Building Compliance without Complexity

Fire Strategy Report

RIBA Stage 4a Report - New Data Centre

at

Springfield Industrial Estate, Beaconsfield Road, Hayes,

Middlesex

Prepared on behalf of:

Black and White Engineering

Fire Strategy Report

Ref No: 504965

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Issue	Description	Date
1.	First issue for client approval	24.6.21
2.	Updated following client comments and section 14.0 - Executive Summary added	16.7.21
3.	Updated following client comments with appendix A added.	16.7.21
4.	90% issue stage 3	11.11.21
5.	Stage 3 issue	14.12.21
5.	Stage 4a issue	03.03.22
6.	Stage 4a issue to reflect revised planning permission	30.03.22
7.	Paragraph 10.3 amended in response to comments from Socotec Approved Inspectors. Paragraph 10.24 added regarding fallow and unoccupied areas. Corridors noted as enclosed in fire resisting construction not as protected corridors Comments regarding water-mist removed. Current fire strategy plans yet to be included. Commentary regarding fuel storage moved to appendix D.	14.07.22
8	Travel distances for Gantries amended to show compliant when measured to compartment door or fire fighting lobby. Paragraph 1.12 amended re fallow areas. Current fire strategy drawings included.	10/11/22

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1.0 Introduction

Salus have been appointed to prepare a fire strategy report in accordance with Approved Document B or BS 9999. It should be noted that business continuity and insurance requirements are not addressed by these two documents and that these may require additional fire precautions to be included.

1.0 This strategy document outlines the general precautions being employed in the new data centre building. The report is prepared in accordance with BS 9999.

1.1 The report address fire safety precautions that will be included in the project.

1.2 The site will contain 2 multistorey data centre which will developed in 2 phases - the larger building will be phase 1 - the smaller building (on the left of the plan below) will be phase 2. Only Building 1 is proposed to be built at this time and although this report considers aspects of fire safety where Building 1 could affect Building 2 the report only addresses the fire precautions to be employed in Building 1.

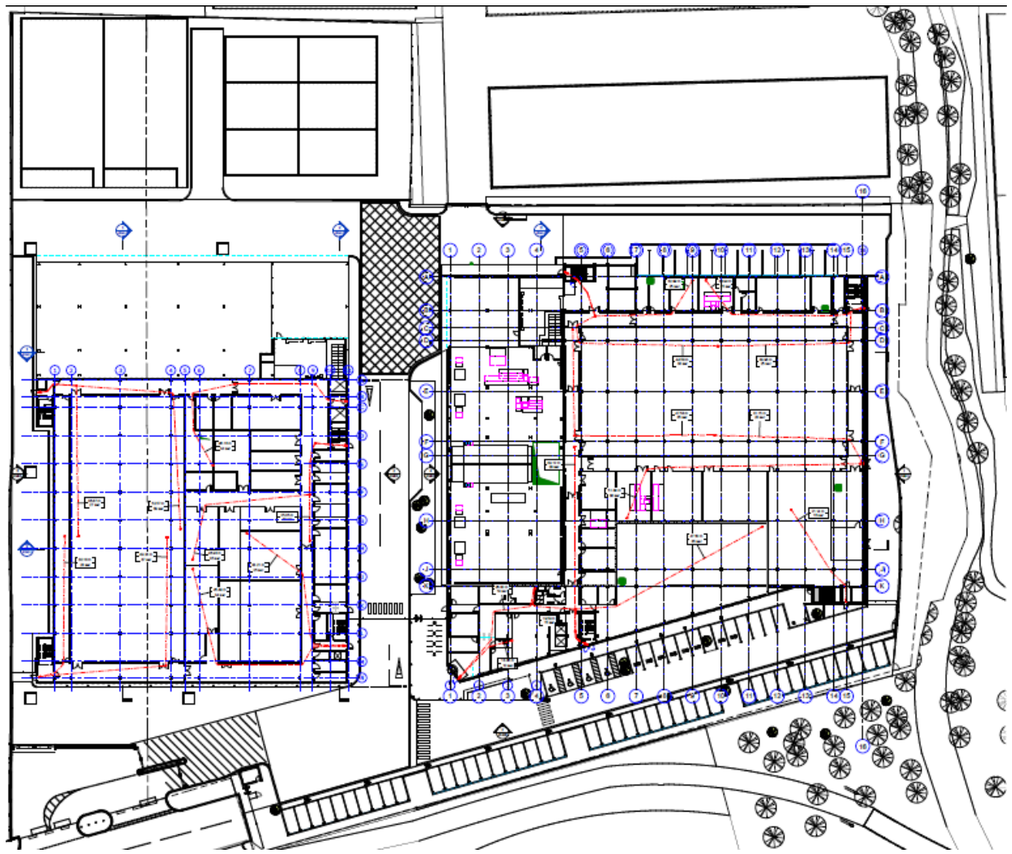


Figure 1 - Indicative site layout

1.3 Each building can be operated in isolation. The fire precautions employed will therefore allow for this to be achieved. No reliance will be placed on fire precautions in one building being necessary to protect occupants in or about the other building.

1.4 The use of the buildings is such that very few people will be working on site. The client has advised that the maximum number of occupants in either building is unlikely to exceed 50 (this includes those in the offices). There will however be a need to carry out future building works at the site during the life of the building so the occupancy of any one floor has been assumed to be a maximum of 100 people and a worse case of 2 floors are assumed to be refurbished at the same time. The total occupancy for each building is therefore taken to be 250 people.

1.5 The gantries shown in the site plan are multi-storey open structures into which packaged plant will be inserted. The external elevations of the gantries will then be clad. The cladding will not be weathertight; the package plant installations will be weathertight.

1.6 The site will be accessed from the highway and a road will encircle both buildings.

1.7 As noted above BS 9999 is used as the document against which compliance is to be demonstrated. This considers the potential users of the building, the hazards posed by different occupancies, giving warning, the need for fire suppression and smoke venting, fire safety management, structural fire protection and compartmentation, security, and access to the building.

1.8 The recommendations in this report assume that under normal circumstances a fire is unlikely to start in 2 places in the building (unless it is due to arson).

1.9 The report is a strategic document describing the fire safety requirements that are to be employed to meet the requirements of the Building Regulations 2010 and by extension some aspects of the Regulatory Reform (Fire Safety) Order. It does not address business continuity, insurers requirements and financial loss because of a fire.

1.10 The primary objective of BS 9999 is to ensure that an adequate standard of life safety is achieved in the event of a fire.

1.11 The fire precautions described are a package of measures. It is therefore important that any changes made take account of this and their impact on the safety measures as a whole be considered.

1.12 Some of the halls may remain fallow. The client is to provide an undertaking that these areas will not be used for any purpose (including storage). Providing that this undertaking is given these areas will not be fitted with AWFSS, primary or emergency lighting. All other precautions described will be included in the fallow areas. When these areas are occupied fire precautions will be installed to the same standard as the rest of the building. It must be ensured that appropriate fire precautions are installed as the build progresses; i.e. fire precautions systems should be installed prior to fire loading being introduced to fallow areas.

2.0 Applicable Legislation & Guidance

The primary pieces of legislation relevant to the scheme are the Building Regulations 2010 and the Regulatory Reform (Fire Safety) Order 2005.

3.1 The Building Regulations that need to be satisfied are as follows

- *Means of Warning and Escape:*

B1 The building shall be designed and constructed so that there are appropriate provisions for the early warning of fire, and appropriate means of escape in case of fire from the building to a place of safety outside the building capable of being safely and effectively used at all material times.

- *Internal fire spread (linings)*

B2 (1) to inhibit the spread of fire within the building the internal linings shall:

(a) Adequately resist the spread of flame over their surfaces; and
(b) Have, if ignited, a rate of heat release which is reasonable in the circumstances.

(2) In this paragraph "internal linings" mean the materials lining any partition, wall, ceiling or other internal structure.

- *Internal fire spread (structure)*

B3 (1) The building shall be designed and constructed so that in the event of fire, its stability will be maintained for a reasonable period.

(2) A wall common to two or more buildings shall be designed and constructed so that it adequately resists the spread of fire between those buildings. For the purposes of this sub-paragraph a house in a terrace and a semi-detached house are each to be treated as a separate building.

(3) To inhibit the spread of fire within the building, it shall be sub-divided with fire-resisting construction to an extent appropriate to the size and intended use of the building.

(4) The building shall be designed and constructed so that the unseen spread of fire and smoke within concealed spaces in its structure and fabric is inhibited.

- *External fire spread.*

B4 (1) The external walls of the building shall adequately resist the spread of fire over the walls and from one building to another, having regard to the height, use and position of the buildings.

(2) The roof of the building shall adequately resist the spread of fire over the roof and from one building to another, having regard to the use and position of the building.

- *Access and facilities for the fire service.*

B5 (1) The building shall be designed and constructed so as to provide reasonable facilities to assist fire fighters in the protection of life.

(2) Reasonable provision shall be made within the site of the building to enable fire appliances to gain access to the building.

2.2 Guidance on how to meet the requirements is given in Approved Document B.

2.3 **The Regulatory Reform (Fire Safety) Order 2005**
Once the building is completed and occupied, the Regulatory Reform (Fire Safety) Order 2005 (RRFSO) becomes the controlling fire safety legislation. It is necessary, among other things, for the occupier of the building to carry out and maintain a fire safety risk assessment. Duties under RRFSO also require that the building's fire safety provisions are appropriately managed, maintained and tested over the whole life of the building. This fire strategy will be an essential source of information for anyone carrying out a fire risk assessment of the building. Compliance with Part B of the Building Regulations is also expected to satisfy RRFSO requirements in terms of the physical fire safety provisions

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 9 (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 Principal Designer. 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, Principal Designer, Contractor and Building Occupiers of CDM issues.

3.0 Executive Summary

3.1 Salus Approved Inspectors and Fire Safety Consultants Ltd. Have been appointed by Black and White Engineering Ltd. to produce a fire strategy for the construction of 2 new 5 storey data centres. The fire strategy is provided to obtain Building Regulations Approval for the project.

3.2 This strategy provides guidance covering various of fire safety to protect the occupants of the building against the effects of a fire including the following:

3.2.1 Means of escape and definition of design occupancies.
3.2.2 Automatic fire detection and alarm systems.
3.2.3 Fire suppression
3.2.4 Passive fire protection
3.2.5 Smoke control systems
3.2.6 Access and facilities for the fire and rescue service.

3.3 As an integrated part of the design team developing the scheme we have reviewed and commented on the proposals so that the scheme can meet the fire safety requirements contained in Building Regulations. The provisions include the following:

- Simultaneous evacuation of the building.

- Category L2 fire detection and alarm system with manual break glass call points in accordance with the latest version BS 5839 part 1 (2017). This will include a repeater panel in the gate house to assist the fire service on arrival.
- AWFSS.
- 4 stairs each providing means of escape for occupants and access for fire fighters.
- 90 minutes fire resistance to elements of structure.
- Compartment floors.
- External walls which limit the potential for fire spread over them.

4.0 Fire Safety Management

Fire safety in buildings is a balance between the technical systems within the building and how the building is used and managed. It is not possible to rely solely on the technical provisions in the building and an active role on the part of the management is essential. It is therefore necessary that the building is used as intended in this report and that the systems are managed appropriately.
As with all buildings, there will be standard fire safety management requirements for the day-to-day operation of the building. It is a fundamental assumption that features described within this fire strategy will require management and maintenance throughout the life of the building. In this building it will be the responsibility of the building management to ensure that all fire protection systems are monitored and maintained on a regular basis (in line with what is recommended by a fire risk assessment which will be carried out to satisfy the RRO).

These systems include but are not limited to:

- Fire detection and alarm system,
- Emergency lighting system,
- Signage,
- Compartmentation
- Refuge electronic voice communication

5.0 Ensuring effective fire protection

Design Stage

This is a strategic document to allow the approving authorities to understand how compliance is to be achieved and in accordance with BS 9999 includes the key assumptions that underpin the design. It should be included in the fire safety manual so that the owners and managers of the building can refer to it.

The designers will need to ensure that the design can be built and installed. The construction process from procurement to commissioning will need to ensure that elements can be inspected, tested, maintained, repaired, and be protected from abuse during normal use of the building.

Documentation will need to be sufficient for the management and maintenance of components and systems.

6.0 Risk profile

Risk profiles are needed to determine the appropriate means of escape and design features to be employed for life safety. They reflect the characteristics of the occupants (such as whether they are familiar with the building or not and whether or not they are likely to be awake or asleep) and the anticipated fire growth rate.

Occupants of the offices will be employed here and so will be familiar with the building, they therefore fit within occupancy characteristic A - awake and familiar with the building.

Occupants of other spaces within the building will not necessarily be employed here, they may not be familiar with the building and therefore fit within occupancy characteristic B - awake but unfamiliar with the building.

Risk profiles are created by combining the occupancy characteristic with the fire growth rate.

The fire growth rate is considered to be medium (fire growth parameter of 0.012kJ/s^3). Medium is described in BS 9999:2017 as evenly distributed low to mid-level fire load comprising a mix of combustible materials. Typical examples of this given are offices, lounges, classrooms, auditoria seating areas, galleries and car parks. The 2008 version of the standard gives examples of typical risk profiles in Table 5 computer rooms in this table are indicated as profile B2.

Risk profile B2 is also to be adopted for the gantries of each building. It is recognised that some of the plant being installed in these areas may result in a higher fire growth rate in certain areas. To ensure that this does not affect the overall risk profile (and to limit the risk of fire spread between buildings) the units containing the plant with a high fire growth rate will be enclosed in 90-minute fire resisting construction. Travel distances within the individual plant containers have been assessed and do not exceed 9.0m in a single direction. Where the containers are too large to meet this distance 2 exits have been provided.

Risk profile B4 is applicable to the fuel storage building - refer to appendix D. Along with the rest of the site this building will need to be fitted with sprinklers which will reduce the risk profile to B3 and enable the guidance contained in BS 9999 to be used.

Area	Risk Profile
Open plan offices	A2
Closed plan and small offices	B2
Data Halls	B2
Gantries	B2
Fuel Storage Building - refer to appendix D	B3

Table 1: Risk profile allocations

As they control a fire it is acceptable to vary the risk profile when installing automatic water fire suppression systems (AWFSS) in buildings. The buildings will be fitted with an AWFSS throughout. The corridors of the gantries will be separated from the rooms (plant containers) with AWFSS by fire resisting construction and will not contain a fire load and so will not include AWFSS. The fire growth rate of the risk profiles could therefore be reduced by one level as follows.

Open plan offices - risk profile A2 to A1.

Closed plan and small offices - risk profile B2 to B1.

Data halls - risk profile B2 to B1.

Gantries - risk profile B2 to B1.

7.0 Evacuation

7.1 The entire building will be evacuated simultaneously by activation of the category L2 automatic fire detection and alarm system (incorporating manual call points). This system will be in accordance with the current version of BS 5839 Part 1.

It will include a repeater panel in the gate house to assist the fire service on arrival.

7.2 Stair widths are designed for simultaneous evacuation.

7.3 On being made aware of fire all occupants will make their way to a place of safety outside of the building. The place of safety must be designated by the operators and be at least 1.5 times the height of the building away from any part of the building. It will also need to be remote from the fuel storage tanks.

7.4 The building will be separated from the gantries by 30-minute fire resisting construction so that on entering the building the occupants of the gantries are protected from a fire on the gantry itself.

8.0 Internal subdivision and spatial/visual orientation

8.1 There is no open spatial (vertical) planning and there are no Atria.

8.2 Areas of higher fire risk will be separated from the rest of the building by fire resisting construction. This includes the following areas:

- Plant containers on the gantries.
- Areas of ancillary accommodation listed in table 29 of BS 9999.

9.0 Package of Fire Protection measures

9.1 The worst-case risk profile is in the data centre is B2 (B3 in the fuel storage building - refer to appendix D - which will be provided with an L2 fire detection and alarm system) this requires a type M fire alarm system. The automatic L2 system being installed (in accordance with BS 5839 part 1) benefits the occupants of the building by providing early warning of a fire elsewhere in the building. It will also ensure occupants of inner room are warned of a fire in the access room.

9.2 A fire alarm repeater panel will be included in the gatehouse to allow the security team to provide advice to the fire service on arrival. A fire safety information box will also be included in the gatehouse to provide plans and information for attending fire safety crews. If Lithium-ion batteries are installed in the buildings is recommend that the fire and rescue Service are made aware of this and information on them is included in the fire safety information box.

9.3 Artificial lighting to enable people to make their way to a place of safety outside the building will be provided. Incandescent filament lamps and high-pressure discharge lamps should not be used. Luminaires will need to conform with the relevant parts of BS 4533.

9.4 Emergency escape lighting will be provided in accordance with BS 5266-1 and BS EN 1838.

9.5 Exit signs in accordance with BS ISO 3864-1 and BS 5499-4 will be provided to guide people along escape routes.

9.6 Doors will be easily identified, able to be opened by people making their way from the building without the use of a key and by the person only having to operate one readily apparent mechanism to open the door.

9.7 Doors will open in the direction of escape where possible. Doors that need to be used by less than 60 people will not open in the direction of escape where it is not possible to do so.

9.8 Cross corridor and dual swing doors will be provided with vison panels.

9.9 Protected power circuits will be provided for:

- Fire alarm circuits to BS 5839-1
- Emergency voice communication circuits to BS 5839-9:2011
- Cables for all other circuits that require a resistance to fire, either for life safety or firefighting to BS 8519.

9.10 Lifts are contained within fire-fighting shafts

9.11 Firefighting shafts in accordance with BS 9999 2017

9.12 Firefighting lifts in accordance with BS 9999 2017 and EN 81-72 2020

9.13 Fire control centre (room)

9.14 Fire suppression

9.15 Structural fire resistance

9.16 Compartmentation (all floors) and between offices and data halls

9.17 Surface spread of flame ratings limiting fire growth potential

10.0 Means of escape

The proposals will meet the guidance contained in BS9999 as they include:

- Doors leading directly to the outside at ground floor.
- Doors leading to protected stairways.
- Protected stairways.
- Doors from protected stairs to outside.
- Travel distances within the recommended limits.
- Internal stairs (due to the height of the building).

- Protected lobbies to stairs
- Refuges for disabled people in each stair or lobby at each upper floor.

Horizontal means of escape

10.1 Escape routes have been designed so that except where there are short dead end conditions two exits are available from all spaces.

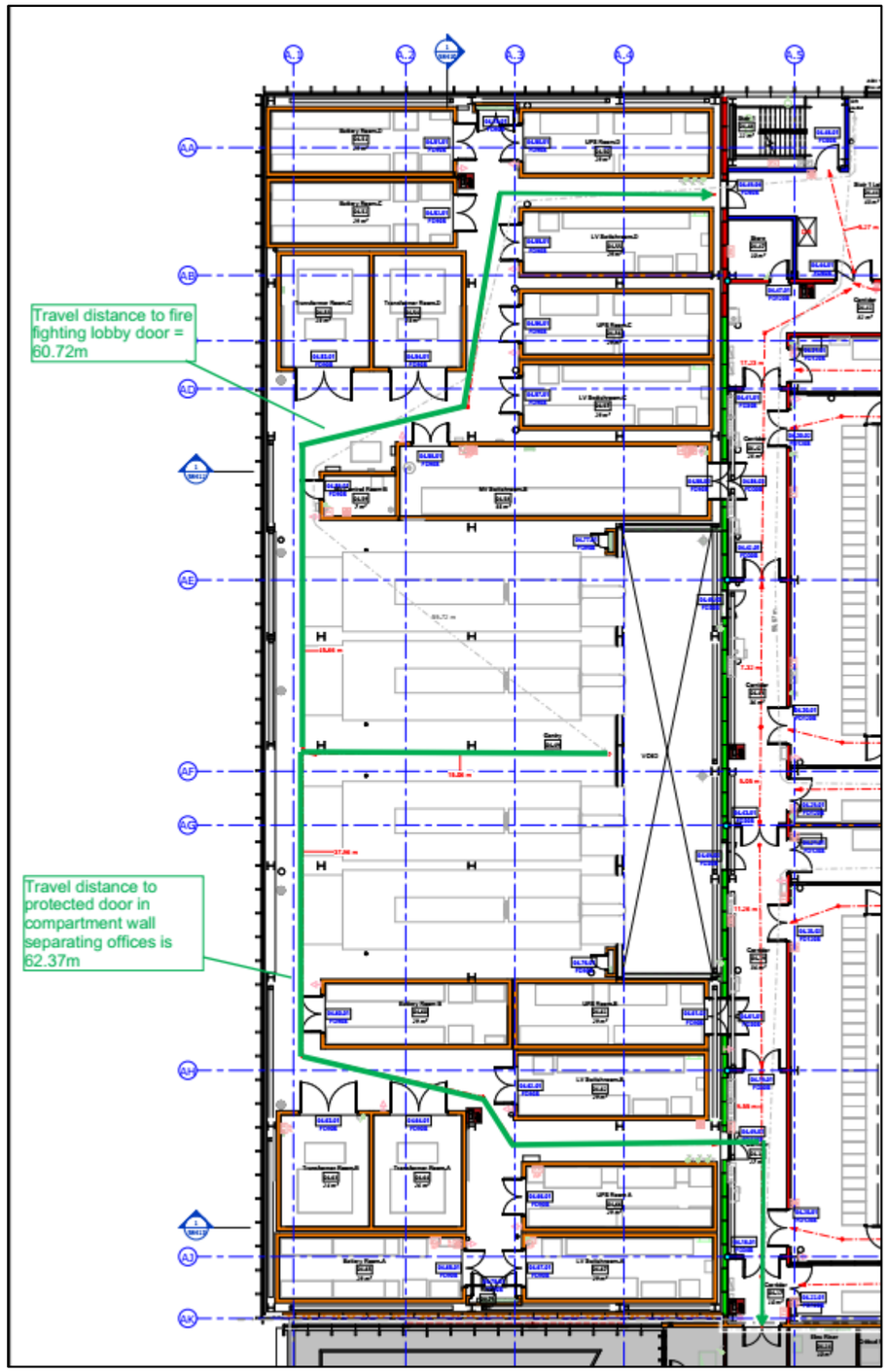
10.2 The intended number of occupants in the building has been based on figures supplied by the client. Additional people have been included to allow building works to be carried out in future.

Maximum number of occupants per storey	Notes
100	The client has advised that there will be no more than 50 people in the building. The maximum number of occupants per storey has been increased to allow for future building works to be carried out (main contractors and subcontractors staff for the duration of the build)
Fuel storage building - refer to appendix D	2

Table 2: Number of occupants per storey

10.3 In the data centre the worst case permitted travel distance in the B2 risk profile is 50 metres. A meeting with the architects was undertaken to ensure that this requirement could be met throughout when (including the cabinets). Note: The installation of AWFSS allows for fire growth factor to be reduced by 1 i.e.B2 risk profile now B1 risk profile.

The travel distance from the plant area on the gantries (a typical layout for this is shown on drawing 58240 Building 1 - Level 04 - Fire Strategy) will exceed the travel distance for B2 risk profile (travel distance when measured to door to fire fighting lobby or door in compartment wall of office block is a maximum of 63.37m), however as there is AWFSS installed the fire growth factor can be reduced by 1; the travel distance for a B1 risk profile is 60 where there are more than one direction of escape. A variation of 15% is allowable due to higher standard of L2 Automatic Fire Detection and Alarm system therefore the maximum travel distance is 69m (60m + 15%). As the travel distance to door to fire fighting lobby or compartment separating office is less than this, the travel distances on the gantries are acceptable.
Note 1: the initial part of the travel distance is in a single direction, this initial travel distance is within the maximum single direction of travel of 24m actual for a B1 risk profile.
Note 2 the majority of the travel distance is within the open gantries, BS 9999 in annex F recognises that more generous travel distances are applicable for Process Plant and outdoor structures so this will give an additional factor of safety.



Extract from drawing DCS20109-NWA-DC-01-04-DR-A-58240-Building 1 - Level 04 showing travel distances on gantries.

Cross corridor doors are provided as close to the middle of the corridors as possible.

The data hall corridors will be enclosed with fire resisting construction (the walls and doors inside the building are in excess of 30-minute fire resisting with fd30s fire doors and cross corridor doors required for such). This is for property protection only and the corridors are not considered protected corridors.

The wall between the offices and data halls will be constructed as a compartment wall. It is therefore considered to be acceptable to measure the travel distance to the doors in this wall for the occupants of the data hall. The doors between the office area and halls will be fitted with ironmongery so that people in the data halls can escape into the office area and persons from office areas can escape into data halls.

In the fuel storage building (B3 risk profile) the one-way direct distance is limited to 11.0m

10.4 The spaces between the packaged plant on gantries will form corridors and that do not contain equipment, therefore actual travel distances can be applied. Please see travel distance table below, for completeness B2/A2 and B1/A1 risk profile shown – see section 6 above re how fire growth factor can be reduced by 1.

Area	Risk profile	Limit with travel available in one detection only (m)*	Limit with travel available in two directions (m)*
Open plan offices	A2	22	55
	A1	26	65
Closed plan and small offices	B2	20	50
	B1	24	60
Data Halls	B2	20	50
	B1	24	60
Gantries	B2	20	50
	B1	24	60
Fuel storage building	B3	11m[1]	-

*Travel distances are used where the layouts of walls etc are known. Direct distances of 2/3 of the travel distances are taken where this is not the case.

[1]Direct distance as the layout is subject to development

Table 3: Travel distances for risk profiles

10.5 BS 9999 does not address travel distances for roof top plant areas that are open to the air. The distances of 60m in a single direction and 100m when 2 directions are available from table 2.1 of Approved Document B Volume 2 have been used for this. Drawings 58250 Building 1 - Roof Level 00 - Fire Strategy and 58260 Building 1 - Roof Level 01 - Fire Strategy show that this requirement can be met. Plant layouts, step overs etc. will be arranged to ensure that the actual distances are acceptable.

10.6 Fire exits will be provided from the offices of the upper floors to the gantry and data hall corridors to ensure the distances described above are achieved. As these areas will all have less than 50 people in them these doors do not need to open in the direction of escape.

10.7 There are sufficient escape routes from all rooms tiers and stories which exceed the minimum provision described in the table below.

Exits are dispersed throughout the building so that they offer suitably located alternatives.

Maximum number of persons	Minimum number of routes required
60	1
600	2
More than 600	3

Table 4: Minimum number of exits

10.8 Occupants of inner rooms will be warned of a fire in the access room by the automatic fire detection and alarm system.

10.9 Doors to stairs need to be 1100mm to allow the fire service to gain access to the floor. The minimum exit width per person for a B2 risk profile is 4.1mm meaning each door will allow 286 people through it. Discounting 1 exit the maximum permitted occupancy (286) of each floor exceeds the design occupancy (100).

10.10 Doors elsewhere throughout the floors need to be at least 850mm wide (clear width as shown below). A clear width of 850mm will people in wheelchairs to reach the stairs without the need for assistance.

Doors in the fuel storage building need a clear width of 750mm - refer to appendix D

Where possible they will open in the direction of escape. It should however be noted that due to the number of people in the building this is not a requirement for any of the doors in day-to-day use. Doors into stairs, stair lobbies and final exits will open in the direction of escape to allow the occupancy to be temporarily increased during future building works.

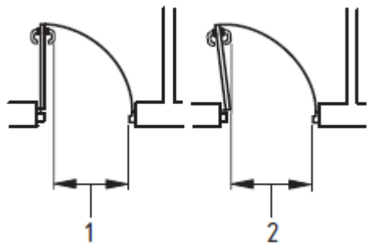


Figure 2 - Measuring door widths

An 850mm wide egress route will allow 121 people to evacuate safely: 500mm/4.1mm (see 10.9 above).

Doors less than 1050mm wide need to be assessed to ensure the width is acceptable:

n = 500/m

n number of people safely accommodated by the door width.
m minimum door width per person from table 12 of BS 9999 (4.1mm worse case - risk profile B2)

n = 500/4.1

n = 121 people which exceeds the 100-person limit per floor and is therefore acceptable.

10.11 Corridors will be at least 1200mm wide.

10.12 The width of doors in corridors should be not less than 150mm less than the width of the corridor.

Vertical means of escape

10.13 All 4 stairs are internal and are to be used for means of escape.

10.14 The flights and landings of the stairs will be constructed from materials of limited combustibility.

10.15 Stairways are in the corners of the building and are approached by corridors.

Due to the height of the building each stair will need to be approached by way of a protected lobby, including the stair between grids A and B; to protect the occupants of other floors lobbies will need to be constructed on the floors that remain fallow.

10.16 Final exits from the stairways are direct to outside of the building.

10.17 Stairs will be enclosed in fire resisting construction, The stair that does not contain a lift will be constructed as a protected shaft. The stairs containing lifts will be fire-fighting shafts. Both requirements exceed the requirements for protected stairs.

10.18 Refuges for disabled people will be provided in all stairs at all levels. The building will not contain a high number of disabled people and no special provisions are required.

10.19 The intended number of occupants in the building has been based on figures supplied by the client. Additional people have been included to allow building works to be carried out in future.

10.20 A storey exit has been discounted when calculating the maximum occupancy of the floor. As the stairs are approached by protected lobbies stairs have not been discounted when calculating the maximum occupancy of the upper floors.

Maximum number of occupants in the building	Notes
250	The client has advised that there will be no more than 50 people in the building. The maximum number of occupants per storey has been increased to allow for future building works to be carried out (main contractors and subcontractors staff for the duration of the build). It is assumed that no more than 2 floors will be worked on at any on time and that all 50 people will remain working in the building.

Table 5: Maximum building occupancy

10.21 The stairs will be 1100mm wide to allow the fire service to access the upper floors. The minimum exit width per person for a B2 risk profile is 2.9mm meaning each stair will allow 379 people down it. The maximum occupancy of the upper floors is therefore 379x4=1516 people which exceeds the design occupancy of 250.

10.22 Each stair will include a refuge for use by disabled people at each upper floor level. Each refuge will include an emergency voice communication system.

10.23 Storey exits need to be wide enough to allow the people travelling down the stairs and those on the ground floor to merge and leave the building.

The width of the final exit doors is determined by the following calculation:

$W_{FE} = NX + 0.75S_{up}$

Where:
W_{FE} = width of final exit in mm
N = number of people served by ground floor storey exit
X = minimum door width per person
S_{up} = stair width in mm

N = 34 (worse case for GF based on 100 people split between 3 exits)
X = 4.1mm
S = 1100mm wide.

$W_{FE} = 34 \times 4.1 + 0.75 \times 1100$
W = 965mm

The requirement for 1.1m clear width for fire service access therefore takes precedence.

10.24 Not all data halls that are to be fitted out as part of this work. Some floors will remain fallow and some offices will not be occupied as follows:

- Level 0; Data hall and corridors around this are built - data hall not fitted out with racks.
- Levels 1 and 2; Data halls and corridors not built, floor to remain fallow - offices not occupied. Fit out will occur later - if the offices are occupied before the data halls are fitted out a corridor will need to be provided as per level 3 to provide access to stair 1
- Level 3; Data halls and most corridors not built, floor to remain fallow - offices are to be occupied. A corridor will be built as per level to provide egress via stair 1 for the occupants of the offices.
- Level 4; full fit out.

11.0 Additional Fire Protection measures

11.1 The width of stairs and doors are set as the minimum level in order to meet various requirements and there is therefore no benefit to be derived from considering the effects of other aspects of the fire safety package on these to increase the maximum number of occupants.

11.2 The fire alarm system exceeds the minimum requirement for a building of this type (Type M), a category L2 system is being provided. The 15% increase allowed in travel distances has been included in the exit routes from the gantries.

12.0 Access and facilities for fire fighting

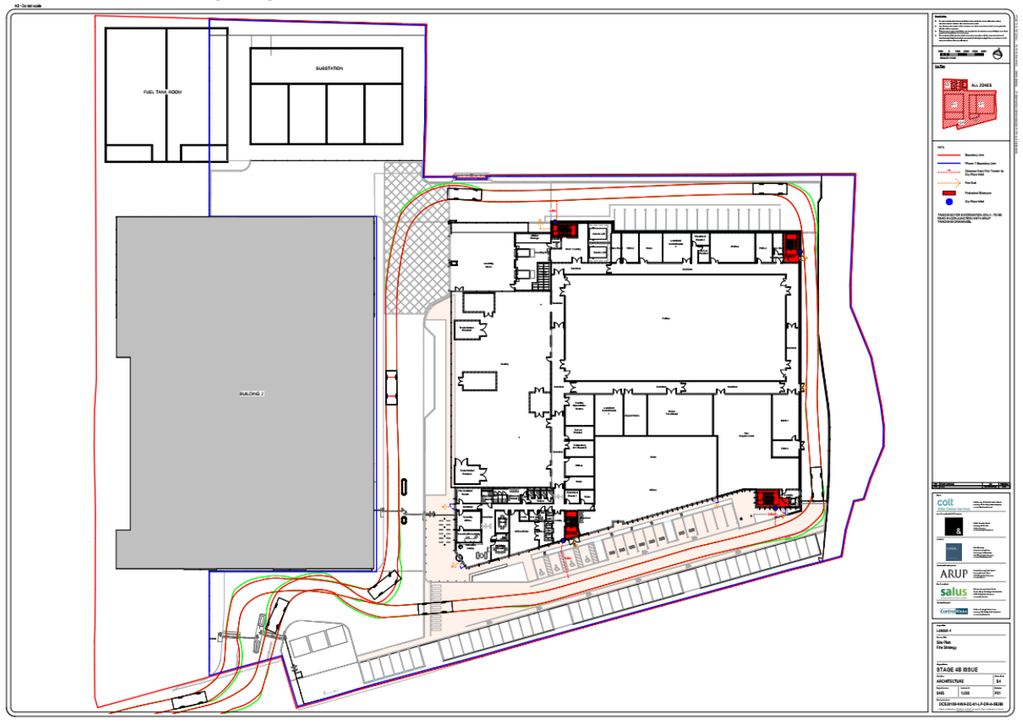
The designs for the smaller building are less well developed - this report will be updated as the designs for this are developed.

12.1 As the buildings are over 18 metres high, they will include firefighting shafts and a fire control room.

12.2 As the building is fitted with an AWFSS 3 No firefighting shafts (those with the lifts) are provided so that no part of any storey is more than 60 metres from the fire main outlet in the firefighting shaft. This distance is measured on a route along which a fire hose can be laid.

These hose lengths are based on AWFSS being provided.

12.3 The site layout will allow fire service tenders access to 100% of the perimeter of both buildings and allow them to leave the site without the need to reverse. It will also allow them to park within 18m of the entrances to the firefighting shafts in full view of the doors and dry riser inlet box.



Site layout

12.4 Firefighting shafts are sited on the outside of the building with direct access to and from the stairs of each shaft from the outside. The dry riser inlet boxes will be positioned next to the stair entrance door.

12.5 Passenger lifts are included within the firefighting shaft - these lifts will include cars which are constructed in accordance with BS EN 81-20. These lifts are only accessible from the firefighting lobby.

12.6 The 3 firefighting shafts in the larger building (the cores containing the lifts) will include:

Stairs that are 1100mm wide stairs, constructed from materials of limited combustibility and ne in accordance with BS 5395-1

Clear signage will be provided to allow the fire and rescue service to identify the floors.

A smoke vent will be situated in the roof and be opened and closed by use of a remote control located at fire service access level. If it is powered by electricity a secondary power supply will be needed in accordance with BS EN 12102-10. All connections between the remote-control actuator will be within the firefighting shaft.

The aerodynamic free area of the vent will be 0.7m^2 when measured in accordance with BS EN 12101-2.

12.7 Firefighting lobbies will be provided at all levels.

Except for the lobby at grid 5B each lobby will have a clear area of between 5m^2 and 20m^2. The lobby at grid 5B is larger to allow sufficient room to manoeuvre equipment into the data halls. While the lifts are noted as good lifts they are provided at this size and capacity to allow these items of equipment to be moved safely into the building and are not a goods lift as such.

The doors between the firefighting stair and firefighting lobby will be kept free from fastenings (other than those needed to ensure that the door functions as a fire door).

Doors will be standard height doors.

A smoke vent will be situated the external wall of each lobby and will be able to be manually opened by a fire-fighter in the lobby. The minimum free area of the vent will be 1.5m^2 when measured in accordance with figure 28 of BS 9999 or the aerodynamic free area of the vent will be 1.0m^2 when measured in accordance with BS EN 12101-2. The top of the vent will be located at or above the top of the door between the lobby and stairwell.

A notice will be provided in each lobby stating “Firefighting lift lobby: do not obstruct the doors. Do not use for storage.

An additional notice will be included to state “Do not leave goods in the lift”.

12.8 The perimeter internal walls of the shaft will achieve 120-minute fire resistance when measured from the outside of the shaft and 60 minutes when measured from the inside.

The structure supporting the shaft will achieve 120 minutes fire resistance.

Walls within the shaft will achieve 60 minutes fire resistance from both sides.

Where the shaft meets the external wall of the building as a continuation of the external wall 500mm of the external wall will achieve 60 minutes fire resistance from both sides.

Where the shaft meets the external wall of the building, and the wall forms an angle with the shaft (such as on grid line 13) either:

- 5m (on plan) of the external wall that is not part firefighting shaft will achieve 120 minutes fire resistance measured from the inside, or
- The relevant external wall of the shaft will achieve 120 minutes fire resistance measured from the outside.

Partitions and walls forming the fire-resistant enclosures described above will be built from brick, concrete or partitioning which satisfies the criteria for compliance contained in table 18 of BS 9999 when tested using the severe duty test contained in Annex F of BS 5235

No floor coverings are to be provided withing the firefighting shafts without prior approval.

12.9 A firefighting lift in accordance with BS EN 81-20 and BS EN 81-72 with a secondary power supply will be provided in each firefighting shaft.

Electrical equipment in the lift well and on the car will be protected against water in accordance with BS EN 81-72.

A drainage channel will be provided in front of all lifts in the firefighting lift well.

Lift machinery for the firefighting lift is best located within a protected space within the enclosure of the firefighting shaft. If it is to be located elsewhere approval will need to be sought.

The lift will include a communication system for use by fire-fighters in accordance with the standards listed above.

12.10 Hydrants forming part of a ring main will be provided within 90m of the dry rising main inlet box. All hydrants will have signage in accordance with BS 3251.

12.11 A fire telephone system in accordance with BS 5839-9:2011 is recommended as there are 3 firefighting shafts. Please note that this is different to the lift communication system.

12.12 A fire control centre will be provided in a dedicated room. It will be adjacent to the fire services access point.

The centre will be enclosed in 120-minute fire resisting construction

3 hour non maintained emergency lights will be provided with power being supplied from a source independent of the normal lighting.

The centre will contain:

- Control and indicating equipment for the fire detection and alarm system and all other fire safety systems
- Control systems showing the location of the incident and status of automatic fire protection installations and facilities.
- Override provision for all automatic fire protection installations (excluding fire suppression system control equipment where this needs to be placed next the systems equipment).
- Override for ventilation and air conditioning.
- The communication system described in 12.12 above.
- An exchange telephone.
- If a PA system is installed the ability to make announcements.
- Monitor screens for security cameras.
- Keys to the building.
- The buildings fire emergency plan
- Floor plans
- Contact details for key personnel and services engineers
- Clock
- Whiteboard and pens
- Refreshment facilities

12.13 The fire tender is able t park within 45m of any point in the fuel storage building - refer to appendix D.

13.0 Building structure - Load bearing and non-load bearing structural elements

13.1 Refer to section 11 for commentary regarding the elements of structure supporting the firefighting shafts.

13.2 For a building with risk profile B2 and an upper storey between 18 and 30 metres above ground level elements of structure are required to achieve 90 minutes fire resistance.

13.3 The internal floor of each building has an area less than 4000 square metres (the maximum limit for the size of compartment with a B2 risk profile). The offices will be separated from the rest of the building by a compartment wall. The packaged plant on the gantries will be surrounded in 90-minute fire resisting construction as will the data halls to ensure that the floor area of the data halls and corridors (including those of the gantries) does exceed the 4000m^2 area limit.

13.4 All floors will be constructed as compartment floors.

13.5 Cores and service risers will be constructed as protected shafts. Walls of these will achieve 90 minutes fire resistance, doors will be fd60s fire doors.

Refer to section 11 for commentary regarding the elements of structure supporting the firefighting shafts.

13.6 Roofs will have an AA, AB or AC or B_{ROOF}(t4) designation.

13.7 External walls generally will either meet the performance criteria given in BR 135 for cladding systems using full scale test data from BS 8414-1 or BS 8414-2 or meet the following recommendations.

- Have an external surface spread of flame rating of Class 0 (national class) or Class B-S3, d2 or better (European class). Profiled or flat steel sheet at least 0.5 mm thick with an organic coating of no more than 0.2 mm thickness is also acceptable.
- Any insulation product, filler material (not including gaskets, sealants and similar), etc. used in the external wall construction will be of limited combustibility.
- Be provided with cavity barriers as described below.

Refer to paragraph 13.0 for additional requirements for the walls of the data halls of the south and east elevations.

13.8 External walls also need to reduce the potential for fire spread between buildings on this and other sites.

The floors are being constructed as compartment floors so only 1 floor will be involved in the fire for this purpose. FFL to FFL for each storey is 6.1m

As all walls are more than 1.0m from the boundary the period of fire resistance required for this part is 90 minutes for loadbearing capacity and integrity and 15 minutes for insulation when tested from the inside only.

Wall (Grid lines used to reference)	**Height (m)**	**Length (m)**	**Distance to boundary (m)**	**Size of enclosing rectangle (m)**	**Maximum unprotected area (%age of enclosing rectangle)***	**Area of wall not requiring fire resistance (m^2) Note 1***
B16 to K16	6.1	52.5	11.8	9x60	0 * Please refer to the section on green walls below	0 * Please refer to the section on green walls below
K13/14 to K11/12 Note 2	6.1	9	21	9x9	100	55
K11/12 to grid 1 corner (Offices)	6.1	65	21	9x80	0 * Please refer to the section on green walls below	0 * Please refer to the section on green walls below
Grid 1 corner to K1 (Offices) Note 4	6.1	19	9	9x21	100	189
K4/5 to A4/5 (Data centre/gantry wall) Note 4 Note 5	6.1	60	22	9x60	100	366
A7 to A15	6.1	40	13	9x40	60	216
N1 to N9	6.1	50	20	9x50	100	305
L1 to D1 (Between stairs)	6.1	41	8	9x50	30	135
A1 to A11 (Including loading bay wall)	6.1	56	6	9x60	22*	118*
Note 6						
A1 to A11 (Including loading bay wall) Note 4	6.1	66	9	9x80	31	151

*Please refer to the commentary on green walls in 13.9 below.

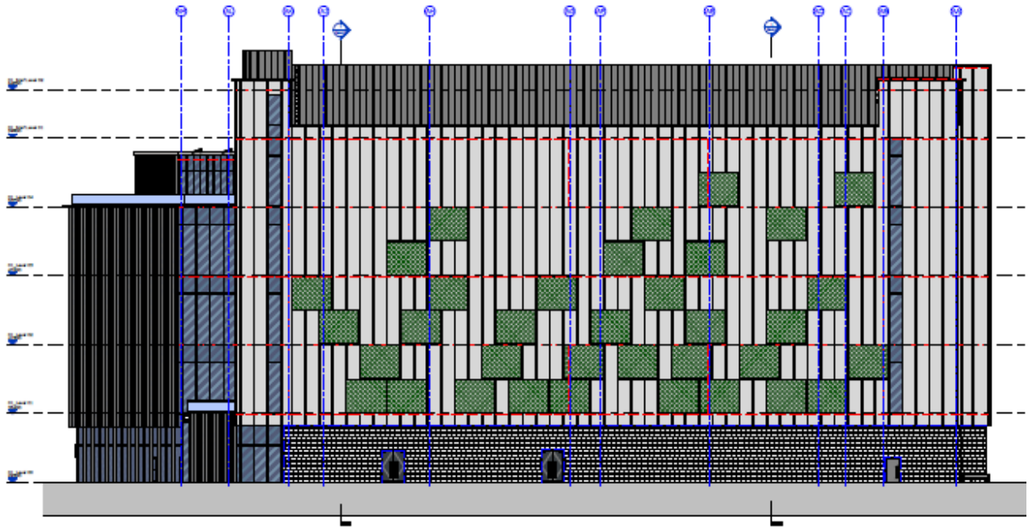
Notes
1. Per storey. In some cases, the actual area of the wall is exceeded as this is based on the size of the enclosing rectangle. In these cases, none of the wall needs to be fire resistant to meet this requirement however requirements described elsewhere apply both for the cladding and structure.
2. Stair wall to office/data hall compartment wall
3. Office/data hall compartment wall to grid line 1
4. Notional boundary set in centre of road between buildings
5. Packaged plant is enclosed in fire resisting construction and so meet UPA requirements individually. This is to ensure the data hall external wall is acceptable. Other than service connections the corridors around the packaged plant are required to be kept free of any fire load.
6. Notional boundary to centre of road.
7. The above to be verified on receipt of elevations and design development of the smaller building.

Table 6: Fire resistance of external walls for unprotected areas

13.9 Green walls are being fixed to the south and east elevations.

The south elevation contains one panel of approximately 22m wide by 10m deep.

The panels are dispersed over the East elevation as shown below.



East Elevation

Department for Communities and Local Government have produced guidance titled “Fire Performance of Green Roofs and Walls” dated August 2013. The green wall system will need to adhere to the recommendations of this guidance. This is summarised as follows:

- As this is external requirement B2 does not apply.
- Fire stopping is required at floor level - this fire stopping will need to match the 90 minutes fire resistance performance requirements applicable to the floor. Please note that products sold as cavity barriers are not required to meet this level of performance and so may not prove to be suitable.
- If a cavity is formed behind the green wall cavity barriers will need to be provided within this cavity at floor level and vertically at the centres described in table 7.
- Test evidence is needed to show that the green wall can meet the guidance contained in diagram 40 of Approved Document B - 2103 edition.

Additionally, as these facades are not sufficiently far from the boundary to have 100% unprotected areas as described in the aforementioned document, the risk of fire spread to adjoining sites needs to be mitigated. The AWFSS will in combination with the internal compartmentation will reduce the risk of a fire affecting the green wall. In addition to this all the cladding of the data halls on these elevations will achieve 90 minutes fire resistance when measured from the inside (to further reduce the risk of fire igniting the green walls) and the walls will be constructed from materials that meet the requirements of Regulation 7 of the Building Regulations to prevent the wall contributing to the fire should the green wall ignite.

Regulation 7 requires that nearly all materials/components that are part of an external wall, or specified attachments need to be none-combustible. Specified attachments are defined in the Regulations as: balconies attached to an external wall, a device for reducing heat gain within a building by deflecting sunlight which is attached to an external wall, or a solar panel attached to an external wall.
For a material to be classified as none-combustible and so be acceptable for use it will need to meet European Classifications A2-s1, d0 or Class A1 when classified in accordance with BS EN 13501-1:2007+A1:2009 entitled “Fire classification of construction products and building elements. Classification using test data from reaction to fire tests” (ISBN 978 0 580 59861 6) published by the British Standards Institution on 30th March 2007 and amended in November 2009.Only materials and components that have passed this test can be used.

Some items built into external walls or forming part of specified attachments do not need to meet the requirement to be none-combustible. They are:

- Cavity trays when used between two leaves of masonry;
- Any part of a roof (other than any part of a roof which falls within paragraph (iv) of regulation 2(6)) of The Building Regulations 2010 as amended if that part is connected to an external wall;
- Door frames and doors;
- Electrical installations;
- Insulation and water proofing materials used below ground level;
- Intumescent and fire stopping materials where the inclusion of the materials is necessary to meet the requirements of Part B of Schedule 1;
- Membranes which achieve a minimum classification of European Class b-S3, d0;
- Seals, gaskets, fixings, sealants and backer rods;
- Thermal break materials where the inclusion of the materials is necessary to meet the thermal bridging requirements of Part L of Schedule 1; or
- Window frames and glass (spandrel and infill panels must meet the requirement described above).

Thermal breaks are small elements used as part of the external wall construction to restrict thermal bridging. There is no minimum performance for these materials. However, they should not span compartments and should be limited to the minimum required to restrict the thermal bridging (the principal insulation is not to be regarded as thermal a thermal break).

The area of green wall on the south elevation is approximately 22m x 10m which requires a distance to the boundary distance of 16m - the boundary is approximately 28m away at this point.

The area of green wall on the east elevation was initially proposed to made of 3 sections sized so that they met the requirements as if they were unprotected areas. The area of each panel was not to exceed 136m^2. Using the Aggregate Notional Area (protractor method) the central section of the wall is always at least 18.0m from the centre line of the water course giving a multiplier of 0.25 for any datum using this multiplier. At least 30% of the other 2 areas are at least 27.5m away from the datum giving a multiplier of 0.1 resulting in an aggregate area of (136m^2 x 0.25)+ (2 x 136m^2 x 0.25 x 0.7)+ (2 x 136m^2 x 0.1 x 0.3) = 90 which is the limit for buildings of this type. Following consultation with the planning authority this area was broken into smaller sections to meet their concerns regarding the design of this elevation - the areas are dispersed in a similar way to achieve a similar result for unprotected area calculations.

13.10 Please refer to paragraph 6 for the walls of the fuel storage building.

13.11 Concealed spaces or cavities in the construction of the building provide a ready route for smoke and flame spread, especially in voids above and below ceilings/floors. Where smoke or flames could be concealed it potentially presents a greater danger.

13.12 Diagram 1 below shows where cavity barriers should be provided. Cavity barriers should be provided to close the edges of cavities, including around openings.

Location	National Class [1]	European Class [1][3][4]
Small rooms [2] of area not more than: a. $2m^2$ in residential accommodation b. $0m^2$ in non-residential accommodation	3	D-s3, d2
Other rooms [2] (Including garages)	1	C-s3, d2
Circulation spaces within dwellings		
Other circulation spaces, including the common areas of blocks of flats	0	B-s3, d2

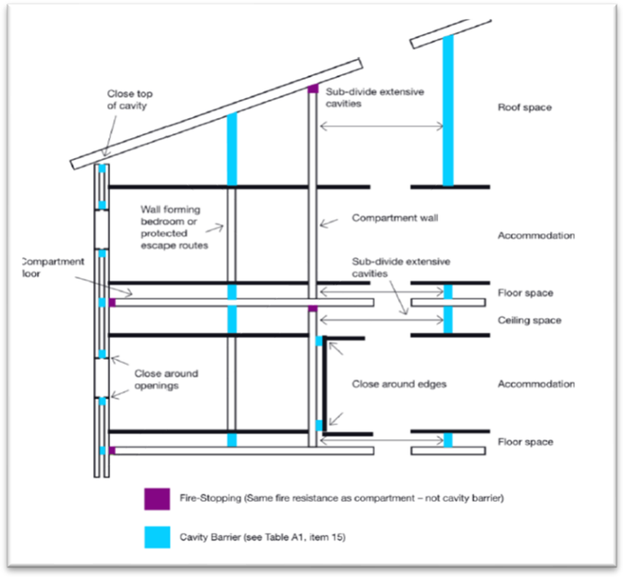


Figure 3 - Typical locations for cavity barriers

Location of cavity	Class of surface/ product exposed in cavity	Maximum dimensions in any direction (m)
National Class	**European Class**	
Between roof and ceiling	Any	Any	20
Any other cavity	Class 0 or class 1	Class A1 or Class A2-s3, d2 or Class B-s3, d2 or Class C-s3, d	20
Not class 0 or 1	Not any of the above classes	10

Table 7: Maximum dimensions of cavities

13.13 All surface finishes in stairs and circulation spaces will offer a Class 0 surface spread of flame rating (European Class B-s3, d2)

13.14 Rooms under $30m^2$ and areas within rooms up to 20% of the floor area to a maximum $60m^2$ may have class 3 surface spread of flame rating (European Class D-s3, d2).

13.15 All other rooms will have walls and ceilings with a surface spread of flame rating of Class 1 (European class C-s3, d2).

Table 7: Surface spread of flame rating

14.0 Special risk protection

14.1 Fire suppression systems will be appropriate to the specific circumstances of the equipment within the space.

15.0 Commissioning and handover

15.1 Prior to handover the building and its systems need to be complete and fully operational.

15.2 Information detailing the building as built and how to operate and maintain the building and its systems need to be provided to the client to be passed on to the responsible person.

This is a legal duty under Regulation 38 of the Building Regulations 2010 which require that “The person carrying out the work shall give fire safety information to the responsible person not later than the date of completion of the work, or the date of occupation of the building or extension whichever is earlier. The Responsible Person is defined in Article 3 of the Regulatory Reform (fire safety) Order of 2005.

Appendix A - documents cited in BS 9999

The following documents, in whole or in part, are normatively referenced in BS 9999 and are indispensable for its application and therefore where applicable to this project for the implementation of this report. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

Standards publications

- BS 476 (all parts), Fire tests on building materials and structures
- BS 799-5, Oil burning equipment – Part 5: Carbon steel oil storage tanks –Specification
- BS 1635, Recommendations for graphic symbols and abbreviations for fire protection drawings
- BS 3251, Specification for indicator plates for fire hydrants and emergency water supplies
- BS 4533 (all parts), Luminaires
- BS 4790, Method for determination of the effects of a small source of ignition on textile floor coverings (hot metal nut method)
- BS 5234 (both parts), Partitions (including matching linings)
- BS 5266-1, Emergency lighting – Part 1: Code of practice for the emergency lighting of premises
- BS 5306-0, Fire protection installations and equipment on premises – Part 0: Guide for selection of installed systems and other fire equipment
- BS 5306-1, Code of practice for fire extinguishing installations and equipment on premises – Part 1: Hose reels and foam inlets
- BS 5306-2, Fire extinguishing installations and equipment on premises – Part 2: Specification for sprinkler systems 2)
- BS 5306-3, Fire extinguishing installations and equipment on premises – Part 3: Commissioning and maintenance of portable fire extinguishers – Code of practice
- BS 5306-4, Fire extinguishing installations and equipment on premises – Part 4: Specification for carbon dioxide systems
- BS 5306-8, Fire extinguishing installations and equipment on premises – Part 8: Selection and positioning of portable fire extinguishers – Code of practice
- BS 5395-1, Stairs – Part 1: Code of practice for the design of stairs with straight flights and winders
- BS 5395-2, Stairs, ladders and walkways – Part 2: Code of practice for the design of helical and spiral stairs
- BS 5410-1, Code of practice for oil firing – Part 1: Installations up to 45 kW output capacity for space heating and hot water supply purposes
- BS 5410-2, Code of practice for oil firing – Part 2: Installations over 45 kW output capacity for space heating, hot water and steam supply services
- BS 5499-4, Safety signs – Part 4: Code of practice for escape route signing
- BS 5651, Cleansing and wetting procedures for use in the assessment of the effect of cleansing and wetting on the flammability of textile fabrics and fabric assemblies
- BS 5655-6, Lifts and service lifts – Part 6: Code of practice for the selection, installation and location of new lifts
- BS 5656-1, Safety rules for the construction and installation of escalators and moving walks – Part 1: Examination and test of new escalators before putting into service – Specification for means of determining compliance with
- BS EN 115-1:2008+A1:2010
- BS 5656-2, Escalator and moving walks – Safety rules for the construction and installation of escalators and moving walks – Part 2: Code of practice for the selection, installation and location of new escalators and moving walks BS 5306-2 has been withdrawn and is superseded by BS EN 12845 but is still used for the maintenance of existing systems.)
- BS 5656-3, Safety rules for the construction and installation of escalators and moving walks – Part 3: Examination and test of new moving walks before putting into service – Specification for means of determining compliance with
- BS EN 115-1:2008+A1:2010
- BS 5839-1:2013, Fire detection and fire alarm systems for buildings – Part 1: Code of practice for design, installation, commissioning and maintenance of systems in non-domestic premises
- BS 5839-8:2013, Fire detection and fire alarm systems for buildings – Part 8: Code of practice for the design, installation, commissioning and maintenance of voice alarm systems
- BS 5839-9:2011, Fire detection and fire alarm systems for buildings – Part 9: Code of practice for the design, installation, commissioning and maintenance of emergency voice communication systems
- BS 5852:2006, Methods of test for assessment of the ignitability of upholstered seating by smouldering and flaming ignition sources
- BS 5867-2:2008, Fabrics for curtains, drapes and window blinds – Part 2: Flammability requirements – Specification
- BS 5906, Waste management in buildings – Code of practice
- BS 6180, Barriers in and about buildings – Code of practice
- BS 6262-4, Glazing for buildings – Part 4: Code of practice for safety related to human impact
- BS 6263-2, Care and maintenance of floor surfaces – Part 2: Code of practice for resilient sheet and tile flooring
- BS 6266, Fire protection for electronic equipment installations – Code of practice
- BS 6644, Specification for the installation and maintenance of gas-fired hot water boilers of rated inputs between 70 kW (net) and 1.8 MW (net) (2nd and 3rd family gases)
- BS 6798, Specification for selection, installation, inspection, commissioning, servicing and maintenance of gas-fired boilers of rated input not exceeding 70 kW net
- BS 7036-0, Power operated pedestrian doorsets – Safety in use – Part 0: Code of practice for risk assessment and risk reduction
- BS 7157:1989, Method of test for ignitability of fabrics used in the construction of large, tented structures
- BS 7176, Specification for resistance to ignition of upholstered furniture for non-domestic seating by testing composites
- BS 7273-4:2015, Code of practice for the operation of fire protection measures – Part 4: Actuation of release mechanisms for doors
- BS 7346-4, Components for smoke and heat control systems – Part 4: Functional recommendations and calculation methods for smoke and heat exhaust ventilation systems, employing steady-state design fires – Code of practice
- BS 7346-7, Components for smoke and heat control systems – Part 7: Code of practice on functional recommendations and calculation methods for smoke and heat control systems for covered car parks
- BS 7346-8, Components for smoke control systems – Part 8: Code of practice for planning, design, installation, commissioning and maintenance
- BS 7671, Requirements for electrical installations – IET Wiring Regulations
- BS 8214, Code of practice for fire door assemblies
- BS 8300, Design of buildings and their approaches to meet the needs of disabled people – Code of practice
- BS 8313, Code of practice for accommodation of building services in ducts
- BS 8414-1, Fire performance of external cladding systems – Part 1: Test method for non-loadbearing external cladding systems applied to the masonry face of a building
- BS 8414-2, Fire performance of external cladding systems – Part 2: Test method for non-loadbearing external cladding systems fixed to and supported by a structural steel frame

- BS 8486-1, Examination and test of new lifts before putting into service – Specification for means of determining compliance with BS EN 81 – Part 1: Electric lifts
- BS 8486-2, Examination and test of new lifts before putting into service – Specification for means of determining compliance with BS EN 81 – Part 2: Hydraulic lifts
- BS 8489-1, Fixed fire protection systems – Industrial and commercial watermist systems – Part 1: Code of practice for design and installation 4)
- BS 8519, Selection and installation of fire-resistant power and control cable systems for life safety and fire-fighting applications – Code of practice
- BS 8524 (both parts), Active fire curtain barrier assemblies
- BS 9251, Fire sprinkler systems for domestic and residential occupancies – Code of practice
- BS 9990, Non-automatic fire-fighting systems in buildings – Code of practice
- BS 9991, Fire safety in the design, management and use of residential buildings – Code of practice
- BS EN 54-11:2001+A1:2006, Fire detection and fire alarm systems – Part 11: Manual call points
- BS EN 54-23, Fire detection and fire alarm systems – Part 23: Fire alarm devices – Visual alarm devices
- BS EN 81-20, Safety rules for the construction and installation of lifts – Lifts for the transport of persons and goods – Part 20: Passenger and goods passenger lifts
- BS EN 81-58, Safety rules for the construction and installation of lifts – Examination and tests – Part 58: Landing doors fire resistance test
- BS EN 81-70, Safety rules for the construction and installation of lifts – Particular applications for passenger and goods passenger lifts – Part 70: Accessibility to lifts for persons including persons with disability
- BS EN 81-71, Safety rules for the construction and installation of lifts – Particular applications to passenger lifts and goods passenger lifts – Part 71: Vandal resistant lifts
- BS EN 81-72, Safety rules for the construction and installation of lifts – Particular applications for passenger and goods passenger lifts – Part 72: Firefighters lifts
- BS EN 81-73:2016, Safety rules for the construction and installation of lifts – Particular applications for passenger and goods passenger lifts – Part 73: Behaviour of lifts in the event of fire
- BS EN 115-1, Safety of escalators and moving walks – Part 1: Construction and installation
- BS EN 378 (all parts), Refrigerating systems and heat pumps – Safety and environmental requirements
- BS EN 671 (all parts), Fixed firefighting systems – Hose systems
- BS EN 1125, Building hardware – Panic exit devices operated by a horizontal bar, for use on escape routes – Requirements and test methods
- BS EN 1154, Building hardware – Controlled door closing devices – Requirements and test methods
- BS EN 1363 (all parts), Fire resistance tests
- BS EN 1364 (all parts), Fire resistance tests for non-loadbearing elements
- BS EN 1365 (all parts), Fire resistance tests for loadbearing elements
- BS EN 1366 (all parts), Fire resistance tests for service installations
- BS EN 1634 (all parts), Fire resistance and smoke control tests for door and shutter assemblies, openable windows and elements of building hardware
- BS EN 1838, Lighting applications – Emergency lighting
- BS EN 12101 (all parts), Smoke and heat control systems
- BS EN 12416-2, Fixed firefighting systems – Powder systems – Part 2: Design, construction and maintenance
- BS EN 12845, Fixed firefighting systems – Automatic sprinkler systems – Design, installation and maintenance 5)
- BS EN 13501 (all parts), Fire classification of construction products and building elements
- BS EN 13565-2, Fixed firefighting systems – Foam systems – Part 2: Design, construction and maintenance
- BS EN 13823, Reaction to fire tests for building products – Building products excluding floorings exposed to the thermal attack by a single burning item
- BS EN 15650:2010, Ventilation for buildings – Fire dampers
- BS EN 16005, Power operated pedestrian doorsets – Safety in use – Requirements and test methods
- BS EN ISO 1182, Reaction to fire tests for products – non-combustibility test
- BS EN ISO 1716, Reaction to fire tests for products – Determination of the gross heat of combustion (calorific value)
- BS EN ISO 12543-2, Glass in building – Laminated glass and laminated safety glass – Part 2: Laminated safety glass
- BS EN ISO 14122-4, Safety of machinery – Permanent means of access to machinery – Part 4: Fixed ladders
- BS ISO 3864-1, Graphical symbols – Safety colours and safety signs – Part 1: Design principles for safety signs and safety markings
- BS ISO 14520 (all parts), Gaseous fire-extinguishing systems – Physical properties and system design
- DD CEN/TS 14816, Fixed firefighting systems – Water spray systems – Design and installation

Other publications

- HARRISON, R. and MILES, S. Smoke shafts protecting fire-fighting shafts; their performance and design. BRE Project Report 79204. Watford: Building Research Establishment, 2002.
- COLWELL, S. and BAKER, T. Fire performance of external thermal insulation for walls of multistorey buildings. BR 135. Third edition. Watford: Building Research Establishment, 2013.
- MORGAN, H.P., GHOSH, B.K., GARRAD, G., et al. Design methodologies for smoke and heat exhaust ventilation. BR 368. Watford: Building Research Establishment, 1999.
- MORGAN, H.P. and GARDNER, J.P. Design principles for smoke ventilation in enclosed shopping centres. BR 186. Watford: Building Research Establishment, 1990.

Appendix B - ensuring effective fire protection

This report summarises the fire precautions to be included in the buildings and is a strategic document describing the fire safety requirements that are to be employed to meet the requirements of the Building Regulations 2010 and by extension some aspects of the Regulatory Reform (Fire Safety) Order. It does not address business continuity and financial loss because of a fire.

The primary objective of BS 9999 is to ensure that an adequate standard of life safety is achieved in the event of a fire.

The fire precautions described are a package of measures. It is therefore important that any changes made take account of this and their impact on the safety measures as a whole be considered.

All passive and active measures forming part of the building will need to be carefully designed, properly constructed, implemented, and maintained.

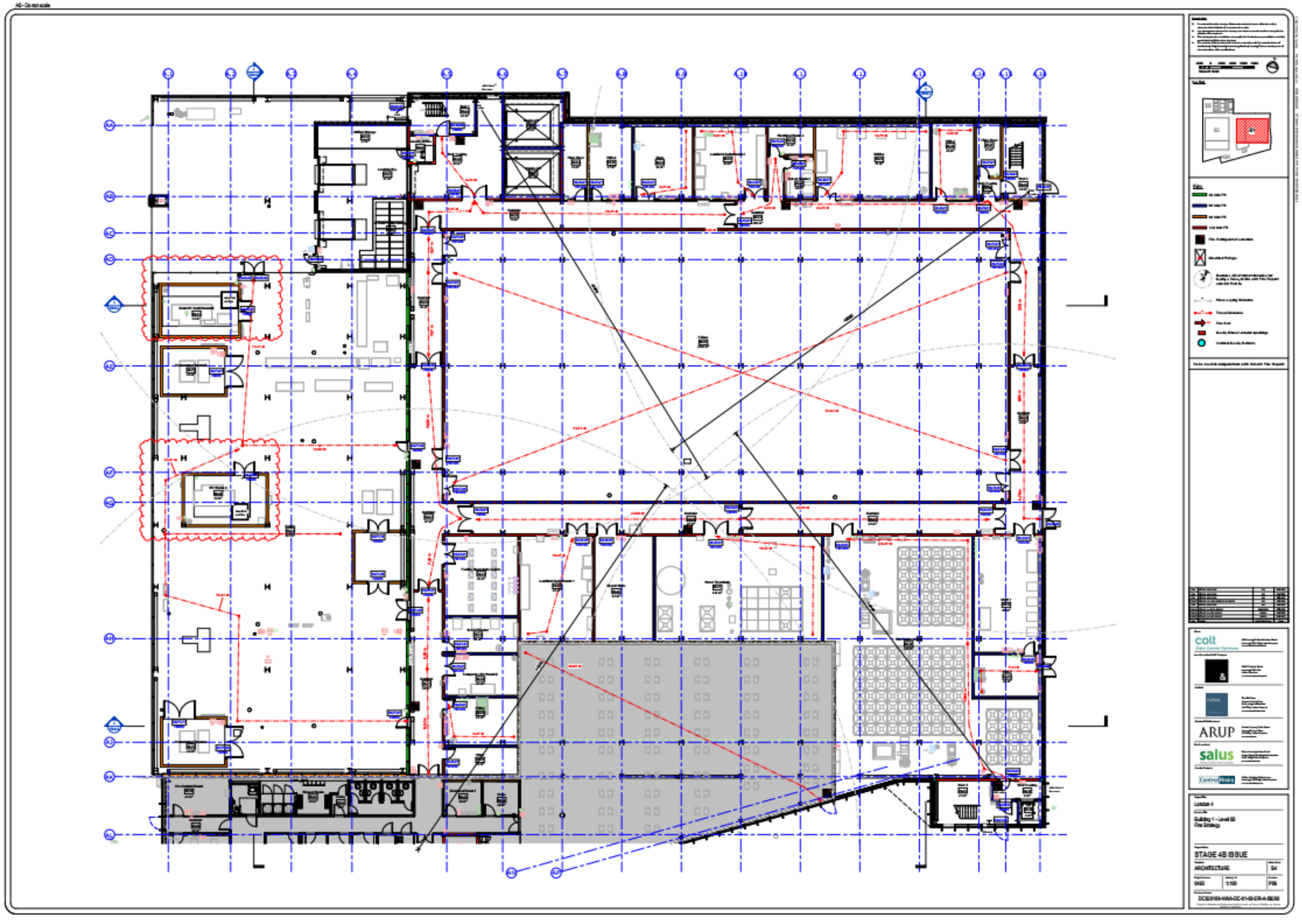
The report details the key assumptions made and a copy will need to be included in the fire safety manual for the building.

The construction management is responsible for quality monitoring during construction. Installation of products should be carried out by third party accredited contractors who understand the relevant fire safety issues.

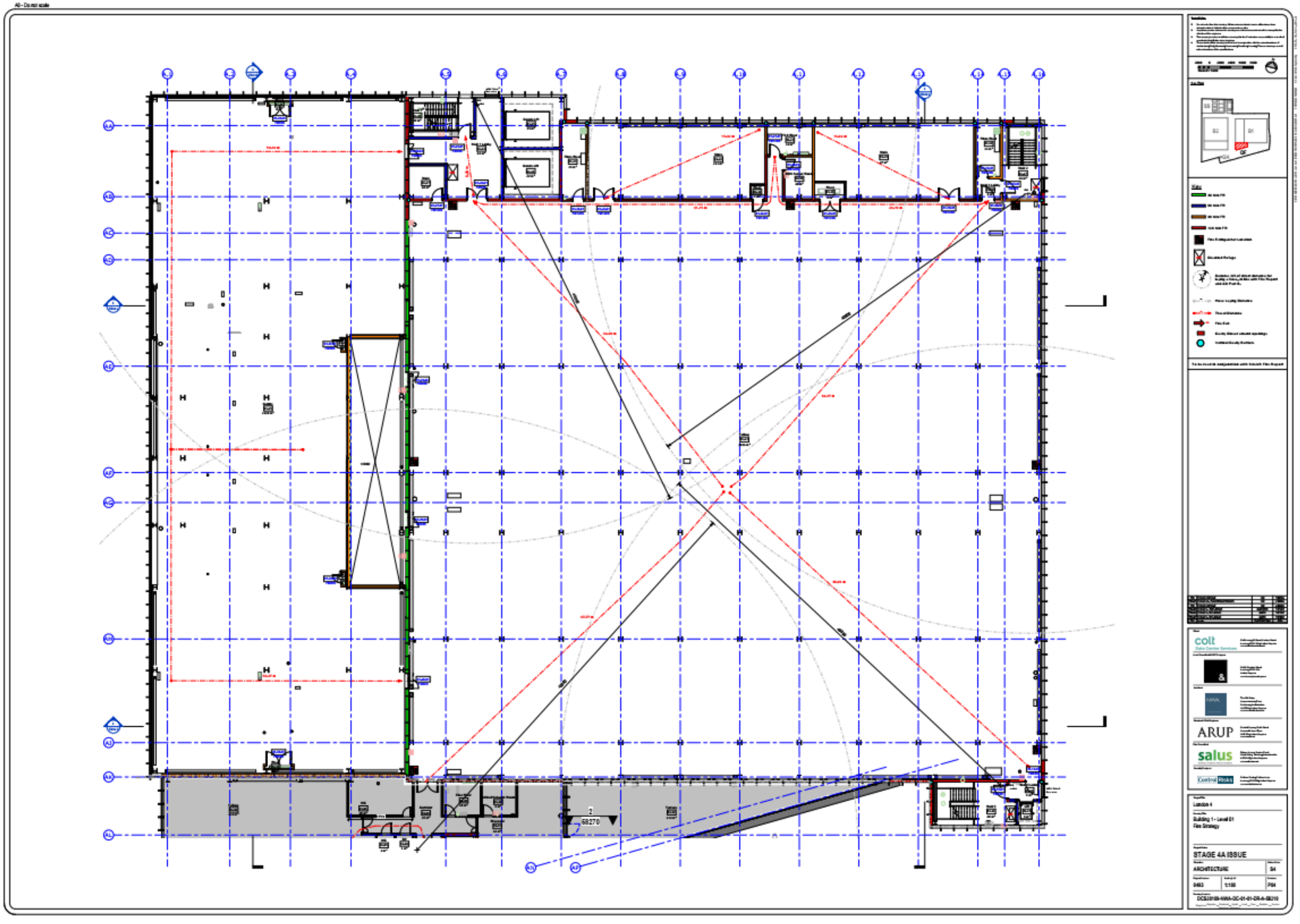
Effective maintenance of the building and its systems is an important part of ensuring effective fire protection. The maintenance regime will need to include testing and inspection to ensure that the precautions included remain effective throughout the life of the building. Works to repair, maintain and alter the building need to be carried out and completed so that they do not compromise fire safety precautions.

Appendix C - NWA Fire Strategy Drawings

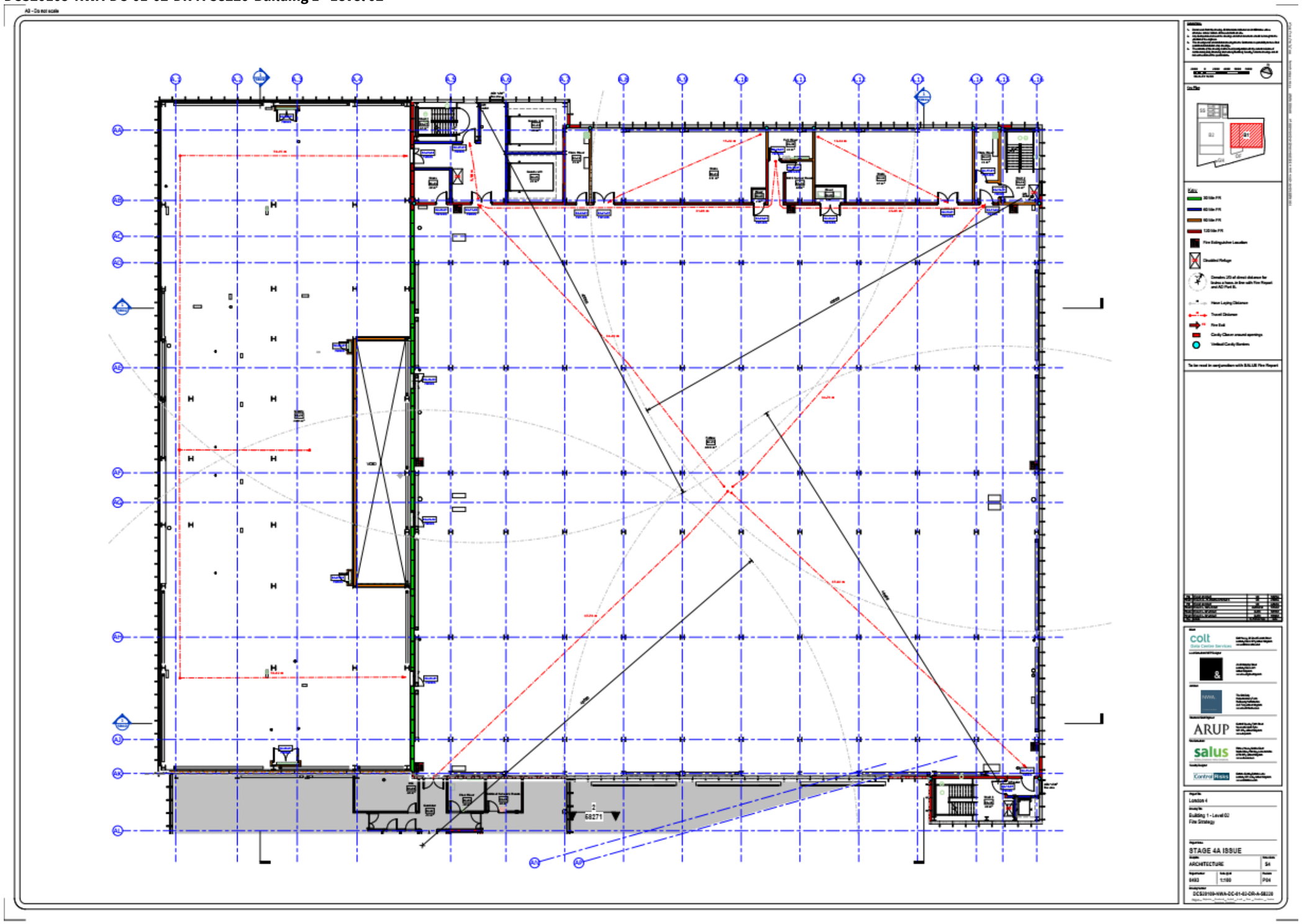
DCS20109-NWA-DC-01-00-DR-A-58200-Building 1 - Level 00



DCS20109-NWA-DC-01-01-DR-A-58210-Building 1 - Level 01



DCS20109-NWA-DC-01-02-DR-A-58220-Building 1 - Level 02



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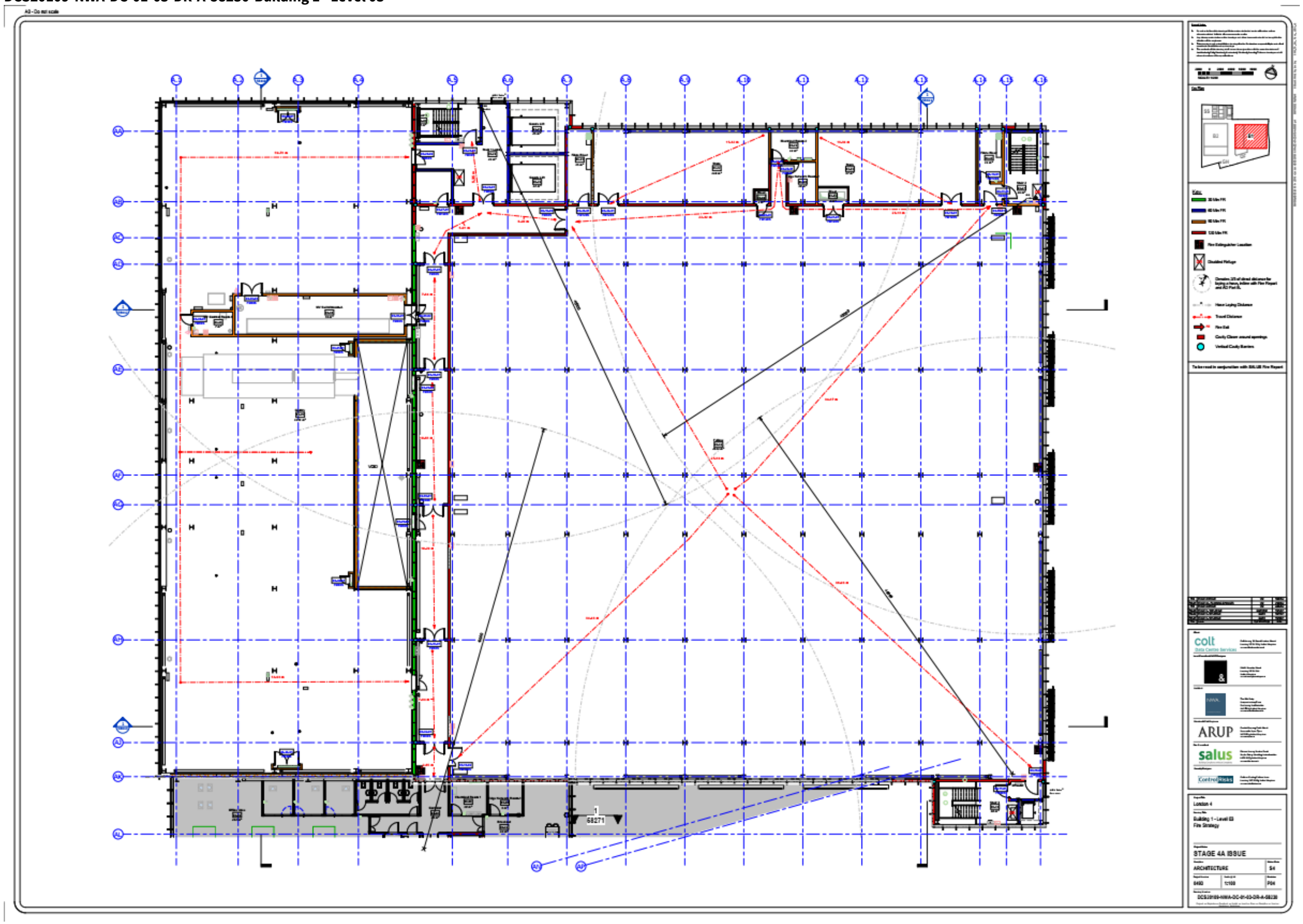

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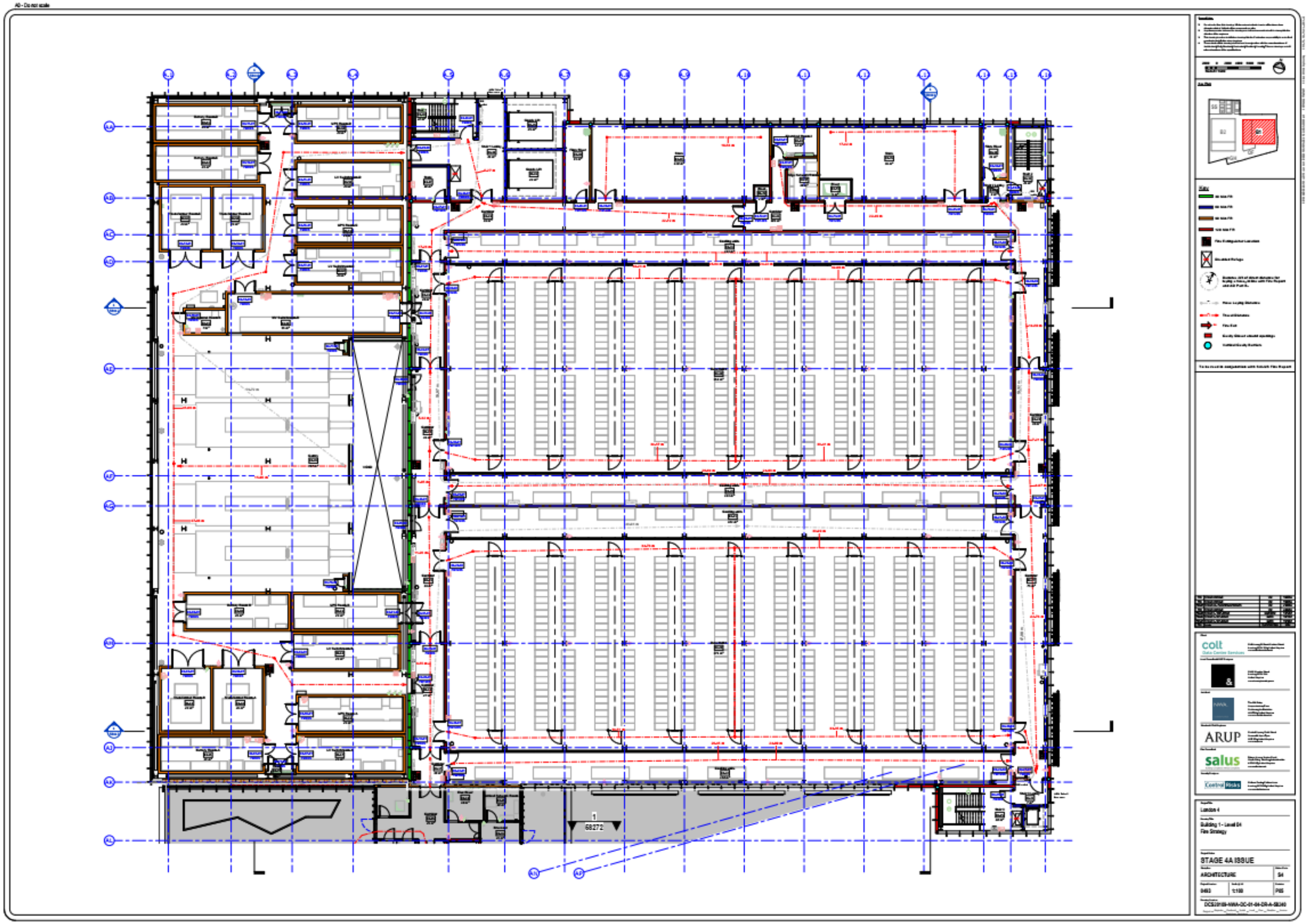
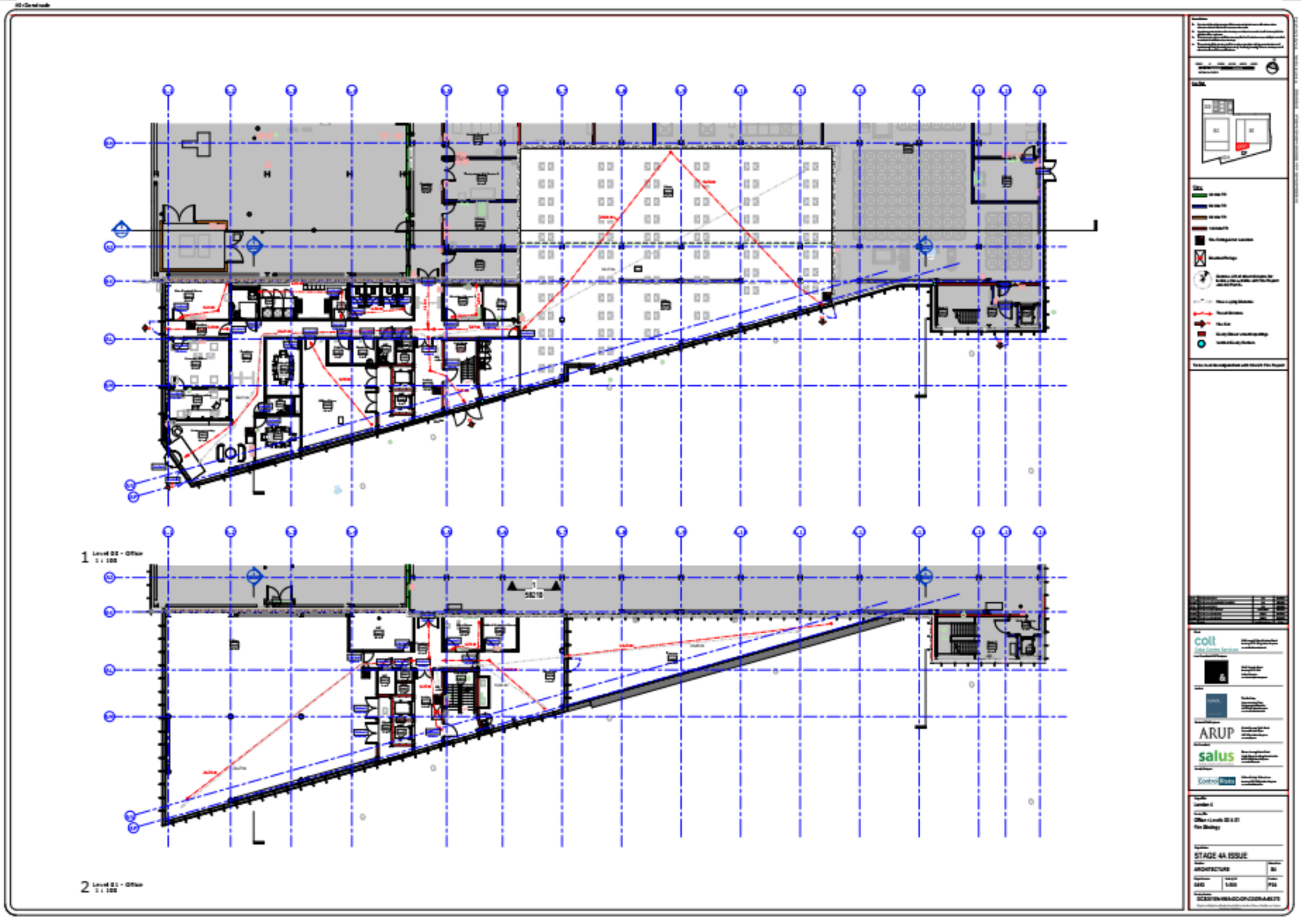
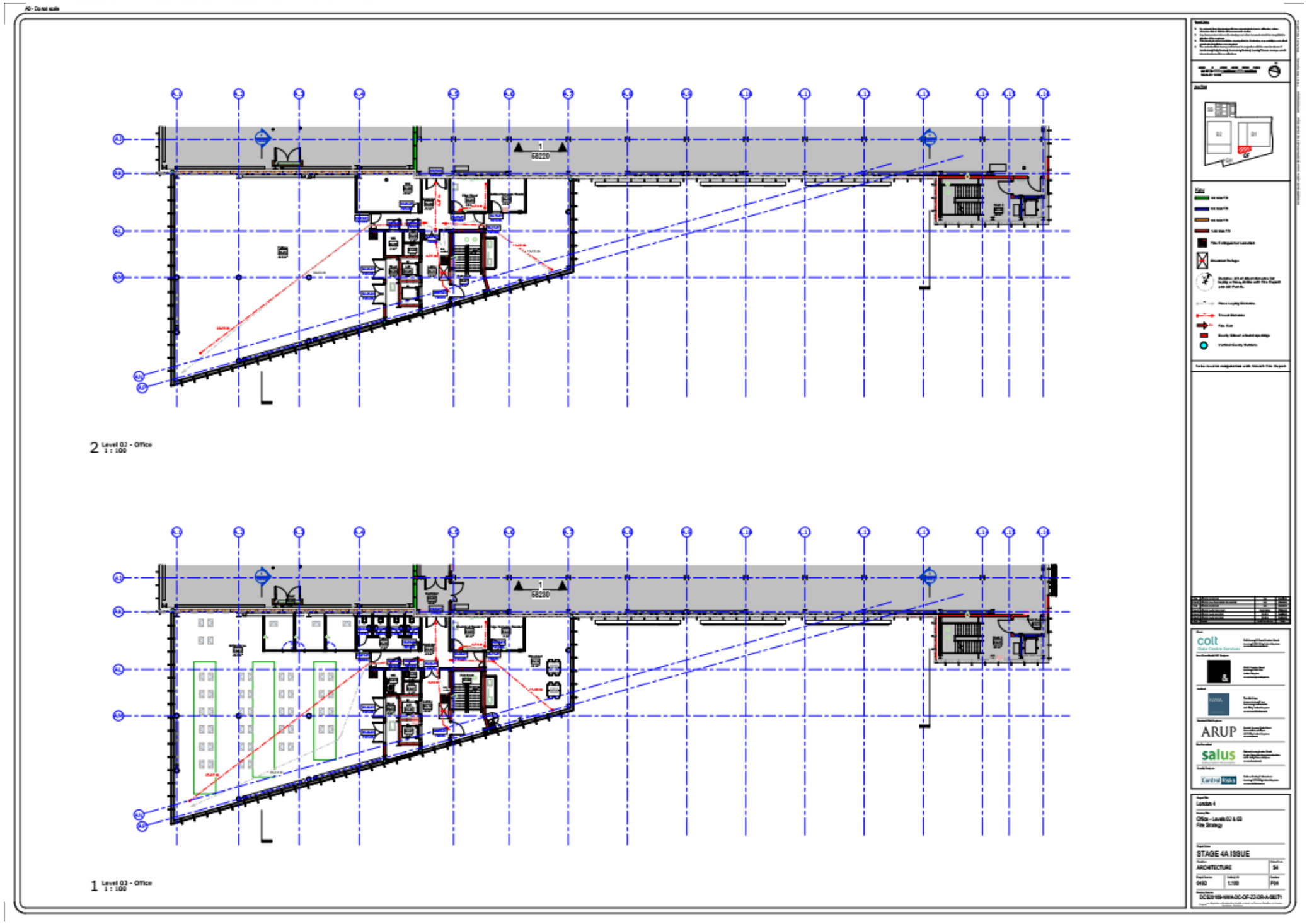


DCS20109-NWA-DC-OF-ZZ-DR-A-58270-Office - Levels 00 & 01

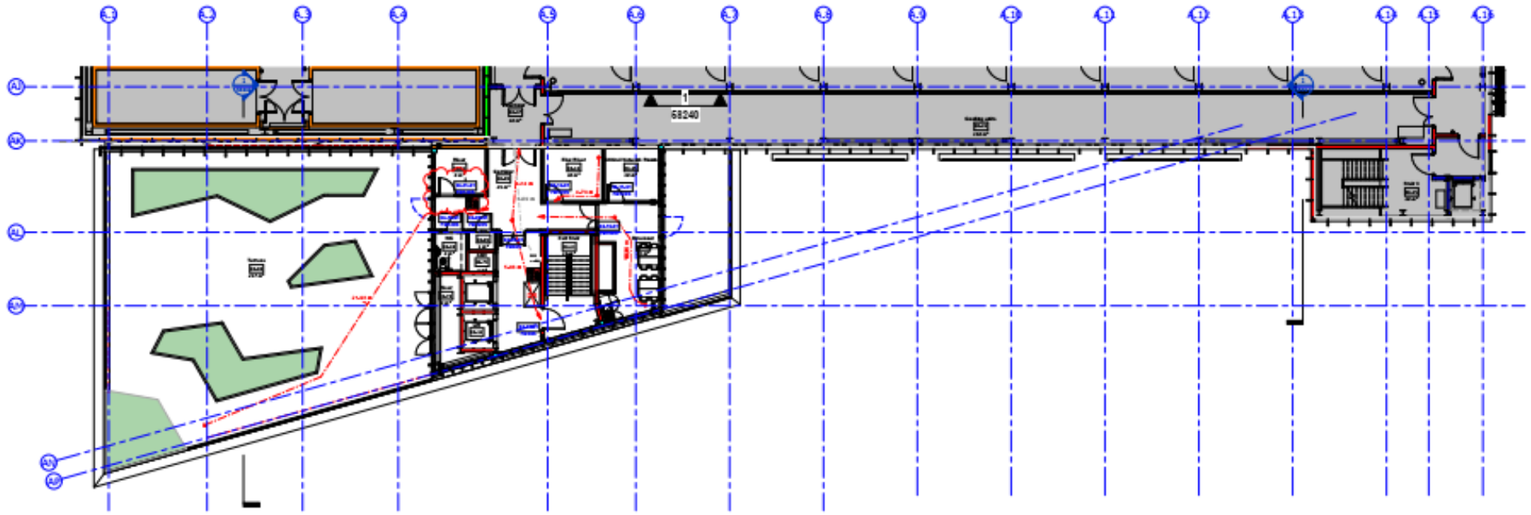


DCS20109-NWA-DC-OF-ZZ-DR-A-58271-Office - Levels 02 & 03

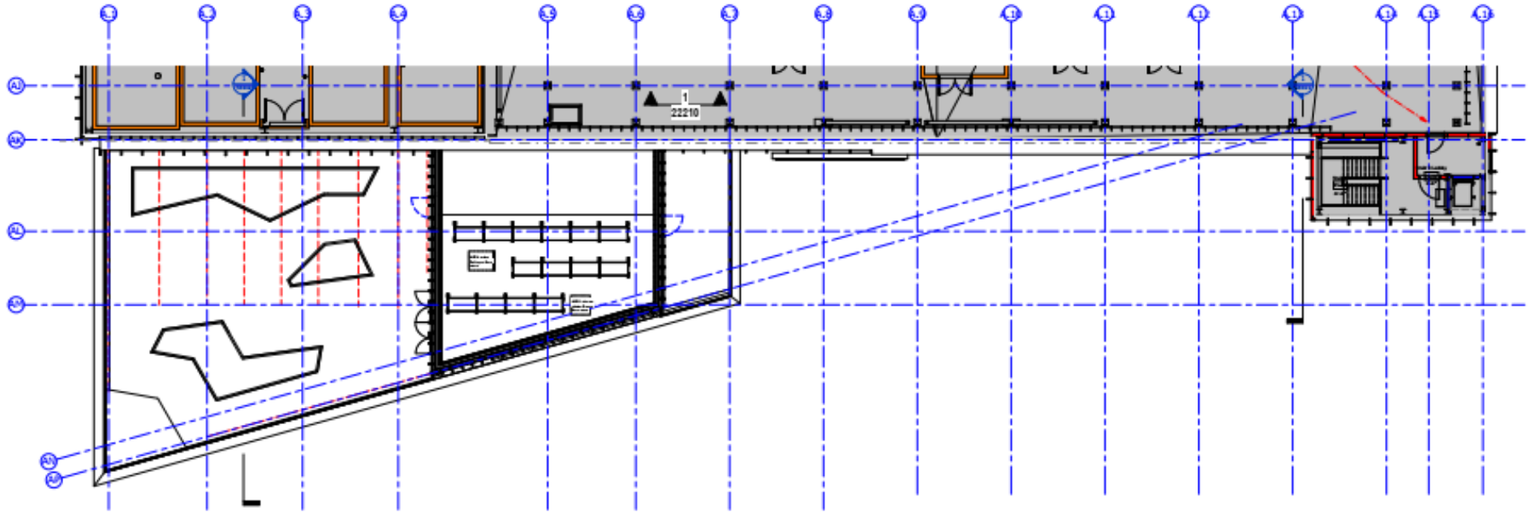


DCS20109-NWA-DC-OF-ZZ-DR-A-58272-Office - Levels 04 & Roof Level 01

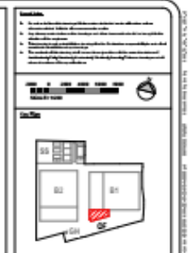
A3 - Do not scale



1 Level 04 - Office
1 : 100



2 Roof Level 01 - Office
1 : 100



London 4

Office - Levels 04 & Roof Level 01
Fire Strategy

STAGE 4A ISSUE

ARCHITECTURE	S4
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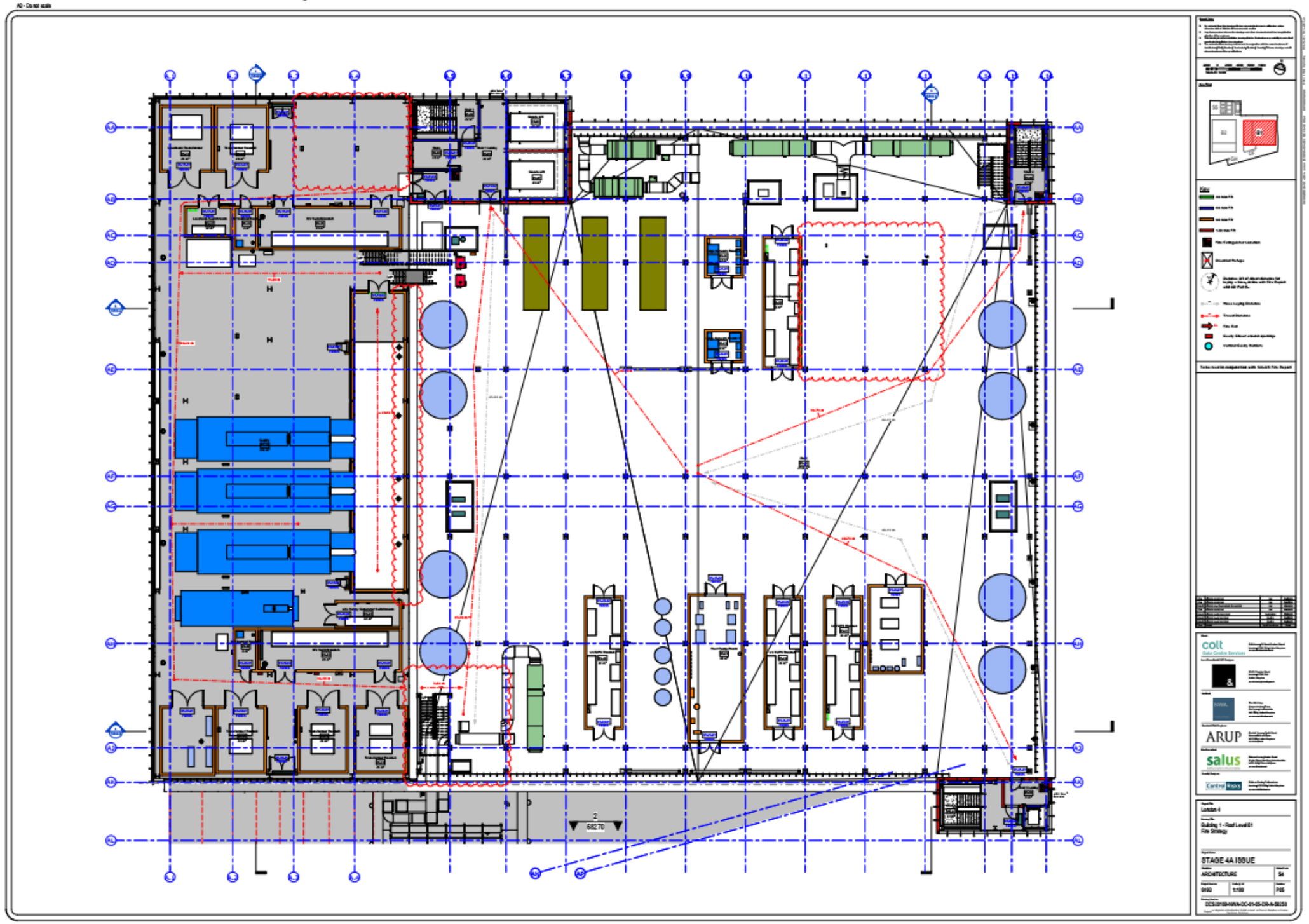
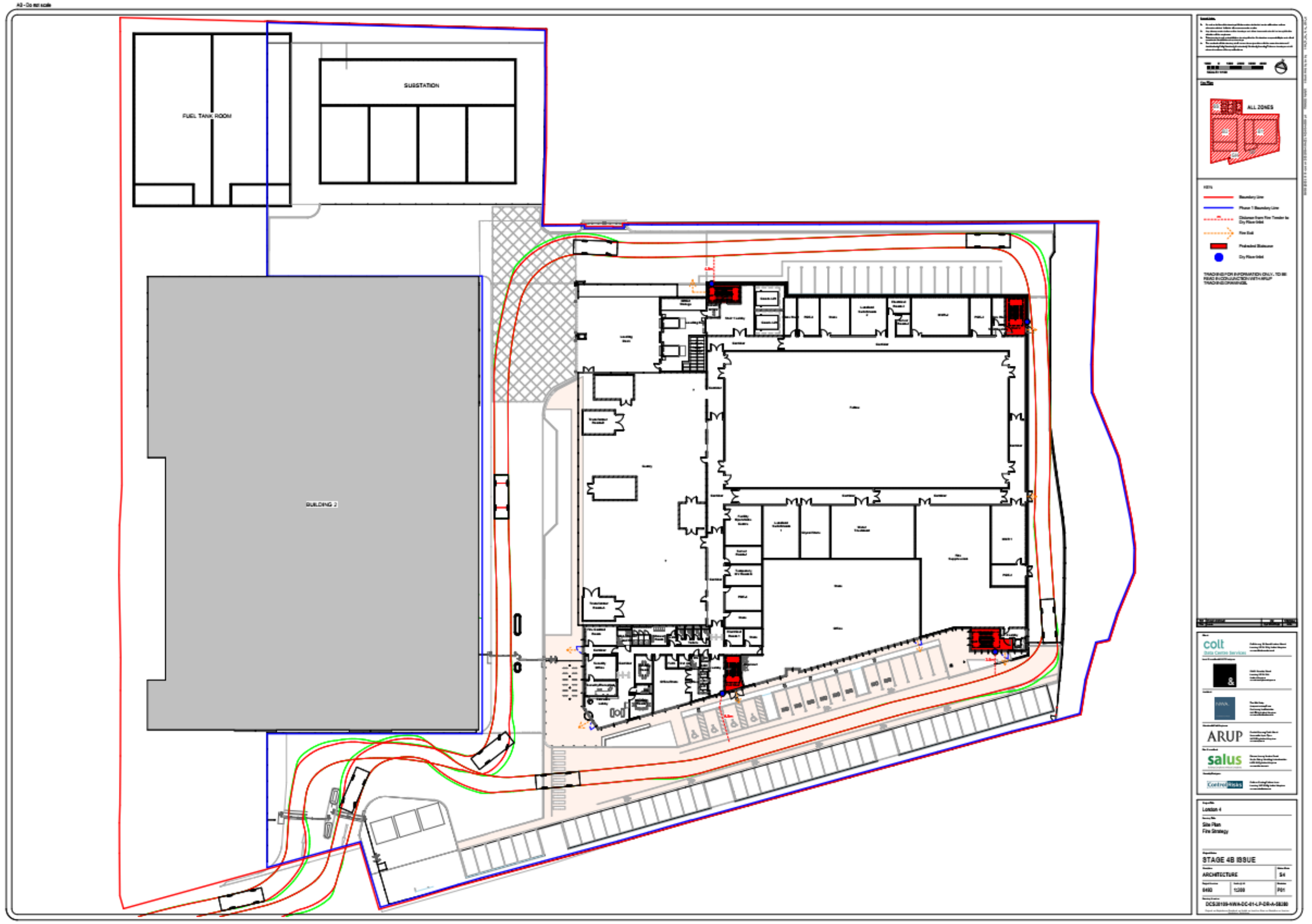
DCS20109-NWA-DC-OF-ZZ-DR-A-58272

DCS20109-NWA-DC-01-05-DR-A-58250-Building 1 - Roof Level 01



Site layout - DCS20109-NWA-DC-01-LP-DR-A-58280



Appendix D - Fuel Storage

Temporary external fuel storage will be provided in the location shown in the plan on the flowing page. As this report addresses safety of people as a result of a fire in the building it does not contain recommendations regarding this part of the site

It is intended that a permanent fuel store building will be erected in the future.

The building will have - risk profile B3.

I order to alter the risk profiles to B3 as above a sprinkler system needs to be designed and installed in the building in accordance with BS EN 12845.

The fuel storage tanks are to be located in a separate building. The Health and Safety Executive have produced guidance for these in “Storage of flammable liquid in tanks” which has been updated to consider the recommendations of the Buncefield Report. The fuel storage area is designed to meet the recommendations of this guidance the notable requirements of this in respect of fire precautions are:

- Single storey none-combustible construction
- Means of removing flammable vapour by mechanical ventilation in the event of an incident.
- High standard of natural ventilation.
- 30-minute fire resistance for walls in the building and external walls where there are other buildings within 4.0m (Note this is increase to 60 minutes in order to meet BS 9999 requirements).
- Adequate means of escape.
- Means of cooing the surface of the tanks in the event of a fire.

Diesel fuel fumes are explosive in the right concentrations when mixed with air. While explosion risk is s is outside the scope of this report it is noted that the DSEAR Regulations will apply and that as a result the Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations will be followed which reduce the risk of a fire.

The commentary in the report also applies to the fuel storage building. In some parts specific requirements are mentioned regarding this build where they differ from the main building.

A0 - Do not scale