HOARE LEA

Manor Farm.
Slough.
Manor Farm Propco Limited.

FIRE ENGINEERING
BASELINE FIRE STRATEGY

REVISION 04 – 13 DECEMBER 2024

STAGE 2

Audit sheet.

Rev.	Date	Description of change / purpose of issue	Prepared	Reviewed	Authorised
00	09/08/2024	Baseline Fire Strategy	DE	DT	SB
01	04/11/2024	Updated to account for alterations to the building layout	DE	DT	SB
02	22/11/2024	Update following comments from the design team	DE	DT	SB
03	27/11/2024	Client name update	DE	DT	SB
04	13/12/2024	Client name update and team comments	DT	--	SB

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Contents.

Executive Summary.

Hoare Lea have been commissioned to provide a Baseline fire strategy for the proposed Data Centre element of the Data Centre and battery energy storage system development at Manor Farm in Slough. This report will address matters relating to means of escape, internal fire spread (linings and structures), external fire spread and Fire Service access, following the guidance and the framework provided in Approved Document B. The fire strategy package for the battery energy storage system falls outside of Hoare Lea's scope of services and has been produced by EDF. The EDF fire strategy has been appended to this fire strategy report for completeness (see Appendix A).

The data centre element of the project consists of a large industrial unit which will comprise three levels of data halls (Ground to Level 02). The topmost occupied storey of the building is Level 02 which is approximately 14m above the lowest adjacent external Ground level. On this basis, the building is required to be provided with 90 minutes structural fire protection. The building will be fitted with an automatic fire suppression system throughout.

This fire strategy is subject to further development at detailed design stage and any recommendations made within this report are subject to discussion and agreement with the Statutory Authorities. The following items are subject to Statutory Approval.

- Travel distances will be measured to protected corridors which will act as a place of relative safety while occupants make their onward escape to the stair cores.
- As it will not be possible to satisfy the perimeter access requirements the building will be provided with firefighting shafts with the addition of fire mains outlets in the corridors to ensure all parts of the building are within 60m from a fire main outlet.
- Ground mounted fire main inlets will be provided where it is not possible to provide access to the façade within 18m of the fire appliance parking position.

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 sections of Approved Document B, or the supporting British Standards referenced therein.

1. Introduction.

The purpose of this report is to provide a Baseline fire strategy for the proposed Data Centre element of the Data Centre and battery energy storage system development at Manor Farm in Slough. The fire strategy will address issues relating to Means of Warning and Escape, Internal Fire Spread, External Fire Spread and Access and Facilities for the Fire and Rescue Service. The fire strategy package for the battery energy storage system falls outside of Hoare Lea's scope of services and has been produced by EDF. The EDF fire strategy has been appended to this fire strategy report for completeness (see Appendix A).

The Data Centre building has been designed under the guidance of Approved Document B.

It is intended that this report is read in conjunction with the following architectural plans produced by Corgans Architects and the marked-up fire strategy plans provided in Appendix B.

- CON-COR-SK-A-01608 – Sketch site plan,
- CON-COR-ZZ-B100-D-A-00203 – Floor Plan – Level Zero -Overall,
- CON-COR-ZZ-B101-D-A-00220 – Floor Plan – Level One -Overall,
- CON-COR-ZZ-B102-D-A-00229 – Floor Plan – Level Two -Overall,
- CON-COR-ZZ-B103-D-A-00238 – Roof plan -Overall,
- CON-COR-ZZ-ZZ-SK-A-01628 – Proposed elevations east and west,
- CON-COR-ZZ-ZZ-SK-A-016289– Proposed elevations north and south,
- CON–COR–ZZ–B1ZZ–D–A–00601 Revision P01.01/ - Building sections, and
- CON-COR-SK-A-01604 -Rotated layout.

It is envisaged that this document, once developed further at the next stage, will be provided as part of the formal Building Regulations submission (in support of Regulation 38 and Part B – Fire Safety) and will be used by the 'responsible person' whilst undertaking the risk assessment of the building, which is required under the Regulatory Reform (Fire Safety) Order 2005.

It is important that the building 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 building that are design to protect lives and property.

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

2. Building Description.

The Data Centre element of the project consists of a large industrial unit, in Slough, which will comprise three levels of data halls (Ground to Level 02).

2.1 Building Height

The height of the building, measured from the lowest adjacent external ground level to the uppermost occupied storey is 14m as highlighted in Figure 1, below.

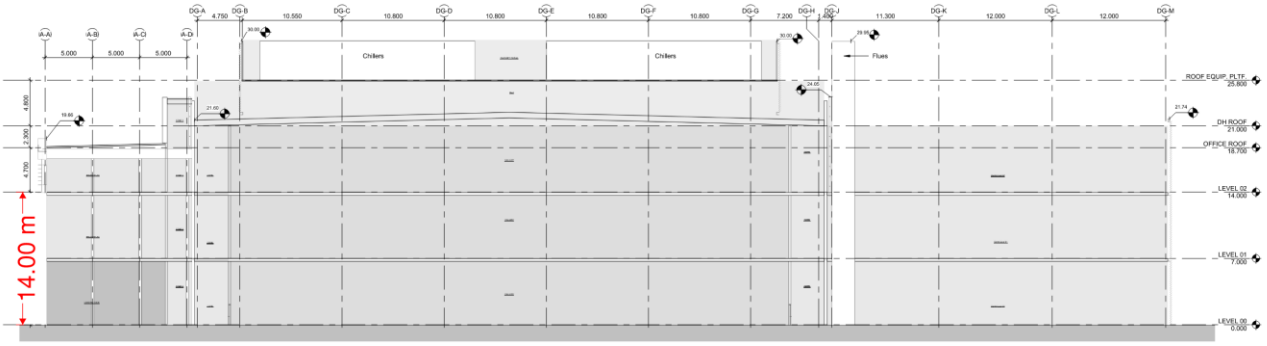


Figure 1 - Height of topmost storey.

The building height measured to the mean roof level is understood to be 20.87m.

2.2 Vertical Circulation

The building is provided with five escape stairs (Stair 1, Stair 2, Stair 3, Stair 4 and Stair 5) which are highlighted in Figure 2, below.

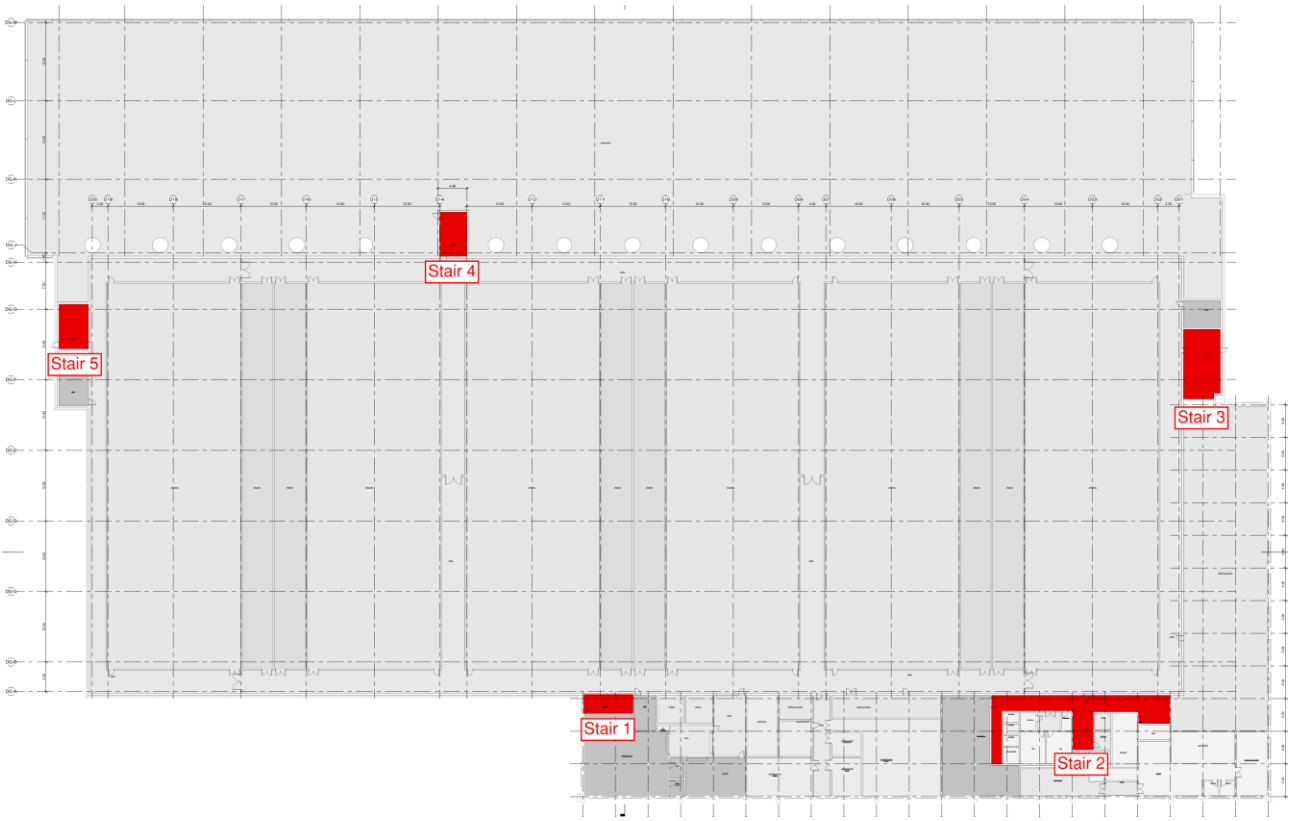


Figure 2 - Vertical Circulation

2.3 Purpose Group

The building contains a mixture of accommodation. However, this is principally to support the main use of the building (i.e. data modules). On this basis, it is proposed to design the building based on purpose group 7a – storage and other non-residential.

2.4 Occupancy

The building will have a low occupancy of staff on site. These may be in any area of the building overseeing the general management as well as undertaking routine maintenance.

2.5 Suppression Systems

The building is not required to have a sprinkler system as a Building Regulations requirement. As the site does not have a tenant at this stage, allowances have been made to ensure the tenant can specify a suppression system to suit their requirements. A tank fed water mist system has been accounted for with space allocated for the tank required. The MMR, electrical rooms and E Pod will be provided with a gaseous suppression system with systems local to the point of use. Finally, the containerised gensets are provided with a foam suppression system, local to the point of use.

3. Statutory Guidance.

3.1 Statutory Legislation

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

- The Building Regulations 2010 (as amended); and
- The Regulatory Reform (Fire Safety) Order 2005.

3.2 The Building Regulations 2010

The buildings will be subject to the requirements of the Building Regulations 2010 (as amended). 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 Approved Document B (AD-B) Volume 2. However, whilst AD-B 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.

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 sections of AD-B Volume 2, or the supporting British Standards referenced therein.

3.3 The Regulatory Reform (Fire Safety) Order

The Regulatory Reform (Fire Safety) Order 2005 (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 the 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 focus 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).

3.4 Property protection

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

3.5 Materials and workmanship

Attention is drawn to Regulation 7(1A) which prohibits the use of relevant metal composite materials (as defined in Regulation 2(6)(c) becoming part of the external wall, or a specified attachment, of any building of any height.

4. Means of Warning and Escape.

4.1 Means of Warning

In accordance with AD-B. the building should be provided with a suitable electrically operated fire warning system with manual call points sited adjacent to exit doors and sufficient sounders to be clearly audible through the building.

However, it is recognised that an automatic fire detection and alarm system will have significant life safety benefits, such as providing occupants with an earlier means of warning in the event of fire compared to a code compliant system of manual call points only.

On this basis, it is recommended that the building is provided with a Category L1/M automatic fire detection and alarm system which is designed and installed in accordance with BS 5839-1.

4.2 Horizontal Means of Escape

4.2.1 Travel Distance

The travel distance in a building should be measured from the most remote point in a room to a storey exit or a final exit.

Where the layout of the room is unknown, then the direct travel distances should be used, which is 2/3rd of the maximum travel distance outlined below.

The distances should be within the permitted limits set out in AD-B, as shown in Table 1, below.

Table 1 - Travel Distance Limitations

Purpose Group/Area	Single Direction Travel Distance (m)	Multiple Direction Travel Distance (m)
Office	18	45
Canteen	18	45
Security	18	45
Loading Dock	25	45
Place of Special Fire Hazard	9	18
Plant Room (Within the room)	9	35
Plant Room (Overall Distance not in Open Air)	18	45
Plant Room (Overall Distance in Open Air)	60	100
General Accommodation	25	45

The proposed room layout including location of doors etc. is subject to further development and, as such, the means of escape provisions will be subject to a more robust review during design development.

At present, the escape from the most remote point in a data hall to a storey exit is approximately 70m (i.e. 25m over the recommended limit), however, occupants can escape from the data halls into circulation corridors within approximately 40m (i.e. 5m under the recommended limit). It is proposed to enclose the corridors in 60 minutes fire resisting construction and, therefore, once occupants reach the corridor they will be in a place of relative safety (similar to a progressive horizontal evacuation strategy in a hospital). In addition, the corridor surrounding each bank of two data halls is provided with a 'running track' arrangement and, therefore, once occupants are in the corridor they will be able to escape in multiple directions reaching various stairs. Coupled

with the enhanced automatic fire detection and warning system, the extended travel distance is considered to be reasonable. However, this will be subject to review and agreement with the Statutory Authorities.

Currently in the electrical gantry, which is to be located in open air, the permitted travel distances are 60m in a single direction and 100m in multiple directions. However, current plans indicate there is a single means of escape from this area located in Stair 4. The provision of additional storey exits into the corridor which will provide access to Stairs 3 and 5 would provide compliance regarding travel distances.

There is limited information provided for the office accommodation with regards to the location of doors. Provided multiple escape routes can be provided from the rooms into the corridors such as to allow occupants to escape away from danger, it is likely that the travel distances will be satisfied, however, this aspect of the design is subject to further review.

4.2.2 Escape Widths

Where a part of a building is provided with more than one escape route, it is assumed that one of the escape routes will be blocked by fire. Therefore, the remaining escape routes should be sufficiently sized to accommodate the maximum population when the widest exit is discounted.

Where the number of persons that may use an escape route exceeds 60 persons, the doors along the escape routes should open in the direction of escape, including final exit doors.

It should be noted that it is understood this building will be unmanned with the exception of maintenance staff when required, and occupancy levels throughout will be limited at these times, however, the guidance outlined in this strategy should be addressed during the design process.

The width of any escape route (i.e. corridors and doors), is dependent on the number of persons required to use the route. The maximum capacity of a corridor/door is based on the escape widths in Table 2, below.

Table 2 - Escape Widths

Maximum Number of People	Minimum Width (mm)
60	750
110	850
220	1050
More than 220	5 per person

4.2.3 Subdivision of Corridors

Any enclosed corridor that connects two or more storey exits and is more than 12m in length should be sub-divided by means of a self-closing smoke sealed fire door (and any necessary associated 30 minute fire-resisting construction), in order to prevent smoke from discounting both storey exits, in accordance with Section 2.26 of AD-B. However, as it is recommended that the circulation corridor should achieve 60 minutes fire resistance, it is recommended that these doors are increased to 60 minutes fire resistance (i.e. E60Sa).

4.2.4 Security / Access Door Controls on Escape Route

In general, doors on escape routes (whether the doors are fire doors) should be either of the following.

- Not fitted with a lock, latch or bolt fastening.
- Fitted only with simple fastenings that are all of the following.
    - Easy to operate; it should be apparent how to undo the fastening.
    - Operable from the side approached by people escaping.
    - Operable without a key.
    - Operable without requiring people to manipulate more than one mechanism.

Doors may be fitted with hardware to allow them to be locked when rooms are empty. If a secure door is operated by code or combination keypad, swipe or proximity card, biometric data, etc., a security mechanism override should be possible from the side approached by people escaping.

Electrically powered locks should return to the unlocked position in all of the following situations.

- If the fire detection and alarm system operate.
- If there is loss of power or system error.
- If the security mechanism override is activated.

Security mechanism overrides for electrically powered locks should be a Type A call point as described in BS 7273-4. The call point should be positioned on the side approached by people escaping. If the door provides escape in either direction, a call point should be installed on both sides of the door.

4.2.5 Inner rooms

An inner room is at risk of fire if a fire starts in the access room. Such an arrangement should only be accepted if all the following conditions are satisfied.

- The occupant number of the inner room does not exceed 60 persons.
- The inner room is not a bedroom.
- The inner room is entered directly from the access room (but not via a corridor)
- The escape route from the inner room does not pass through more than one access room.
- The travel distance from any point in the inner room to the exits from the access room does not exceed the distances in Section 4.2.1 above.
- The access room meets both the following conditions:
  - It is not a place of special fire hazard.
  - It is in control of the same occupier.
- One of the following arrangements is made:
  - The enclosures (walls or partitions) of the inner room stop a minimum of 500mm below the ceiling. The door or walls of the inner room contain a vision panel (minimum 0.1m^2), so people can see if a fire starts in the access room.
  - The access room is fitted with an automatic fire detection and alarm system to warn occupants of the inner room if a fire starts in the access room.

4.3 Vertical Means of Escape

4.3.1 Stair Width

As the number of occupants in the building will be very low (i.e. less than 50 persons), the stairs are only required to achieve a minimum of 800mm clear width, however, it is proposed to design the stairs as firefighting shafts to help facilitate Fire Service access and, on this basis, the stairs are required to achieve a minimum of 1100mm clear width (see Section 7, below, for further details regarding Fire Service access).

Final exits from stairs are not permitted to narrow in the direction of escape and, therefore, should achieve a minimum clear width of 1100mm.

Stairs should discharge direct to the outside or into a protected corridor achieving the same fire resistance as the stair served. Specific attention is drawn to Stairs 1, 2 and 4.

4.3.2 Disabled Refuges

Disabled Refuges should be provided within every protected stair enclosure at every floor level. The refuges should achieve a minimum area of 900mm x 1400mm and be provided with an emergency voice communication system conforming to BS 5839-9 and consist of Type B outstations.

4.4 Other Means of Escape Provisions

Escape signage and emergency lighting will need to comply with the recommendations of AD-B and the supporting British Standards.

5. Internal Fire Spread.

5.1 Wall and Ceiling Linings

The internal walls and linings of the building should be designed to satisfy the following surface spread of flame classifications:

- Small rooms of areas not more than 30m^2 – D-s3, d2,
- Other rooms – C-s3, d2, and
- Other circulation spaces – B-s3, d2.

5.2 Loadbearing Elements of Structure

For a building in purpose group 7a with a finished floor level of greater than 5m, but less than 18m above the lowest adjacent external ground floor level, any loadbearing elements of structure should achieve a minimum of 90 minutes fire resistance.

In accordance with AD-B, elements of structure requiring structural fire resistance include the structural frame, beams or columns, loadbearing wall elements, and floors (including compartment floors). Whilst a structure that only supports a roof does not require fire resistance, structural fire resistance is required where the roof performs the function of a floor (i.e. supporting roof-top plant), supports a roof top means of escape route, or the structure is essential for the stability of a fire rated element of external wall.

5.3 Compartmentation

5.3.1 Compartment Walls

In an unsprinklered building with the height of the top floor less than 18m above Ground, the maximum compartment size permitted is 20,000m^2 on any single floor. The building is approximately 13,500m^2 on a single level and, therefore, no additional compartment walls are required.

5.3.2 Compartment Floors

As the building does not have a storey in excess of 30m, there is no requirement to provide compartment floors.

5.3.3 Firefighting shafts

Firefighting shaft should be enclosed in 120 minutes fire resisting construction and accessed via E60S$_a$ self-closing fire doors. Internal within the shaft (e.g. between the stair and the lobby) elements are permitted to be 60 minutes fire resisting and accessed via E30S$_a$ self-closing fire doors.

5.3.4 Protected Corridors

It is proposed to provide the corridors surrounding the data halls as protected corridors achieving 60 minutes fire resisting construction. All rooms accessed from the corridor should be provided with an E60Sa self-closing fire door.

5.4 Places of Special Fire Hazard

A place of special fire risk is defined in AD-B as one of the following:

- Oil-filled transformer room,
- Switch gear room,
- Boiler rooms,
- Storage place for fuel or other highly flammable substances, or
- Rooms that house a fixed internal combustion engine.

If any of the rooms within the building conform to the above definition, they should be enclosed in 30 minutes fire resisting construction and accessed via E30 fire doors which should be kept locked shut.

5.5 Concealed Barriers and Fire Stopping.

Cavity barriers and fire stopping will be provided in accordance with Sections 9 and 10 of AD-B.

6. External Fire Spread.

6.1 Space Separation Analysis

A preliminary space separation analysis has been conducted using the Enclosing Rectangles methodology described within BR 187 *External fire spread: building separation and boundary distances*, published by the Building Research Establishment. Where buildings are sprinklered the boundary distance may be half that of an otherwise unsprinklered building or the unprotected area may be doubled.

In accordance with the guidance of Section 13.5 of AD-B, a relevant boundary does not exist between storage, office or industrial buildings on the same site and under the same ownership/management. On this basis, it is not considered necessary to assess the risk of external fire spread between this building and the guard house.

The separation distance is measured to the opposite relevant boundary, this may be a site boundary or the mid-point of an adjacent public road.

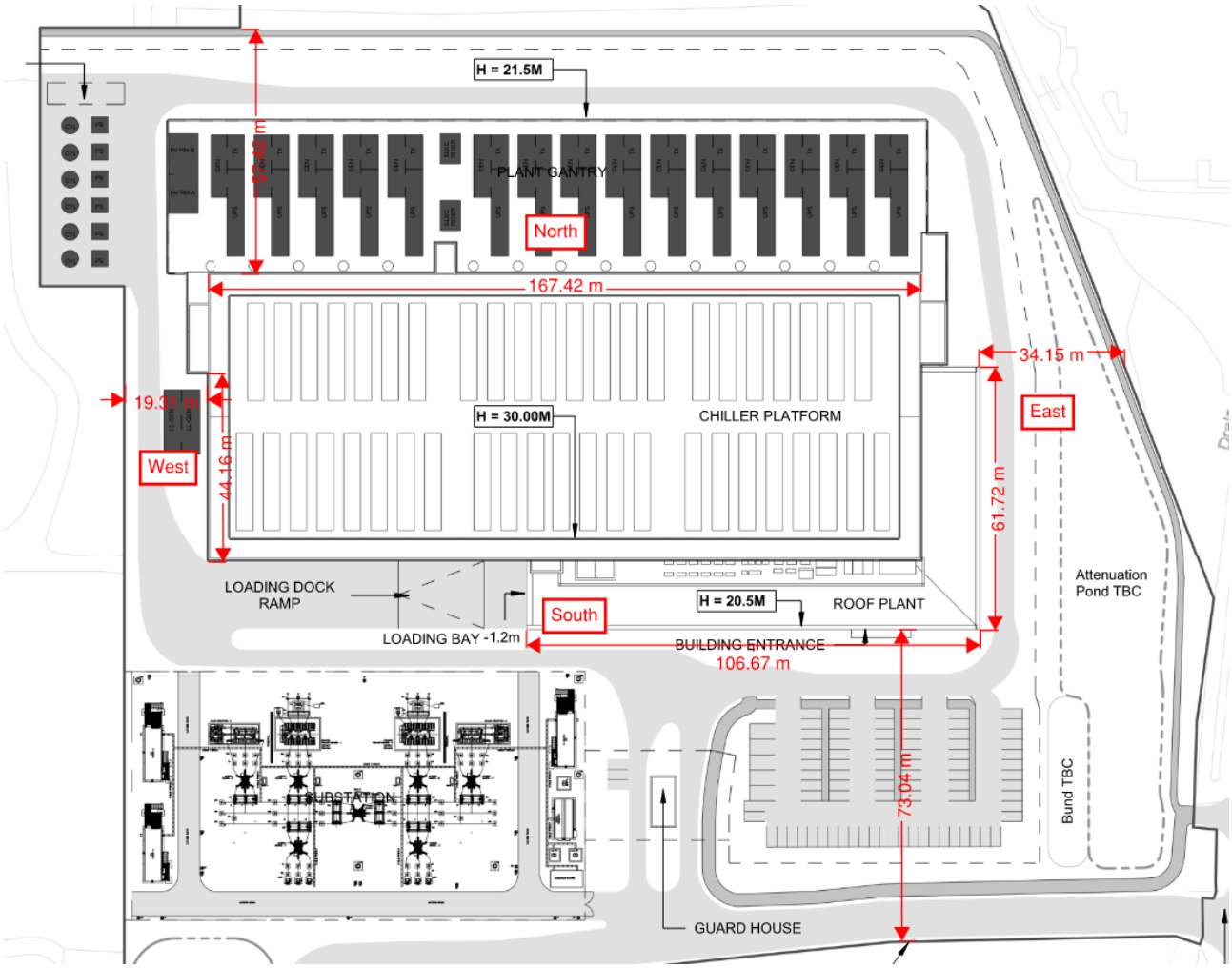


Figure 3 - External Fire Spread Boundary Distances

6.1.1 North Elevation

The external wall of the North elevation overlooks the site boundary at a distance of approximately 57.3m at the narrowest point. The elevation is 167.4m wide by 21m high (3,515.4m^2).

The maximum width of an enclosing rectangle in BR 187 is 130m wide. Considering this width and a height of 24m, 100% of the enclosing rectangle is permitted to be unprotected for a boundary distance of 51.5m. If sprinklers or a water mist system are installed, the required boundary distance is halved to 25.75m. As the elevation is only 29% wider than the maximum value in BR 187, and it is likely a suppression system will be installed, a boundary distance of 57.3m is sufficient and the risk of external fire spread is considered to be negligible. Furthermore, the provision of the protected corridor around the accommodation will provide a fire resisting barrier between the accommodation and the external walls which will mitigate the risk of fire spread.

6.1.2 East Elevation

The East elevation overlooks the site boundary at a distance of 34.15m. The data halls portion of the building is approximately 22.4m high by 11.07m wide (247.97m^2). Considering an enclosing rectangle 24m high 12m wide by (288m^2), 100.% of the enclosing rectangle is permitted to be unprotected.

The office portion of the building is approximately 17.7m high by 59.5m wide (1,053.15m^2). Considering an enclosing rectangle 18m high 60m wide, 100.% of the enclosing rectangle is permitted to be unprotected.

6.1.3 South Elevation

The South elevation overlooks the site boundary at a distance of 73m. This is far in excess of the separation distance outlined in the tables of BR 187 and, therefore, the risk of external fire spread is considered to be negligible.

6.1.4 West Elevation

The West elevation overlooks the phase 2 development boundary, for the purposes of this report this boundary has been treated as a relevant boundary. While the POE portion of the building projects forward, this accounts for a very small portion of the building by comparison to the main data hall portion of the building. On this basis, the risk of external fire spread has been assessed based on the distance to the largest portion of the elevation (i.e. the data hall). The main data hall building is approximately 19.2m away from this boundary. The data halls portion of the building is approximately 67.5m wide by 22.4m high (1,512m^2), considering an enclosing rectangle 80m wide by 24m high (1,920m^2), 61.2% of the enclosing rectangle is permitted to be unprotected (1,175.04m^2). This can be increased to 100% accounting for the provision of sprinklers.

6.2 External Wall Construction

The building does not have a storey that exceeds 18m in height and, therefore, either the external walls should satisfy the performance criteria described in BRE report BR 135 or the external wall surface should be in accordance with Table 12.1 of AD-B for surface spread of flame classification, and cavity barriers in any external wall cavity are required in accordance with Section 9 of the AD-B.

Full reference should be made to the guidance provided in AD-B regarding recommendations for external walls.

7. Fire Service Access.

7.1 Fire Service Access

For a building in purpose group 7(a), with an aggregate floor area of more than 24,000m^2, vehicle access should be provided to 100% of the building perimeter. However, due to the arrangement of the site, this is not achievable and therefore, it is proposed to provide each of the stairs as firefighting shafts comprising of the following elements:

- Ventilated firefighting stair: a 1.0m^2 automatic opening vent is to be provided as high as reasonably practicable at the head of the stair.
- Ventilated firefighting lobby: a 0.6m^2 mechanical smoke extract shaft system serving all floors or a 1.5m^2 Automatic opening vent at every floor level.
- Dry rising main: outlet located within the firefighting lobby on every floor level, to ensure every part of each floor can be reached in a 60m hose distance on a route suitable for laying hose.

Every area of the floor plate should be reached within 60m of a dry rising outlet. It is proposed to provide the corridors around the data modules as protected corridors with additional dry risers located in them. Additional dry rising mains should be provided throughout the protected corridors to allow access to every point in the data modules within 60m of a riser. This is akin to the design of a hospital street whereby dry risers would be provided in the protected corridor (hospital street) at the access points to each department.

In addition, it should be noted that a safe route will be required for the Fire Service through the plant gantry to reach Stair 5. While this route will be external, it is comparable to a protected access corridor, however, while BS 9999 recommends that access corridors should not exceed 18m in length, as this route is external it is considered reasonable for this to be longer through the plant gantry access route. This distance is approximately 30m.

Stair 2 is required to be provided with an access corridor which will be a continuation of the firefighting stair.

The access corridor to Stair 2 and the access route to Stair 5 should be at least 500mm wider than the clear width required for means of escape (i.e. 1100 + 500 = 1600mm).

This is subject to approval by the Statutory Authorities.

7.2 Vehicle Access

The vehicle access route for a pump appliance should meet the following specifications in accordance with AD-B.

Table 3 - Fire Appliance Turning Requirements

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

Fire and Rescue Service vehicle should not have to reverse more than 20m from the end of an access road.

As the building will be fitted with dry fire mains, both of the following apply.

- Access should be provided for a pumping appliance to within 18m of each fire main inlet connection point.
- The fire main inlet connection point should be visible from the parking position of the appliance.

Due to the size of the plant gantry access will not be possible within 18m and, therefore, it is proposed to provide ground mounted fire main inlet points which the Fire Service can connect to within 18m of the fire appliance parking position.

7.3 Hydrants

As the building has a compartment greater than 280m^2, if the building is being erected more than 100m from an existing hydrant, then private hydrants may be required. The location of any existing hydrants is subject to confirmation via a site survey (by others).

It is understood at this stage that the building is within 100m of an existing hydrant.

Appendix A – EDF Battery Storage Fire Strategy.

Section 1 – General

1.1 Introduction

EDF Renewables has a large pipeline of Battery Energy Storage System (BESS) projects both standalone and co-located with other renewable energy technologies. As a responsible developer and operator of BESS facilities, EDF-R has taken the proactive approach of developing this Fire Safety Philosophy which captures how the risk of fire associated with Li-ion batteries is managed at its facilities.

The main fire risks associated with Li-ion batteries are attributed to Class B – Electrolytic Fires which can result from physical damage to a battery cell, Class E – Electrical Fires in electrical system components and Class D – Thermal Runaway. A Thermal Runaway event in an individual cell can be caused by electrical abuse, physical damage, or thermal abuse from prolonged exposure to Class B or E fires. This document is focused on highlighting how Thermal Runaway events are firstly prevented and the mitigation techniques considered should the event occur.

Section 1 of this document outlines the general provisions which will feature in the development of BESS sites while Section 2 will document any site-specific requirements not captured or requiring greater detail of protection than mentioned in Section 1.

1.2 Standards and Codes

The measures outlined in section 1.4 were developed using considerations from UK guidance, international best practices used in the wider EDF Group and applicable international standards.

This document considers recommendations from the following best practice documentation in the UK and internationally:

- Grid Scale Battery Energy Storage System Planning – Guidance for FRS (NFCC)
- NFPA 855 – Standard for the Installation of Stationary Energy Storage Systems
- NFPA 68 – Standard on Explosion Protection by Deflagration Venting
- NFPA 69 – Standard on Explosion Prevention Systems
- NFPA 2010 – Standard for Fixed Aerosol Fire-Extinguishing Systems
- FM Global Property Loss Prevention Data Sheets 5-33
- UL9540A Testing Compliance

1.3 Fire Safety Methodology

The approach developed to minimise the fire risk at our BESS sites follows the Hierarchy of Controls as depicted in Figure 1. This approach is intended to ensure there are several barriers in place to 1) reduce the likelihood and 2) mitigate the consequences of any fire events during the operational life of an EDF-R BESS site. These controls are imperative to protecting maintenance and emergency response personnel, the environment and both EDF-R and 3rd-party assets.

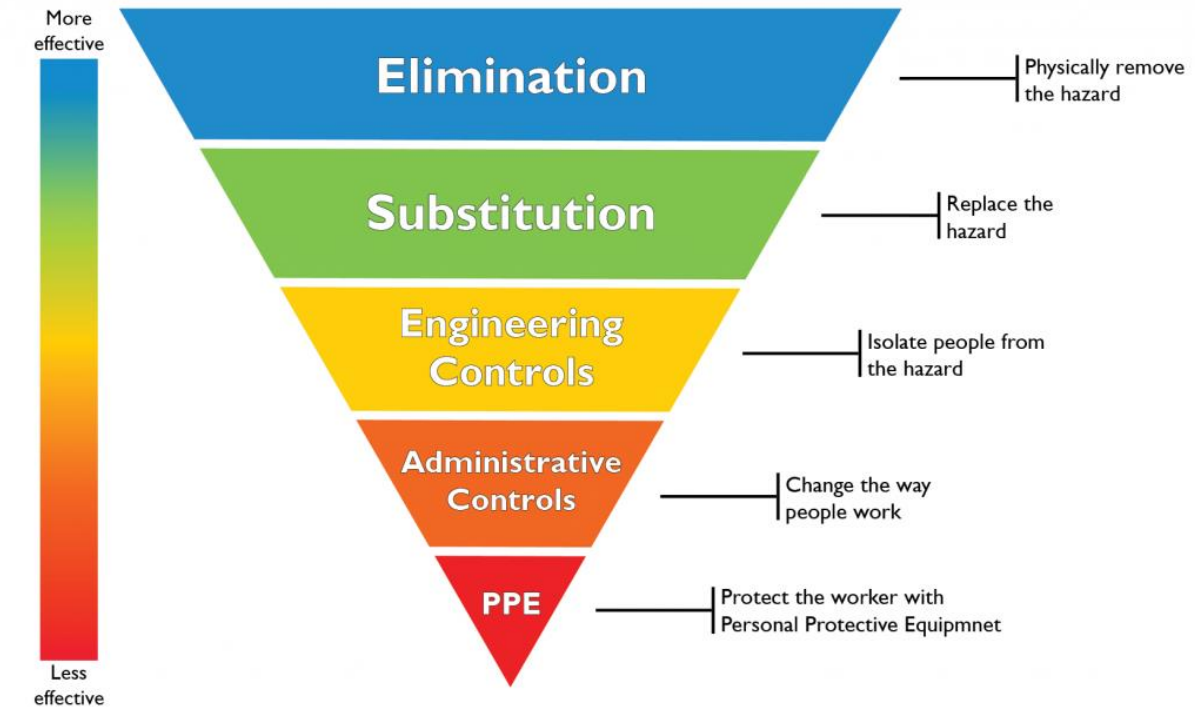


Figure 1: Hierarchy of Controls

1.4 BESS Fire Protection Measures

1.4.1 Elimination

Major Equipment Supplier (MES) Qualification and Selection

EDF-R utilises an extensive multiphase MES qualification process which evaluates the safety, quality control and assurance, testing, R&D and a range of other criteria for new and existing suppliers. Supplier factory audits are also a key component of the qualification process. A specific aspect for BESS suppliers is the testing and certification of their cell, module and BMS and the barriers designed within their equipment package to reduce the fire risks.Testing of battery equipment per UL9540A – UL9540A reports (cell, module and unit) are required to be provided by the equipment supplier during the tender process – these are then reviewed by specialised EDF Energy engineers. EDF-R only accepts bids from suppliers that demonstrate no module-to-module propagation during testing. As an additional barrier of protection, EDF Research & Development (France) conducts its testing of cell related risks under abusive conditions to a greater analyse the off gases produced during cell venting under a thermal runaway event. The testing conducted by EDF RD provides a critical input in understanding the volume of off gases which are likely to be produced and adequate steps to mitigate the impacts.

Equipment Design and Site Operation

The design configuration of the BESS enclosures provides a passive barrier of protection as the immediate threat to life of maintenance, emergency response and other personnel is avoided through physical space restrictions within the enclosures, thereby preventing access.

Exposure risks to personnel are further eliminated as the BESS site will operate unmanned with monitoring done autonomously through the onsite control systems in addition to 24/7 monitoring by a remote-control room.

1.4.2 Substitution

Transformers are an integral component of BESS sites, with coil and core insulation facilitated by oil. To reduce the fire risk in the event of a spill, a non-mineral oil which is less flammable is used as the insulating fluid.

1.4.3 Engineering Controls

The BESS enclosures feature several engineering controls ranging from passive barriers to active monitoring and detection systems. These measures are employed to further reduce the likelihood (pre-event) and consequences (post-event) of a fire at our BESS facility. These controls include:

1) BESS equipment specifications and installation guidelines
    a) All major equipment (BESS enclosures, power converting systems and inverter/rectifier transformers) is installed per the manufacturer's equipment spacing requirements for maintenance and safety clearances.
    b) Battery Management System (BMS) - provides early detection of potential cell failure which could result in a Thermal Runaway event. The critical cell is identified, automatically disconnected and isolated before further degradation and ultimately a Thermal Runaway event can be initiated. The BMS also provides cell and module over and under voltage protection, alert, and correction.
    c) Cell Level Protection – protection provided at cell level which is also controlled by the BMS:
        (i) Battery cells fitted with current interrupting devices (CIDs) which allow for automatic isolation of individual cells during an external short.
        (ii) Overcharge safety device (OSD) – activated due to current interruption during over-charge.
        (iii) Cells outfitted with a safety function layer through ceramic coating which is designed to suppress Thermal Runaway within the cell.
    d) 1-hour fire-rated walls – 2-hour protection from one BESS enclosure to another. (back-to-back container)
    e) Flammable gas detectors (H_2 and CO) monitored by BMS with automatic shutdown capabilities.
    f) Smoke Detector
    g) Heat Detector
    h) Siren and Strobe Alert
    i) Fire Alarm Control Panel (FACP) – one unit per enclosure/row connected to a central BMS.
    j) Aerosol protection to extinguish Class E fires in electrical components Intended for use on Class E fires only, not designed to prevent or combat a Thermal Runaway event.
    k) Deflagration panel(s) – designed to structurally fail at a lower pressure than the enclosure structure, reducing overpressure. Any blast overpressure of gases is directed upwards, and away

from emergency personnel in the event of ventilation system failure or a failure to remove flammable gases at a satisfactory rate.

l) Ventilation System – sequenced after the Flammable Detectors are activated and signals the BMS of the presence of flammable gases. The ventilation system is designed to limit the maximum concentration of flammable gases to 25% of the lower flammable limit (LFL) of the total enclosure volume.

1.

2) Firewater protection via a static water tank, hydrant, or other source with a capacity of at least 1900 L/hr for 2 hours (min 228m^3 of storage). The fire water is intended to provide exposure cooling to adjacent units and along the site boundaries to contain fire events within the BESS compound rather than direct water application on any ignited BESS unit. (for hydrant, address hose length in Section 2)
3) Standard EDF site layout and separation distances:
   a) 30m separation distance (minimum) from the BESS site boundary and occupied building per NFPA 855
   b) 10m separation from combustible vegetation
   c) 3.3m BESS row separation (3.1m required per NFPA 855)
   d) 6.5m fire break between groups of equipment where possible
   e) 10m separation between the water tank and BESS nearest enclosure.
4) Plume Modelling to analyse downwind concentration and impacts of potential toxic gas release.

2.

In addition, EDF Renewables has received proprietary testing reports from a supplier who performed a sustained fire experiment in a controlled environment on its BESS equipment. The report concluded that the fire event did not propagate to the adjacent units which further strengthens the testing referenced in point #2 above.

1.4.4 Administrative Controls

EDF-R utilises internal procedures, stakeholder engagement and response planning to manage the residual risks which remain after the designed engineering controls.

Local Fire and Rescue Service Consultations

Early engagement with the local FRS forms a critical input during the development and early design phase of BESS sites. The process begins with consultation with local FRS during the initial site design which can provide further guidance to the development engineering works for the BESS site. The finalised designs and site layout cater to the equipment of the local FRS with provisions for site access, adequate turning circles and fire water capacity. EDF-R also facilitates site walkthroughs to ensure familiarisation once the site has been fully commissioned.

Development of Emergency Response Plan

An ERP will be developed for the BESS site in alignment with current UK civil response procedures using the bronze (operational), silver (tactical) and gold (strategic) command and control structure. The ERP will be informed by site-specific risks and detail the level of response required following activities such as the consultation with local FRS and other emergency services, the recommendations of the plume analysis and any other risk or impact assessments conducted. All EDF-R personnel deployed to the site will be adequately trained and act as tactical liaisons. Site-specific risk information will be available at the site entrance(s) to aid in response efforts.

Risk Assessments

EDF-R commissions a series of risk assessments with our BESS equipment suppliers. These risk assessments contain many of the engineering controls detailed in this document and are presented using the BowTie Methodology. This process allows us to have a global risk management approach across our sites and to ensure a level of standardisation among different equipment suppliers while also factoring in site-specific risks.

1.4.5 PPE

All personnel on site whether during construction, commissioning or during operation will have the minimum PPE requirement necessary to be on site. In addition, there will be adequate signage detailing the required PPE for each site.

Section 2 – Site Specific Requirements

This section details any site-specific requirements which may be as a result of site constraints or engagement with the local FRS which are not captured in Section 1.

Details

Appendix B – Marked-up Fire Strategy Comments.

HOARE LEA

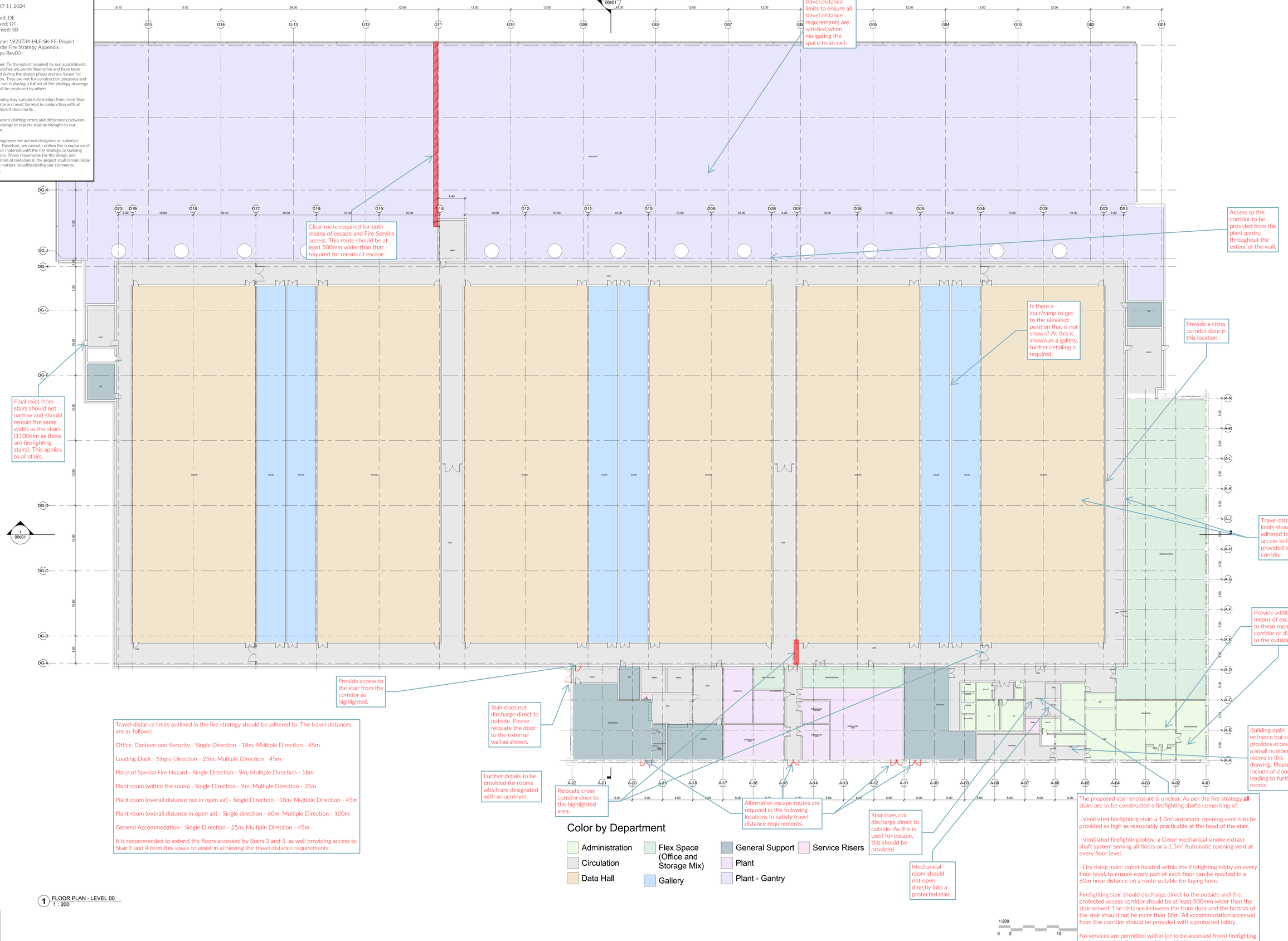
Project Name: Project Concorde

Sketch Title: Fire Strategy Appendix Markups

Date: 27 11 2024

Prepared: DE
Reviewed: DT
Authorised: SB

File name: 1923734-HLE-SK-FE-Project Concorde Fire Strategy Appendix Markups-Rev00



Travel distance limits outlined in the fire strategy should be adhered to. The travel distances are as follows:

Office, Canteen and Security - Single Direction - 18m, Multiple Direction - 45m

Loading Dock - Single Direction - 25m, Multiple Direction - 45m

Place of Special Fire Hazard - Single Direction - 9m, Multiple Direction - 18m

Plant room (within the room) - Single Direction - 9m, Multiple Direction - 35m

Plant room (overall distance not in open air) - Single Direction - 18m, Multiple Direction - 45m

Plant room (overall distance in open air) - Single direction - 60m, Multiple Direction - 100m

General Accommodation - Single Direction - 25m, Multiple Direction - 45m

It is recommended to extend the floors accessed by Stairs 3 and 5, as well providing access to Stair 1 and 4 from this space to assist in achieving the travel distance requirements.

The proposed stair enclosure is unclear. As per the fire strategy **all** stairs are to be constructed a firefighting shafts comprising of:

-Ventilated firefighting stair; a 1.0m² automatic opening vent is to be provided as high as reasonably practicable at the head of the stair.

-Ventilated firefighting lobby; a 0.6m² mechanical smoke extract shaft system serving all floors or a 1.5m² Automatic opening vent at every floor level.

-Dry rising main: outlet located within the firefighting lobby on every floor level, to ensure every part of each floor can be reached in a 60m hose distance on a route suitable for laying hose.

Firefighting stair should discharge direct to the outside and the protected access corridor should be at least 500mm wider than the stair served. The distance between the front door and the bottom of the stair should not be more than 18m. All accommodation accessed from this corridor should be provided with a protected lobby.

No services are permitted within (or to be accessed from) firefighting shafts other than those associated with the operation of the firefighting shaft.

1 FLOOR PLAN - LEVEL 00
1 : 200

CORGAN

Architect name
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N

NOTES:

Do not scale. Figured dimensions only to be taken from this drawing. Check dimensions on site and report discrepencies back to the Architect.
All areas have been measured from current drawings. They may vary because of (e.g) survey, Construction tolerances, Statutory requirements or re-definition of the area to be measured.

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Rev	Revision Description	Date	Author/ Reviewer

WIP

Client:

Project: CONCORDE

Address: Poyle Road, Slough, SL3 0BL, England, U.K.

Title:
FLOOR PLAN - LEVEL ZERO - OVERALL

Scale	1 : 200	Size	A0
Date		Drawn	Author
Job Number	24303.0000	Checked	Checker

CON - COR - ZZ - B100 - D - A - 00203

Project	Originator	Functional Breakdown	Spatial Breakdown	Form	Discipline	Number

STATUS S1 REVISION

HOARE LEA

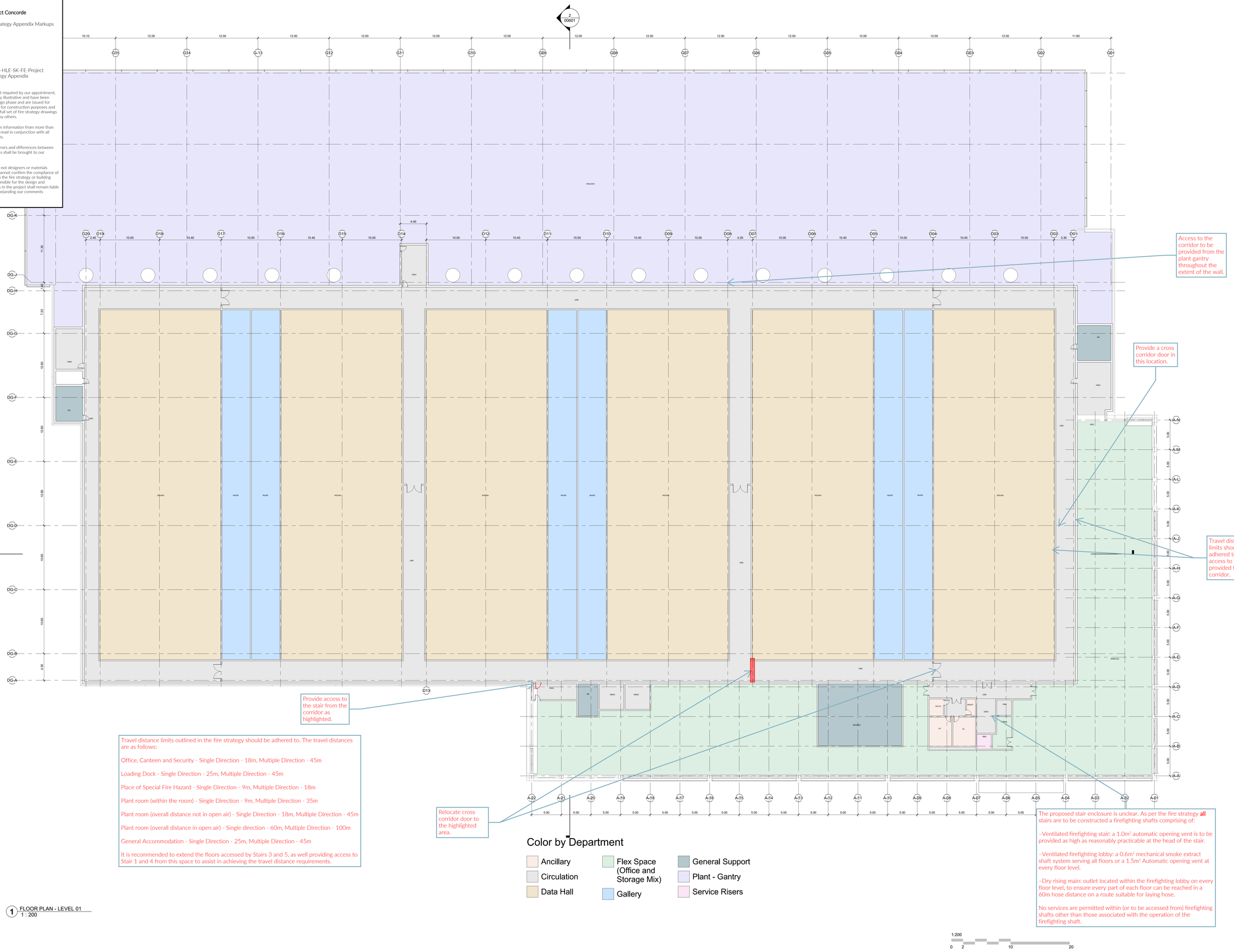
Project Name: Project Concorde

Sketch Title: Fire Strategy Appendix Markups

Date: 27 11 2024

Prepared: DE
Reviewed: DT
Authorised: SB

File name: 1923734-HLE-SK-FE-Project Concorde Fire Strategy Appendix Markups-Rev00



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Loading Dock - Single Direction - 25m, Multiple Direction - 45m

Place of Special Fire Hazard - Single Direction - 9m, Multiple Direction - 18m

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Plant room (overall distance not in open air) - Single Direction - 18m, Multiple Direction - 45m

Plant room (overall distance in open air) - Single direction - 60m, Multiple Direction - 100m

General Accommodation - Single Direction - 25m, Multiple Direction - 45m

It is recommended to extend the floors accessed by Stairs 3 and 5, as well providing access to Stair 1 and 4 from this space to assist in achieving the travel distance requirements.

Color by Department

- Ancillary
- Circulation
- Data Hall
- Flex Space (Office and Storage Mix)
- Gallery
- General Support
- Plant - Gantry
- Service Risers

The proposed stair enclosure is unclear. As per the fire strategy **all** stairs are to be constructed a firefighting shafts comprising of:

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-Ventilated firefighting lobby: a 0.6m² mechanical smoke extract shaft system serving all floors or a 1.5m² Automatic opening vent at every floor level.

-Dry rising main: outlet located within the firefighting lobby on every floor level, to ensure every part of each floor can be reached in a 60m hose distance on a route suitable for laying hose.

No services are permitted within (or to be accessed from) firefighting shafts other than those associated with the operation of the firefighting shaft.

1:200
0 2 10 20

1 FLOOR PLAN - LEVEL 01
1 : 200

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Rev	Revision Description	Date	Author Reviewer

WIP

Client:

Project: CONCORDE

Address: Poyle Road, Slough, SL3 0BL, England, U.K.

Title:
FLOOR PLAN - LEVEL ONE - OVERALL

Scale	1 : 200	**Size**	A0
Date		**Drawn**	Author
Job Number	24303.0000	**Checked**	Checker

CON - COR - ZZ - B101 - D - A - 00220

Project	Originator	Functional Breakdown	Spatial Breakdown	Form	Discipline	Number

STATUS S1 **REVISION**

23-05-2024 20:06:11

HOARE LEA

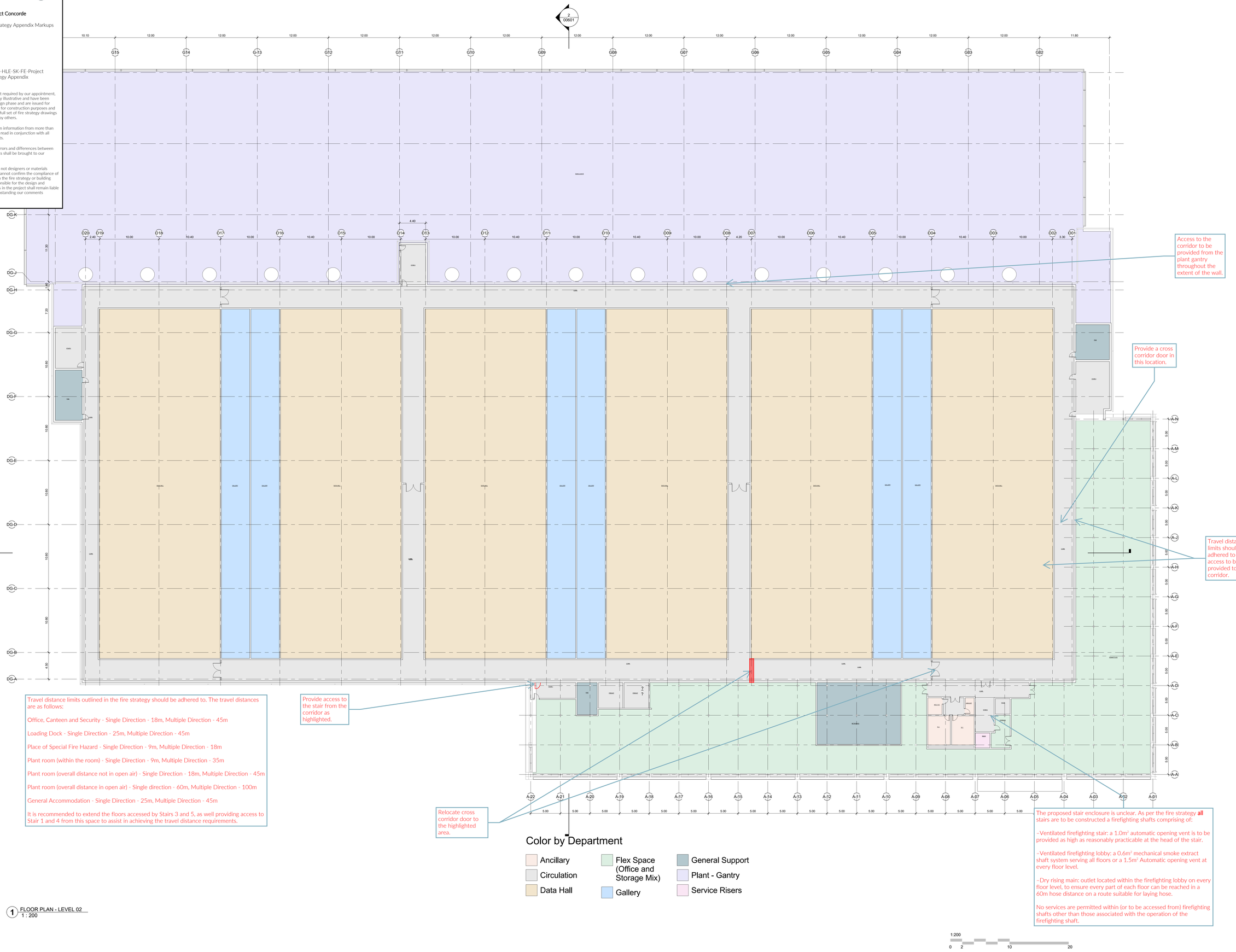
Project Name: Project Concorde

Sketch Title: Fire Strategy Appendix Markups

Date: 27 11 2024

Prepared: DE
Reviewed: DT
Authorised: SB

File name: 1923734-HLE-SK-FE-Project Concorde Fire Strategy Appendix Markups-Rev00



1 FLOOR PLAN - LEVEL 02
1 : 200

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NOTES:

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Rev	Revision Description	Date	Author/ Reviewer

WIP

Client:

Project: CONCORDE

Address: Poyle Road, Slough, SL3 0BL, England, U.K.

Title:
FLOOR PLAN - LEVEL TWO - OVERALL

Scale	1 : 200	**Size**	A0
Date		**Drawn**	Author
Job Number	24303.0000	**Checked**	Checker

CON - COR - ZZ - B102 - D - A - 00229

Project	Originator	Functional Breakdown	Spatial Breakdown	Form	Discipline	Number

STATUS S1 **REVISION**

RE-ISSUE FOR PLOT

HOARE LEA

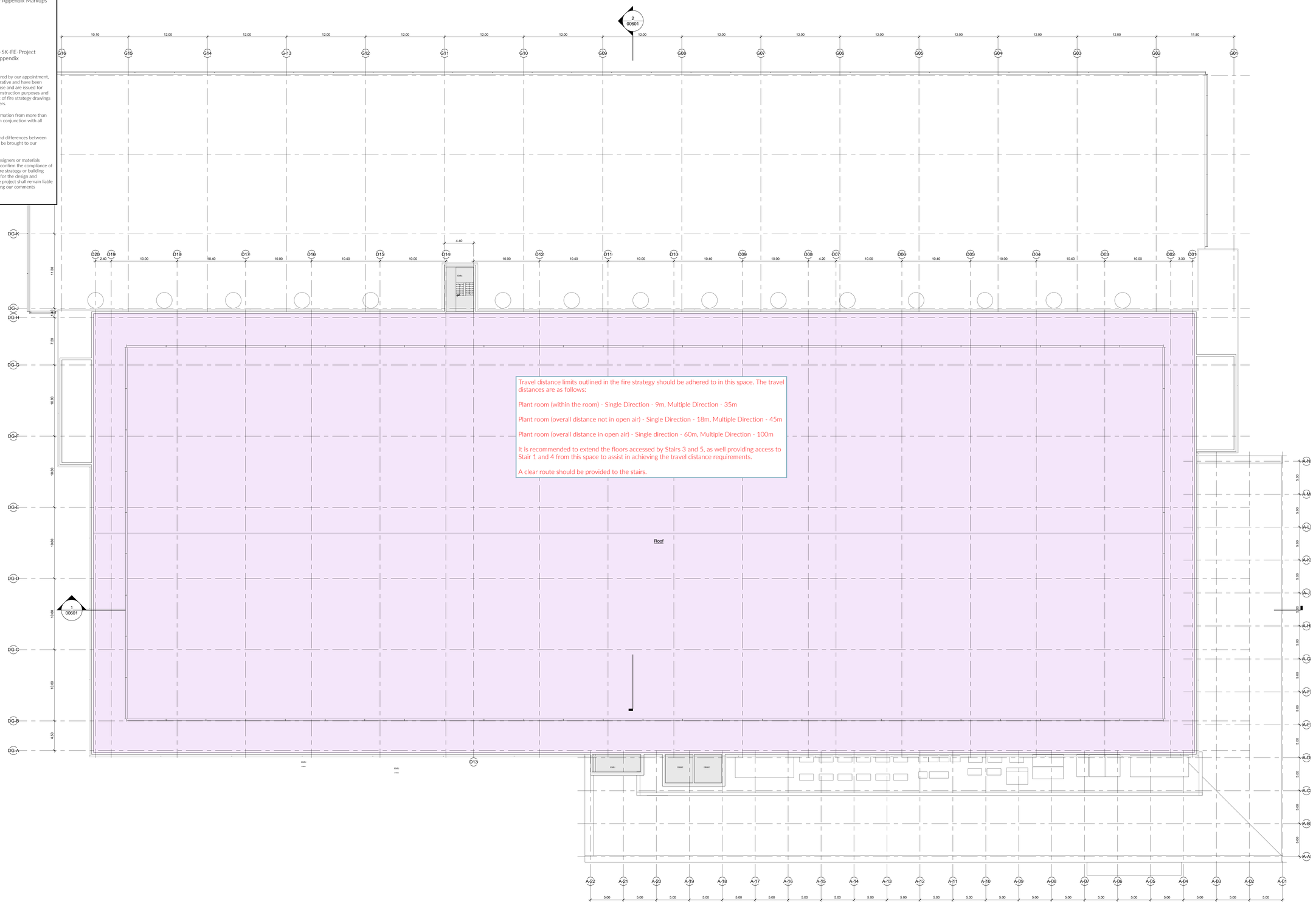
Project Name: Project Concorde

Sketch Title: Fire Strategy Appendix Markups

Date: 27 11 2024

Prepared: DE
Reviewed: DT
Authorised: SB

File name: 1923734-HLE-SK-FE-Project Concorde Fire Strategy Appendix Markups-Rev00



Color by Department

- Circulation
- Plant

1 ROOF PLAN
1 : 200

1:200
0 2 10 20

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Rev	Revision Description	Date	Author/ Reviewer

WIP

Client:

Project: CONCORDE

Address: Poyle Road, Slough, SL3 0BL, England, U.K.

Title:
ROOF PLAN - OVERALL

Scale	1 : 200	**Size**	A0
Date		**Drawn**	Author
Job Number	24303.0000	**Checked**	Checker

CON - COR - ZZ - B103 - D - A - 00238

Project	Originator	Functional Breakdown	Spatial Breakdown	Form	Discipline	Number

STATUS S1 **REVISION**

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