooms;
- Storage space for fuel or other highly flammable substances (including PE mats) or chemicals;
- Cloakrooms
- Laboratories;
- Technology rooms with open heat sources;
- Kitchens;
- Oil-filled transformer and switch-gear rooms; and
- Rooms housing a fixed internal combustion engine

It is noted that rooms which contain valuable equipment (e.g. IT server rooms), are frequently required by the insurance company/client to be enclosed in a minimum of 30 minute fire-resisting construction.

6.4.2 Lockers and Noticeboards/Displays in Corridors.

It is noted that any lockers located within circulation areas are required to be constructed of materials of limited combustibility. Examples of such materials may be found in Appendix A of BB 100 (2007).

Any noticeboards/displays should be no more than 3m wide and there should be a gap between noticeboards of at least 1000mm. Noticeboards in a protected corridor should be fitted with a cover, preferably top hung so that the cover cannot be left projecting into the escape route.

6.5 Concealed Spaces (Cavities).

Where appropriate, suitable provisions should be made to prevent the unseen spread of fire and smoke through cavities or concealed spaces by the use of cavity barriers.

The provision of such barriers should meet the general recommendations of Section 6.4 of BB 100 (2007).

6.6 Fire Stopping.

Openings in any fire-separating element (e.g. compartment floors, fire-resisting walls, cavity barriers, etc.) should be protected with appropriate fire stopping or sealing to ensure the fire resistance of the element is not compromised.

The provision of any such protection should meet the general recommendations of Section 6.5 of BB 100 (2007).

7. External Fire Spread.

7.1 Space Separation Analysis.

Under the guidance of BB 100 (2007), the external walls of the building should be constructed such that the amount of unprotected area overlooking the boundary is restricted in order to limit the potential for fire spread by radiant heat transfer.

BB 100 (2007) recommends using the enclosing rectangle calculation outlined in BR 187 (2014) - *External fire spread: building separation and boundary distances*. The calculation method assesses thermal radiation against separation distance to a relevant boundary.

As the building will be used for 'assembly and recreation' purposes, BR 187 permits the use of the 'reduced fire loading' values for the enclosing rectangle calculation.

On the basis of the initial external fire spread assessments, it was determined that it was necessary that each floor within the building would need to be provided as a 60 minute compartment floor. Therefore, on the basis of the provision of compartment floors within the building, external fire spread has been assessed on the basis of a fire being contained to a single floor level/compartment.

7.1.1 Relevant Boundaries.

In accordance with BB 100 (2007), the relevant boundary is considered to be the legal site boundary, the mid-point of any adjacent public road, or a notional boundary between buildings on the same development site.

In accordance with BB 100 (2007), a notional boundary should be assigned between two buildings on the same site, when at least one is classed as 'assembly and recreation'.

The notional boundary is assumed to exist in the space between the buildings and is positioned so that each building would comply with the provisions for space separation, as illustrated in Figure 1 below.

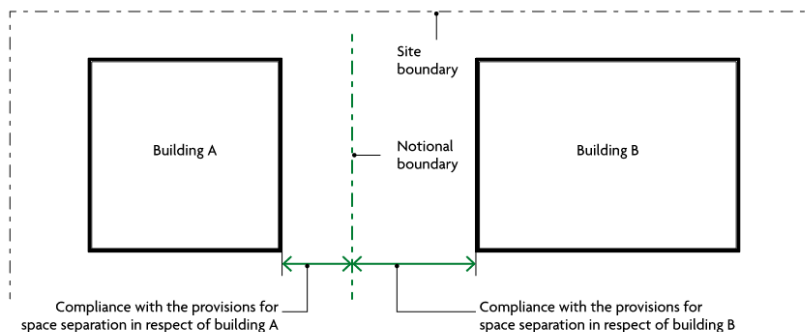


Figure 1: Notional boundaries

The notional boundary between the school building and the adjacent Tower C4 (The Blade) residential building has been set by the requirements of the residential building to be 3.74m from the closest point of the Tower C4 façade. Therefore, as the distance between the external walls of the school building and the Tower C4 residential building is a minimum of 6.7m, the notional boundary is located a minimum of 2.96m from the external wall of the school building.

The relevant boundaries assumed within the external fire spread assessment are outlined within Figure 2 below.

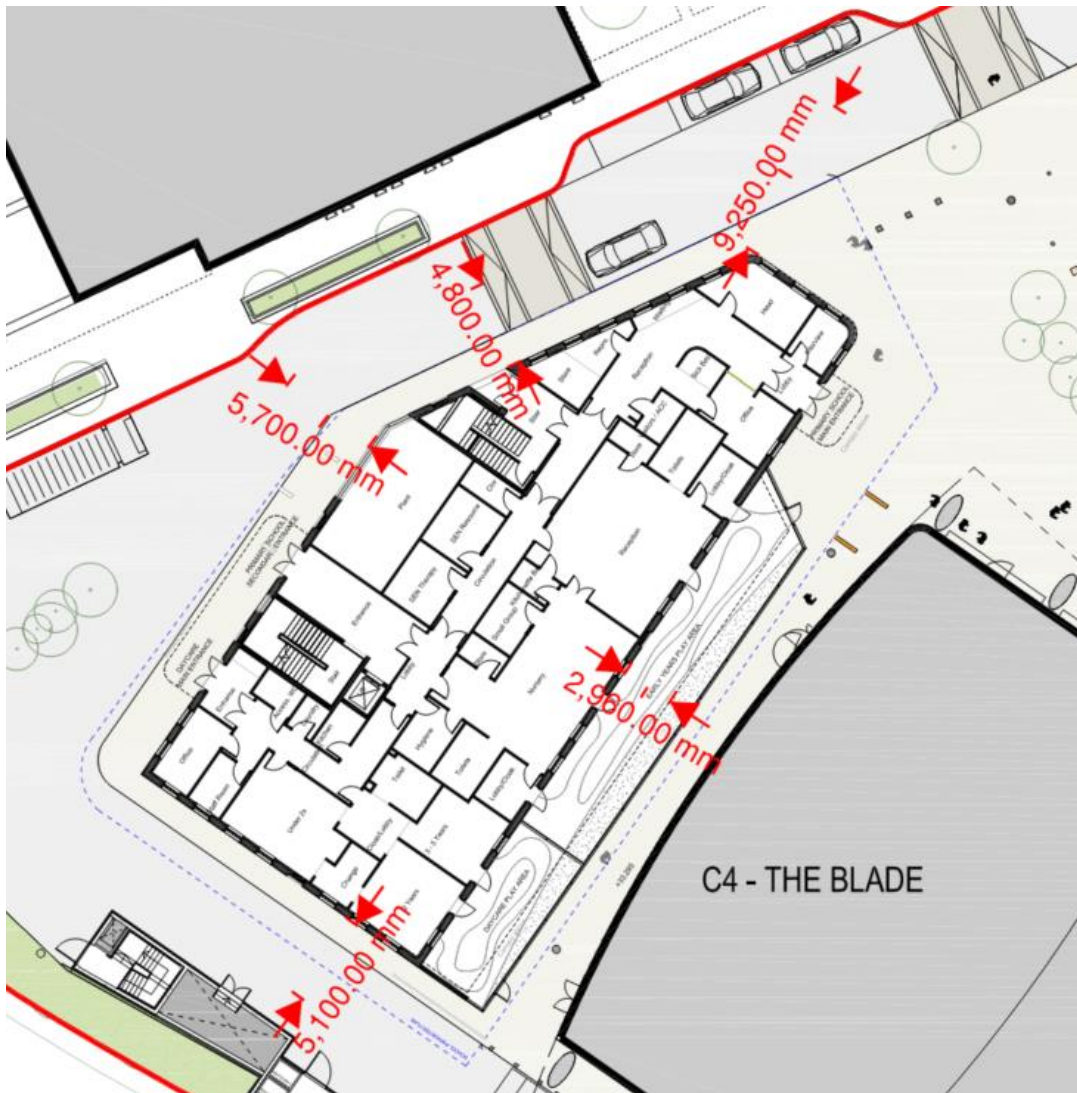


Figure 2: Site boundaries

7.1.2 South Elevation.

The South Elevation overlooks the mid-point of the adjacent roadway at a distance of approximately 5.1m.

Based on the provision of compartment floors, the assessment considers the largest compartment, which has an area of approximately 67.68m², with a height of 3.6m and width of 18.8m.

Therefore, for an enclosing rectangle of 6m in height and 21m in width, the actual elevation (assumed to be 100% unprotected) represents an unprotected area of 53.7% and, as such, a minimum boundary distance of 4.37m is required. However, as sprinklers are installed in the building, the required boundary distance can be halved to 2.185m.

As the required boundary distance is less than the actual boundary distance, there is therefore no requirement to protect the façade.

7.1.3 West Elevation.

The West Elevation overlooks the mid-point of the adjacent roadway at a distance of approximately 5.7m.

Based on the provision of compartment floors, the assessment considers the largest compartment, which has an area of approximately 90.72m², with a height of 3.6m and width of 25.2m.

Therefore, for an enclosing rectangle of 6m in height and 27m in width, the actual elevation (assumed to be 100% unprotected) represents an unprotected area of 56% and, as such, a minimum boundary distance of 4.8m is required. However, as sprinklers are installed in the building, the required boundary distance can be halved to 2.4m.

As the required boundary distance is less than the actual boundary distance, there is therefore no requirement to protect the façade.

7.1.4 Northwest Elevation.

The Northwest Elevation overlooks the mid-point of the adjacent roadway at a distance of approximately 4.8m.

Based on the provision of compartment floors, the assessment considers the largest compartment, which has an area of approximately 81.72m², with a height of 3.6m and width of 22.7m.

Therefore, for an enclosing rectangle of 6m in height and 24m in width, the actual elevation (assumed to be 100% unprotected) represents an unprotected area of 56.8% and, as such, a minimum boundary of 4.79m is required. However, as sprinklers are installed in the building, the required boundary distance can be halved to 2.395m.

As the required boundary distance is less than the actual boundary distance, there is therefore no requirement to protect the façade.

7.1.5 North Elevation.

The North Elevation overlooks the mid-point of the adjacent roadway at a distance of approximately 9.25m.

Based on the provision of compartment floors, the assessment considers the largest compartment, which has an area of approximately 34.2m², with a height of 3.6m and width of 9.5m.

Therefore, for an enclosing rectangle of 6m in height and 12m in width, the actual elevation (assumed to be 100% unprotected) represents an unprotected area of 47.5% and, as such, a minimum boundary of 3.38m is required. However, as sprinklers are installed in the building, the required boundary distance can be halved to 1.69m.

As the required boundary distance is less than the actual boundary distance, there is therefore no requirement to protect the façade.

7.1.6 East Elevation.

The East Elevation faces the Tower C4 residential building, with a distance of 2.96m to the notional boundary between the buildings (as set by the Tower C4 requirements).

Based on the provision of compartment floors, the assessment considers the largest compartment, which has an area of approximately 161.64m², with a height of 3.6m and width of 44.9m.

Therefore, for an enclosing rectangle of 6m in height and 50m in width, the actual elevation (assumed to be 100% unprotected) represents an unprotected area of 53.9% and, as such, a minimum boundary of 4.89m is required. However, as sprinklers are installed in the building, the required boundary distance can be halved to 2.445m.

As the required boundary distance is less than the actual boundary distance, there is therefore no requirement to protect the façade.

It is noted that this elevation contains canopies over the external Ground floor play areas. Whilst BB 100 (2007) recommends that canopies attached to the side of a building may be ignored where the edges of the canopies are at least 2m from the relevant boundary, in this case the canopies are less than 1m from the relevant boundary.

Notwithstanding, the above calculation considers the separation distance taken from the external wall of the school building (i.e. rather than the edge of the canopies), which is considered to be reasonable due to the

provision of sprinklers within the building, the open-sided nature of the external canopies, and the low fire loading under the canopies. However, this will be subject to discussion and agreement with Building Control.

7.2 External Wall Construction.

In accordance with Table 13 of BB 100 (2007), for buildings up to 10m above ground level which are more than 1m from the relevant boundary, the external surfaces of the walls should achieve Class C-s3, d2 or better. Where the building is less than 1m from the relevant boundary the external surfaces of the walls should achieve Class B-s3, d2 or better.

Full reference should be made to the guidance provided in BB 100 (2007) recommendations for external walls.

In addition, it is recommended that any additional insurers requirements are clarified at the earliest possible stage.

8. Fire Service Access.

8.1 Fire Service Access.

As the building does not contain a storey of 900m² or more in area that is more than 7.5m above Fire Service access level, there is no requirement to provide a firefighting shaft.

As the building will not be fitted with a fire main, is less more than 11m in height, and has a total floor area of 2405m², Fire Service vehicle access should be provided to at least 50% of the perimeter (i.e. 58m based on a perimeter of approximately 116m), in accordance with Table 18 of BB 100 (2007).

This perimeter access will be provided by means of the surrounding roadways.

8.2 Vehicle Access.

Site access roads providing perimeter access should be suitable for access by a pumping appliance, as detailed in Table 19 of BB 100 (2007) and replicated in the table below:

Table 4- Pumping Appliance Requirements

Minimum width of road between kerbs (m)	Minimum width of gateways (m)	Minimum turning circle between kerbs (m)	Minimum turning circle between walls (m)	Minimum clearance height (m)	Minimum carrying capacity (tonnes)
3.7	3.1	16.8	19.2	3.7	12.5

Any perimeter wall to which the Fire Service vehicle access is provided should have a door, not less than 750mm wide, giving access to the interior of the building.

The configuration of the surrounding roadways should not require the Fire Service vehicles to reverse more than 20m.

8.3 Hydrants.

Where a building is not provided with fire mains, fire hydrants should be provided within 90m of an entry point of the building and not more than 90m apart.

Nearby existing fire hydrants located in Silvercroft Street and Melbourne Street and considered to satisfy this requirement.

9. Summary.

Subject to the incorporation of the recommendation within this report, it is considered that the building meets the functional requirements of the Building Regulations.

Whilst reference should be made to the full report, the key fire strategy issues are as follows:

- Whilst there is no requirement to provide a sprinkler protection system to meet the functional requirements of the Building Regulations, the school will be provided with a sprinkler system in accordance with BS EN 12845, incorporating the Annex F additional measures to improve system reliability and availability.
- The school is to be provided with a Category L2 automatic fire detection and alarm system in accordance with BS 5839-1:2017.
- The school is to be provided with 60 minute compartment floors for external fire spread purposes.
- As the lift will be located outside of the stair at the upper floor levels, but within the stair enclosure at Ground floor, the lift landing doors at First, Second and Third floors will be provided with automatic smoke curtains (i.e. activated via the building fire alarm system), in order to prevent smoke spread into the protected escape stair via the lift doors.
- The East elevation of the building contains a canopy which is less than 2m away from the relevant site boundary. However, the external fire spread calculation is undertaken from the compartment wall rather than the edge of the canopy. This is considered to be reasonable due to the provision of sprinklers within the building, the open-sided nature of the external canopies, and the low fire loading under the canopies. However, this will be subject to discussion and agreement with Building Control.

Appendix A – Indicative Fire Strategy Plans.

Fire Strategy Legend

Fire Resistance:

240mins

120mins

90mins

60mins

30mins

Fire Door:

FD20

FD30

FD60

FD20S

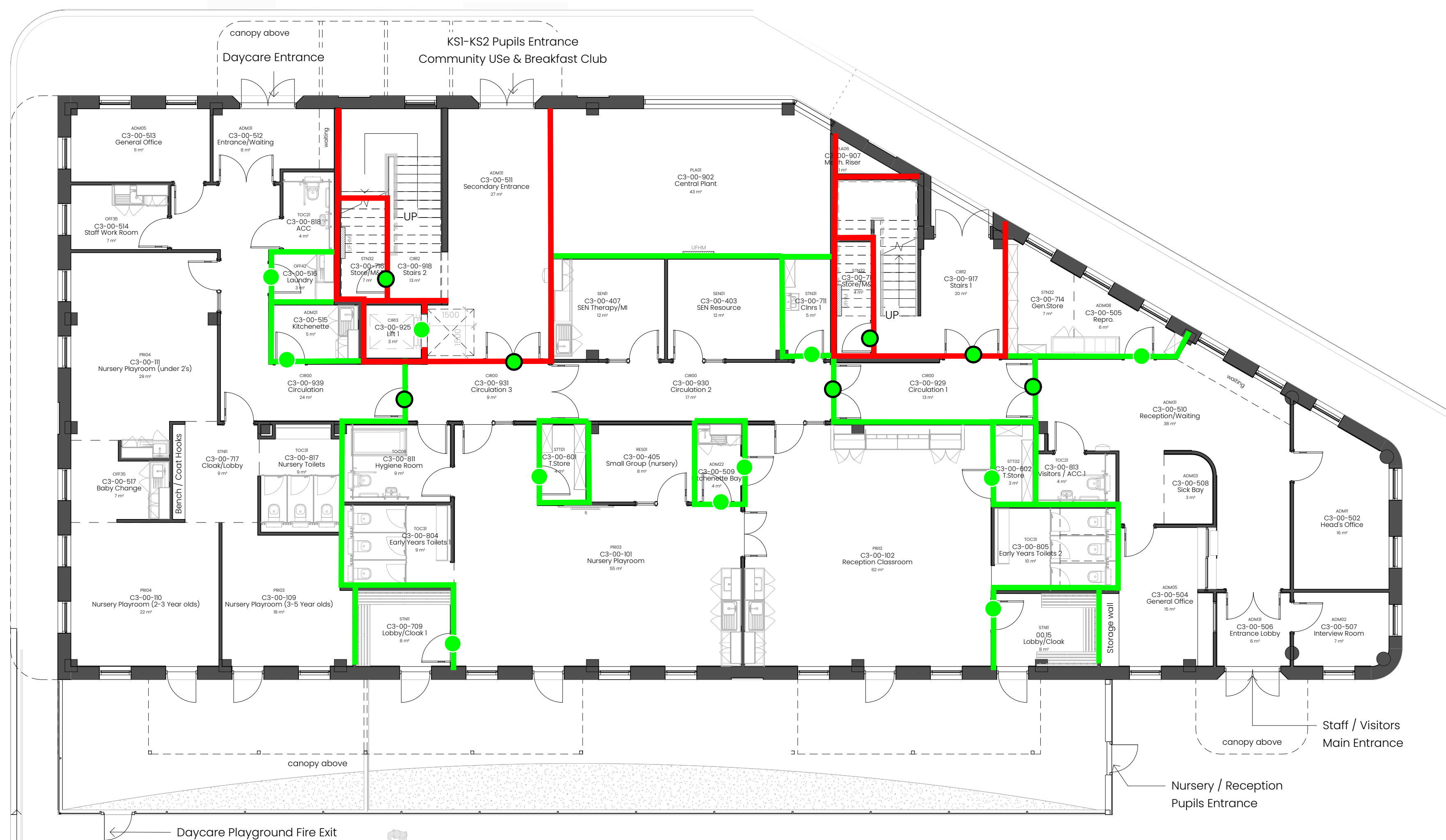
FD30S

FD60S

Fire Curtain:

Smoke curtain

Fire curtain



00 - Ground Floor Overall GA Plan

1:100

Fire Strategy Legend

Fire Resistance:

240mins

120mins

90mins

60mins

30mins

Fire Door:

FD20

FD30

FD60

FD20S

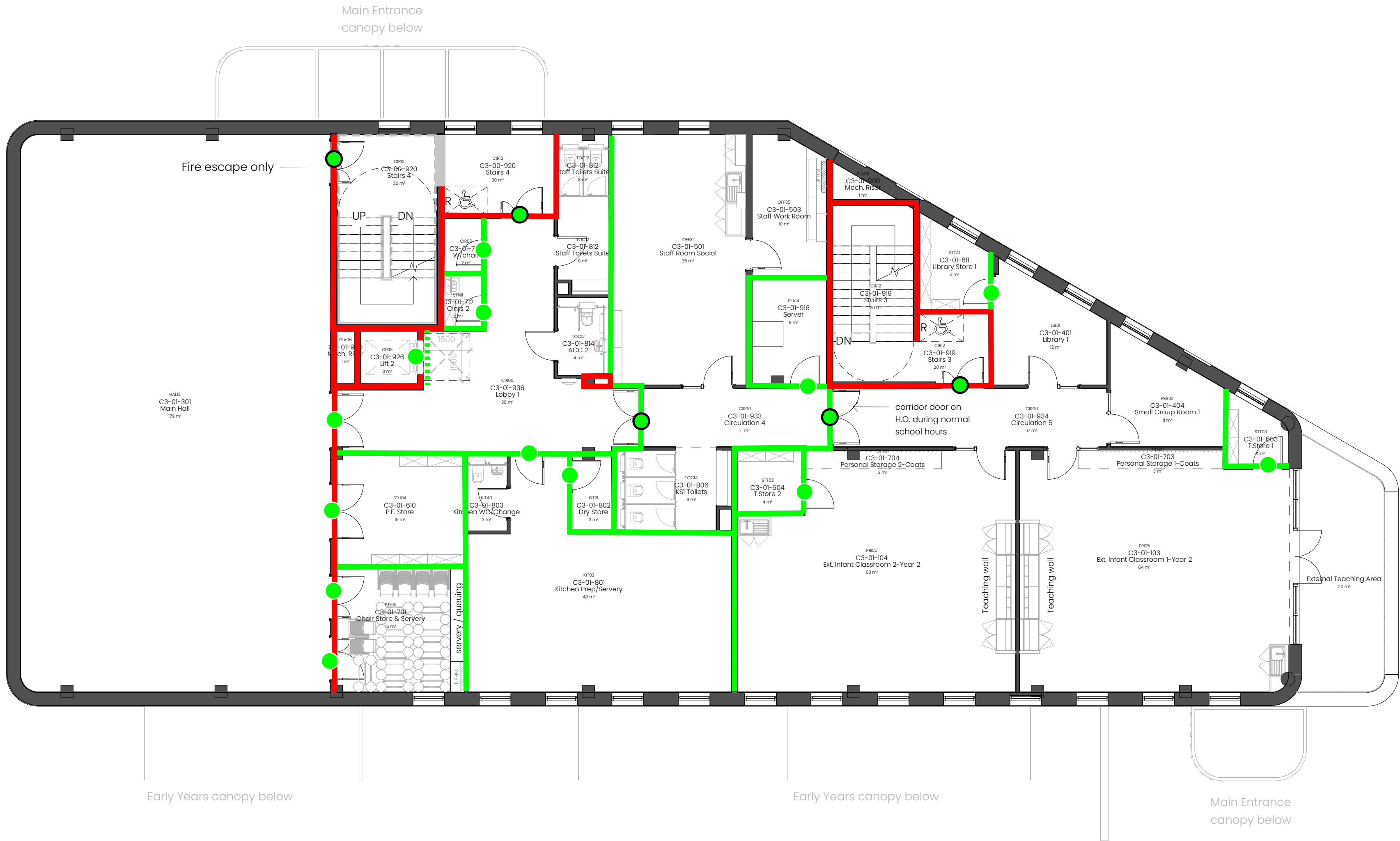
FD30S

FD60S

Fire Curtain:

Smoke curtain

Fire curtain



01 - First Floor Overall GA Plan

1:100

Fire Strategy Legend

Fire Resistance:

240mins

120mins

90mins

60mins

30mins

Fire Door:

FD20

FD30

FD60

FD20S

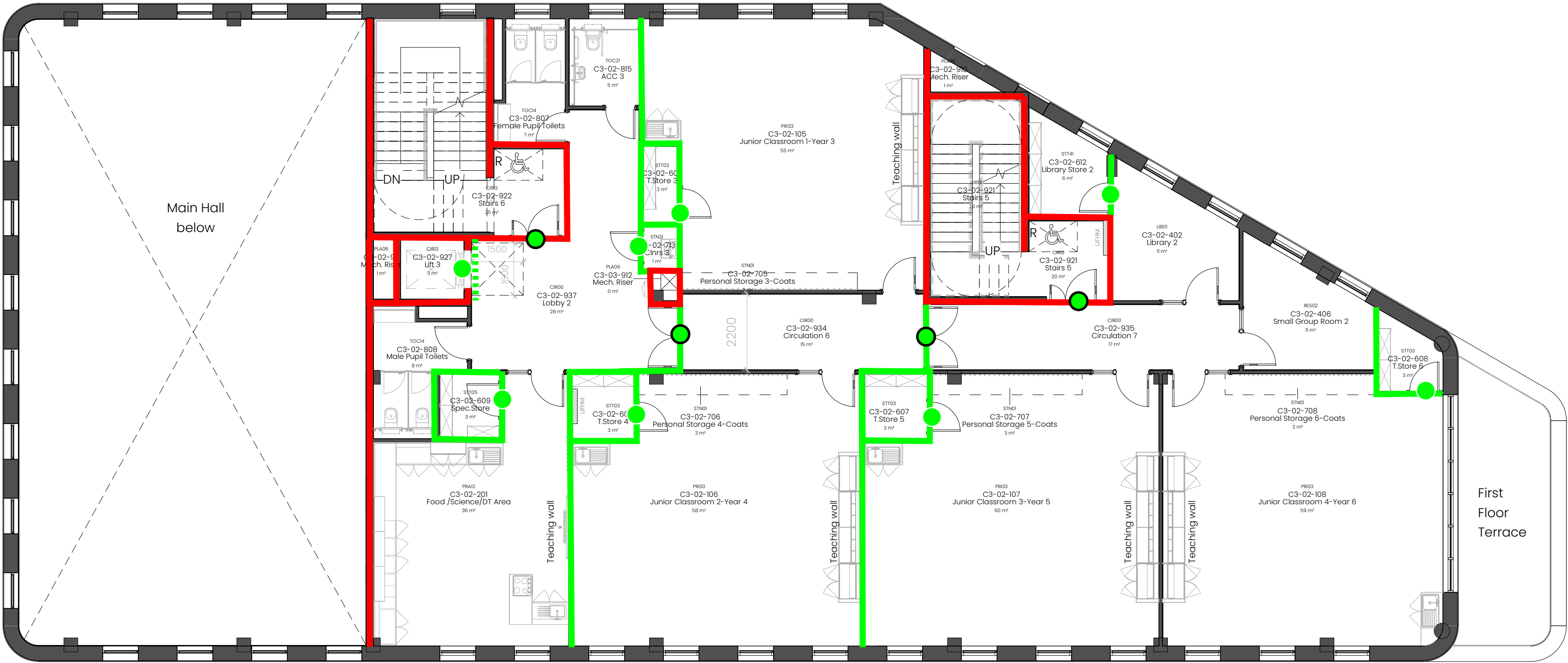
FD30S

FD60S

Fire Curtain:

Smoke curtain

Fire curtain



02 – Second Floor Overall GA Plan
1:100

Fire Strategy Legend

Fire Resistance:

240mins

120mins

90mins

60mins

30mins

Fire Door:

FD20

FD30

FD60

FD20S

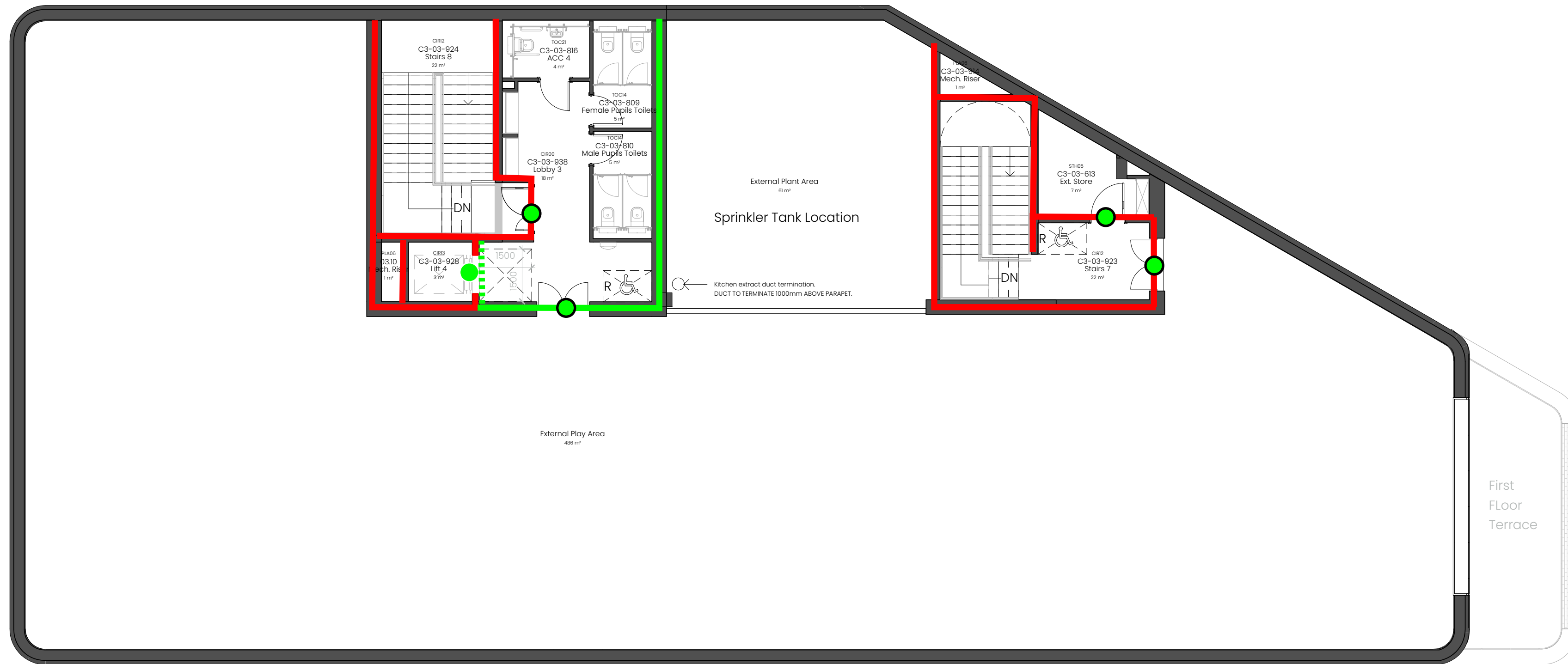
FD30S

FD60S

Fire Curtain:

Smoke curtain

Fire curtain



03 – Third Floor Overall Plan

1:100



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