Margam Substation

RIBA Stage 3 Fire Safety Strategy

Revision 02

For Issue

Stantec

1 September 2025

Prepared for:
National Grid

Document Reference:
331201497-HYD-XX-XX-RP-FE-0000

Stantec Limited

Document control sheet

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Client	National Grid	
Project name	Margam Substation	
Title	RIBA Stage 3 Fire Safety Strategy	
Doc ref	331201497-HYD-XX-XX-RP-FE-0000	
Project number	331201497	
Status	For Issue	
Date	1 September 2025	

Document production record

Issue number	02	Name
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Document revision record

Issue number	Status	Date	Revision details
00	For Comment	15.07.2025	For Comment
01	For Issue	06.08.2025	For Issue
02	For Issue	01.09.2025	For Issue

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Executive Summary

Building Description	The proposed Margam Substation development comprising two main areas: Margam Amenities Building and Margam GIS Hall, both located at Level 00, as outlined in Section 1.4.1. It should be noted that the Margram Substation development comprises several areas; however, only the Margam Amenities Building and Margam GIS Hall are within the scope of this report.
Design Guidance and Legislation	The development is generally to be designed in accordance with BS 9999:2017 for all areas. All deviations from this guidance will require agreement with the approving authority and local fire service. In addition, the following manuals from the 'Generic Electricity Substation Design (NGET) Manual for Civil, Structural, and Building Engineering (TS_2.10 series)' are considered where applicable: • TS_2.10.01 – Oil Containment – Issue 2, December 2020 • TS_2.10.06 – Limitation of Fire Risk at Electricity Substations – Issue 2, August 2024 • TS_2.10.10 – GIS and Other Substation Buildings Design – Issue 2, April 2017
Fire Detection and Alarm System	**The Margam Amenities Building:** the minimum required level of fire detection and fire alarm system is M, in accordance with Table 7 of BS 9999:2017, given the risk profile of A2 in the areas of this building. However, considering the wider purpose of the development as a substation, a Category L1 system is considered to provide enhanced protection. **The Margam GIS Hall:** the minimum required level of fire detection and fire alarm system is M and L2, in accordance with Table 7 of BS 9999:2017, given the risk profile of A2 for the '3rd Party Area' and A3 for the rest of the building, respectively. However, considering the purpose of the different areas within this building and the risks they present, a Category L1 system is considered to provide enhanced protection.
Evacuation Strategy	The proposed evacuation strategy is based on a single-stage simultaneous evacuation.
Structural Fire Protection	Elements of structure throughout the Margam Amenities Building are to achieve a minimum of 30 minutes fire resistance with respect to load-bearing capacity. Elements of structure throughout the Margam GIS Hall are to achieve a minimum of 240 minutes fire resistance with respect to load-bearing capacity. Refer to the Section 6.1 for further details.
Fire Service Access	The accessible perimeter of the Margam Amenities Building is 50%, while that of the Margam GIS Hall is 51.5%. Both are compliant with the fire and rescue service vehicle access requirements for buildings under 11 metres in height that are not fitted with fire mains, as set out in Clause 21.2 and Table 19 of BS 9999:2017. It is proposed no fire main is to be provided. See Section 8 for further information.

1 Introduction

Stantec Fire have been engaged by National Grid to provide fire engineering services for the proposed developments at Margam Substation, located on Margam, Port Talbot, SA13 2NF, Wales, United Kingdom.

1.1 Purpose of Report

The purpose of this report is to demonstrate to the approving authorities that the proposed development at Margam Substation satisfies all functional requirements of Part B (Fire Safety) of Schedule 1 to the Building Regulations 2010 (as amended) and to outline the Fire Safety Strategy to the team.

1.2 Basis of Report

This Fire Safety Strategy has been developed based on the information and drawings provided by National Grid, as outlined in Table 1.

It should be noted that a reference code has been assigned to each document in Table 1. For ease of reference, these codes will be used throughout this report to refer to the respective documents.

Table 1 Information on which the fire safety strategy is based

Reference code	Description	Drawing no.	Revision	Date
D1	Margam GIS Hall - Level 00 General Arrangement	MARPT-BHK-01-00-DG-A-201000	P06	05.08.2025
D2	Margam GIS Hall - GIA & GEA General Arrangement Plans	MARPT-BHK-01-00-DG-A-201100	P06	05.08.2025
D3	Margam Amenities Existing and Demolition	MARPT-BHK-01-00-DG-A-201501	P03	24.04.2025
D4	Margam Amenities Building - (Level 00 General Arrangement_Proposed Plan)	MARPT-BHK-01-00-DG-A-201510	P05	05.08.2025
D5	Margam GIS Hall - Level 01 (Crane Access) General Arrangement	MARPT-BHK-01-01-DG-A-201001	P06	05.08.2025
D6	Margam Amenities Building - (Roof General Arrangement)	MARPT-BHK-01-R1-DG-A-201515	P04	05.08.2025
D7	Margam GIS Hall - Roof Plan General Arrangement	MARPT-BHK-01-R2-DG-A-201003	P06	05.08.2025
D8	Margam GIS Hall - Location Plan	MARPT-BHK-01-ZZ-DG-A-130020	P04	29.07.2025
D9	Margam GIS Hall - Existing Site Plan	MARPT-BHK-01-ZZ-DG-A-130021	P04	05.08.2025
D10	Margam GIS Hall - Demolition Site Plan	MARPT-BHK-01-ZZ-DG-A-130022	P04	05.08.2025
D11	Margam GIS Hall - Proposed Site Plan	MARPT-BHK-01-ZZ-DG-A-130023	P05	29.07.2025
D12	Margam GIS Hall - General Arrangement Sections	MARPT-BHK-01-ZZ-DG-A-200300	P02	05.08.2025
D13	Margam GIS Hall_Typical Decontamination Unit	MARPT-BHK-01-ZZ-DG-A-201010	P01	24.04.2025
D14	Margam GIS Hall - Typical Modular Storage & Workshop Units	MARPT-BHK-01-ZZ-DG-A-201011	P01	24.04.2025
D15	Margam GIS Hall - Water Tank	MARPT-BHK-01-ZZ-DG-A-201012	P02	05.08.2025
D16	Margam GIS Hall Context Elevations	MARPT-BHK-01-ZZ-DG-A-202000	P04	05.08.2025
D17	Margam GIS Hall - General Arrangement Elevations	MARPT-BHK-01-ZZ-DG-A-202001	P06	05.08.2025
D18	Margam GIS Hall - Proposed Materials	MARPT-BHK-01-ZZ-DG-A-202002	P05	05.08.2025
D19	Margam GIS Hall - Context Elevations -Existing	MARPT-BHK-01-ZZ-DG-A-202100	P04	05.08.2025
D20	General Arrangement Elevations Existing	MARPT-BHK-01-ZZ-DG-A-202110	P01	10.01.2025
D21	Margam Amenities Building - (Proposed Elevations and Materials)	MARPT-BHK-01-ZZ-DG-A-202510	P05	05.08.2025
D22	Margam Amenities Building - (General Arrangement Sections)	MARPT-BHK-01-ZZ-DG-A-203501	P05	05.08.2025
D23	MARGAM SWEPT PATH ANALYSIS LAYOUT SHEET 01 OF 02	MARPT-BHK-01-ZZ-DG-C-161029	P03	30.05.2025
D24	MARGAM SWEPT PATH ANALYSIS LAYOUT SHEET 02 OF 02	MARPT-BHK-01-ZZ-DG-C-161030	P03	30.05.2025
D25[1]	Margam GIS Hall - Fire Strategy Level 00	MARPT-BHK-01-00-DG-A-200601	P06	21.08.2024
Notes:				
1. It should be noted that this file is intended solely to illustrate the Gantry level clear widths in Section 4.6.				

1.3 Limitations of Report

It is important to note that the fire strategy report does not represent a set design or specification; it is a series of principle recommendations that others may relate to the proposed design as appropriate. The information contained herein is strategic only and does not address detailed aspects of design or construction, such as construction details.

It is not always feasible to capture all diverse design and construction related items within a single document. The aim of this report is to clearly establish the design principles of the project and demonstrate that the functional requirements of the Part B of Building Regulations 2010 (as amended) have been met. Subsequently, where an explicit design item is not outlined within the report, the reader should refer to the relevant design code of practice to seek guidance on such item.

This report focuses primarily on life safety. Considerations such as property protection, business continuity, and environmental impact fall outside the scope of this report. It is assumed that the National Grid guidance details the minimum performance requirements to meet the listed considerations above.

Any diagrams incorporated into this document are illustrative, intended to convey aspects of the Fire Safety Strategy and do not necessarily reflect the latest arrangement. The diagrams are not a substitute for the architectural general arrangement drawings or the detailed M&E drawings or specifications, which should be referred to in conjunction with this report.

For clarity, whilst the below is not exhaustive, the information herein does not specifically address

- Insurance requirements
- Property or business protection
- Construction/fit-out fire safety
- Detailed management procedures or duties under the Regulatory Reform (Fire Safety) order (RRO)

It should be noted that this report focuses on two buildings of the proposed Margam Substation development: the Margam Amenities Building and the Margam GIS Hall which are the occupied buildings on the site. Consideration is given to other structures present on the site (unoccupied buildings) where impacting on the Amenities and GIS Hall buildings (External fire spread and firefighting facilities).

1.3.1 Information Provided by Others

The Fire Safety Strategy represents only the best judgement of the consultants involved in its preparation, and is based, in part, on information provided by others. Under no circumstances is liability accepted for the accuracy of such information provided by others.

The following information was provided by other parties involved in the Margam Substation development project in email responses to the queries raised for the Margam GIS Hall:

1- From BakerHicks [dated 18.06.2025 at 12:13]:

   a) It is BakerHicks understanding that the gas is non-combustible and inert. As such the room would be classed as medium hazard.

   b) The room is subject to Hydrogen build-up. However, a Low Level has been included, additionally the room will be equipped with appropriate sensors and alarms. Due to the nature of the gas, the room would be classed as high hazard and travel distances have been accounted for in this respect. DSEAR risk assessment will be undertaken for the Battery Room.

   c) The building will largely be un-manned with staff only attending occasionally.

2- From GE Vernova [dated 18.06.2025 at 14:59]:

   a) GIS is filled with G3 gas. There is no oil based switchgear in the GIS hall

   b) Batteries are plante type.

   c) GIS hall is largely un-manned. Staff would be located in a separate building unless carrying out maintenance activities. WC only located there due to distance between the buildings.

These responses will be referenced in the relevant sections of this report.

1.3.2 Alternative Methods of Compliance

Where the Fire Safety Strategy proposes alternative methods of compliance, that have been based on accepted codes of practice, to satisfy the functional requirements of Part B (Fire Safety) of Schedule 1 to the Building Regulations 2010 (as amended), they will be subject to the agreement of the approving authorities and local Fire and Rescue Service.

1.3.3 Minimum Requirements

This report outlines the minimum requirements to satisfy the functional requirements of Part B (Fire Safety) of Schedule 1 to the Building Regulation 2010 (as amended). However, whilst these satisfy the statutory imperatives, Stantec advise consideration of additional fire safety measures.

1.4 Building Overview

The scope of this report covers two main areas of the proposed Margam Substation development, Margam Amenities Building and Margam GIS Hall, both located at Level 00, as outlined in Section 1.4.1.

The proposed location of Margam Substation within the wider site is illustrated within Figure 1, it is highlighted in yellow, while the Margam Amenities Building is highlighted in orange, and the Margam GIS Hall is highlighted in green. It should be noted that the other sites highlighted in the yellow are outside the scope of this report, however their impact on the fire safety of the Amenities and GIS Hall buildings are considered within this report.

Figure 1 Site plan [D11]

1.4.1 General Arrangements

The general arrangements for the proposed Margam Substation development, including the Margam Amenities Building and the Margam GIS Hall, are covered in detail in the following sections.

1.4.1.1 Margam Amenities Building

The Margam Amenities Building features a Meeting/Mess Room, General Office, Office, Archive, and an entrance lobby.

The general arrangement of the Margam Amenities Building is illustrated in Figure 2.

Figure 2 General arrangement of the Margam Amenities Building [D4]

1.4.1.2 Margam GIS Hall

The Margam GIS Hall includes the main GIS Hall area, a 3rd Party Area, Telecom Room, Protection & Control Room, Control Room, LV AC/DC Room, Battery Room, and an access corridor. There is also a Modular Decontamination Area (separate to the GIS Hall building) which is outside the scope of this report.

The general arrangement of the Margam GIS Hall is illustrated in Figure 3.

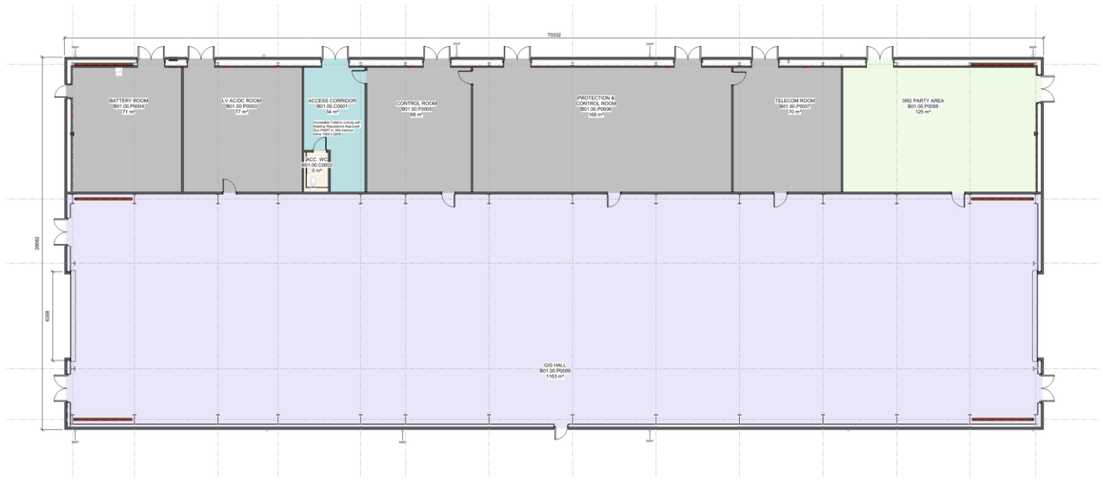


Figure 3 General arrangement of the Margam GIS Hall [D1]

1.4.2 Building Height

For the purposes of the Fire Safety Strategy, the top-most occupied storey of the proposed Margam Substation development, including the Margam Amenities Building and the Margam GIS Hall, is located at 0m above ground level, as both buildings are single-storey structures. Figure 4 and Figure 5 show an elevation view of each building, respectively.

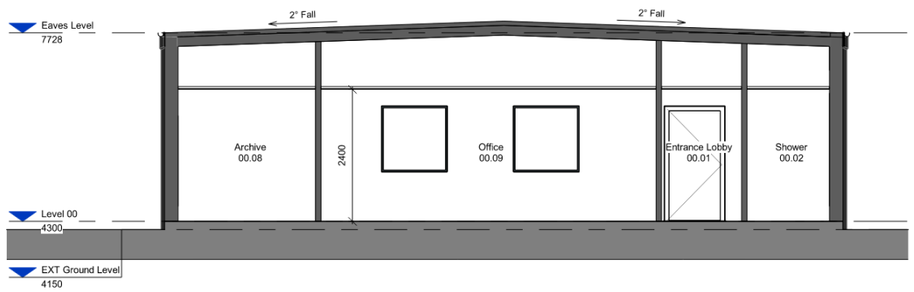


Figure 4 An elevation view of the Margam Amenities Building [D22]

Figure 5 An elevation view of the Margam GIS Hall [D12]

2 Legislation

The following sections provide an outline of the regulations and guidelines on which the Fire Safety Strategy is based.

2.1 The Building Regulations 2010

The building work will be subject to control under the restrictions of the Building Regulations 2010 (as amended). The Building Regulations are concerned with the life safety of persons in and around a building. The development will be designed and constructed to satisfy the functional requirements of Part B (Fire Safety) to Schedule 1 of the Building Regulations 2010 (as amended), which includes the following:

- 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

2.2 Guidance Documents

Guidance referred to in this report includes, but is not limited to the following:

- BS 9999:2017 ‘Fire safety in the design, management and use of buildings – Code of practice’;
- ADB2:2006 (Wales): Approved Document B (fire safety) volume 2- Buildings other than dwellinghouses, 2006 Edition incorporating 2010, 2013, 2016, 2017 and 2020 amendments - For use in Wales;
- ADB2:2019 (England): Approved Document B (fire safety) volume 2- Buildings other than dwellings, 2019 edition incorporating 2020, 2022 and 2025 amendments and forthcoming 2026 and 2029 changes – for use in England;
- BS 5839-1:2025 ‘Design, installation, commissioning and maintenance of fire detection and fire alarm systems in non-domestic premises – Code of Practice’;
- BS 5499-4:2013 ‘Code of practice for escape route signing’;
- BR 187:2014 ‘External Fire Spread – Building separation and boundary distances’;
- BS 5266-1:2016 ‘Emergency lighting. Code of practice for the emergency lighting of premises’;
- BS 9990:2015 ‘Non-automatic firefighting systems in buildings’;
- BS EN 13501-1:2018 ‘Fire classification of construction products and building elements. Classification using data from reaction to fire tests’;
- PD 7974-6:2019 ‘Application of fire safety engineering principles to the design of buildings. Part 6: Human Factors: Life safety strategies – Occupant evacuation, behaviour and condition (sub-system 6)’;
- BS 5839-9:2021 ‘Fire detection and fire alarm systems for buildings. Code of Practice for the design, installation, commissioning and maintenance of emergency voice communication systems’;

Guidance for the fire precautions will generally follow the recommendations contained within BS 9999:2017. Stantec believes this is the most appropriate guidance given the use of the buildings and associated risks.

Any deviations from these standards are to be provided with justification demonstrating that the functional requirements of Part B (Fire Safety) of Schedule 1 to the Building Regulations 2010 (as amended) are met; however, these will be subject to approval from the approving authority and local Fire Service. Where no specific provision is mentioned in this document regarding any particular aspect, reference should be made to BS 9999:2017.

As per the email received from National Grid dated [dated 23.05.2025 at 17:05], the following manuals from the ‘Generic Electricity Substation Design (NGET) Manual for Civil, Structural, and Building Engineering (TS_2.10 series)’ were advised to be considered:

- TS_2.10.01 – Oil Containment– Issue 2, December 2020
- TS_2.10.06 – Limitation of Fire Risk at Electricity Substations– Issue 2, August 2024
- TS_2.10.10 – GIS and Other Substation Buildings Design– Issue 2, April 2017

Appendix A outlines the fire-relevant clauses of the applicable NGET Manuals, clarifies how this report addresses those aspects within its defined scope, and explains how compliance with National Grid requirements is to be ensured. All potentially applicable clauses have been included to provide National Grid with a comprehensive overview and to clearly indicate which aspects fall within the scope of this report.

The Fire Safety Strategy is to be read in conjunction with the Fire Strategy Drawings in Appendix B.

2.3 Other Applicable Legislation

2.3.1 The Regulatory Reform (Fire Safety) Order 2005

The Regulatory Reform (Fire Safety) Order (RRFSO) regulations shall apply to this development and are the landlord’s responsibility. The RRFSO came into force in 2006 with the aim of resolving the overlap caused by a number of previous legislations. Therefore, a large number of legislations were rationalised and consolidated into the RRFSO with the result that it also rationalised the number of enforcement authorities involved in fire safety matters.

The RRFSO applies to all workplaces and other non-domestic areas and premises, requiring the ‘Responsible Person’ to undertake an assessment of the fire risk in their premises and to keep this assessment under review. It requires that where the ‘Responsible Person’ does not have the relevant training and experience to undertake such an assessment they must appoint a suitable ‘Competent Person’ to undertake the Risk Assessment.

The main focus of the Risk Assessment is to ensure that the premises is safe for the occupants to use and that all fire safety measures are adequate and appropriately maintained. In new buildings, the Fire Risk Assessment ensures that the fire safety provisions required under the Building Regulations 2010 are maintained, whereas in existing buildings it ensures that despite any modifications undertaken throughout the building’s history, it is still safe for use. It is therefore important that the Fire Safety Strategy for more complex buildings (regardless of age) is clear and well documented.

2.3.2 Regulation 38

In conjunction with the RRFSO, Regulation 38 requires that information relating to the fire safety provisions within a building is provided to the ‘Responsible Person’ so that they (or an appointed ‘Competent Person’) can undertake

the Fire Risk Assessment required under the RRFSO. It is therefore of paramount importance that the fire safety information for a building that falls under the requirements of the Building Regulations 2010 is kept up to date and a true reflection of the completed building.

This report does not form the Risk Assessment required under the RRFSO, nor does it absolve the client from exercising their duties under Regulation 38. However, the aim of this Fire Safety Strategy is to demonstrate how the project complies with the requirements of the Building Regulations 2010 (as amended) and therefore should form part of the information provided to the ‘Responsible Person’ in order for them to undertake and maintain the Fire Risk Assessment for the project.

3 Risk Profile

BS 9999:2017 takes a risk-based approach to developing the fire safety strategy. A risk profile is assigned to each occupancy type within the building in order to determine the appropriate means of escape and the appropriate design features of the building for life safety. The risk profile consists of an occupancy characteristic and an expected fire growth rate based on the expected fire load in the space.

As per Clause 5 of BS 9999:2017, risk assessments for property protection, business continuity and environmental damage can be undertaken as an extension to that carried out for life safety. However, these are outside the scope of this report.

3.1 Occupancy Characteristic

According to the Clause 6.2 of BS 9999:2017, the occupancy characteristic is principally determined according to whether the occupants are familiar or unfamiliar with the building and whether they are likely to be awake or asleep:

- Category A - Occupants awake and familiar with building layout
- Category B - Occupants awake but unfamiliar with building layout
- Category C - Occupants asleep
- Category D - Occupants receiving medical care

It is assumed that the Margam Amenities Building will be accessible by both staff and inducted visitors, and therefore are assumed to have an occupancy characteristic of Category A. This assumption is based on the basis that visitors will either be contractors undergoing induction or will be accompanied by staff, making the Category A classification reasonable.

The Margam GIS Hall will largely be un-manned with staff only attending occasionally, as confirmed by BakerHicks. Therefore, the Margam GIS Hall is assumed to have an occupancy characteristic of Category A.

The detailed occupancy characteristics of the Margam Amenities Building and Margam GIS Hall are summarised in Table 2 and Table 3, respectively.

Table 2 Occupancy characteristics of the Margam Amenities Building

Space	Occupancy Characteristics
Meeting/Mess Room	A
Offices (including General Office and Office)	A
Archive	A

Table 3 Occupancy characteristics of the Margam GIS Hall

Space	Occupancy Characteristics
Main GIS Hall	A
3rd Party Area	A
Telecom Room	A
Protection & Control Room	A
Control Room	A
LV AC/DC Room	A
Battery Room	A

3.2 Fire Growth Rate

According to the Clause 6.3 of BS 9999:2017, the fire growth rate is the rate at which it is estimated that a fire will grow. The fire risks associated within each space are determined by the use of each space:

- Category 1 - Slow fire growth rate
- Category 2 - Medium fire growth rate
- Category 3 - Fast fire growth rate
- Category 4 - Ultra-fast fire growth rate

Fire growth rates within each area of the Margam Amenities Building and Margam GIS Hall are outlined in Table 4 and Table 5, respectively.

Table 4 Fire growth rates of the Margam Amenities Building

Space	Fire Growth Rate
Meeting/Mess Room	2
Offices (including General Office and Office)	2
Archive	2

Table 5 Fire growth rates of the Margam GIS Hall

Space	Fire Growth Rate
Main GIS Hall	3[1]
3rd Party Area	2
Telecom Room	3[1]
Protection & Control Room	3[1]
Control Room	3[1]
LV AC/DC Room	3[1]
Battery Room	3[2]

Notes:
1. Detailed information regarding equipment specifications, operational conditions, material specifications, relevant fire test results, and an advanced risk assessment are required to understand the fire risks this room may present. This is to be undertaken at RIBA stage 4. **Therefore**, the fire growth rate is assumed to be Category 3 - Fast fire growth rate.
2. Plante type Batteries are present as confirmed by GE Vernova. However, detailed information regarding material specifications, relevant fire test results, and an advanced risk assessment are required to understand the fire risks this room may pose. This is to be undertaken at RIBA stage 4. Therefore, the fire growth rate is assumed to be Category 3 - Fast fire growth rate.

3.3 Risk Profiles

The Fire Safety Strategy has been developed based on the following risk profiles, in accordance with Clause 6.4 of BS 9999:2017, detailed in Table 6 and Table 7.

Table 6 Risk profiles of the Margam Amenities Building

Space	Risk Profiles
Meeting/Mess Room	A2
Offices (including General Office and Office)	A2
Archive	A2

Table 7 Risk profiles of the Margam GIS Hall

Space	Risk Profiles
Main GIS Hall	A3
3rd Party Area	A2
Telecom Room	A3
Protection & Control Room	A3
Control Room	A3
LV AC/DC Room	A3
Battery Room	A3

4 Means of Warning and Escape

Functional Requirement B1:

The building shall be designed and constructed so that there are appropriate provisions for 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.

4.1 General

Means of escape from the building is generally to be in accordance with BS 9999:2017. Where the proposed means of escape strategy deviates from this guidance document it will require agreement with the approving authority and local Fire Service.

4.2 Evacuation Strategy

The proposed evacuation strategy is based on a single-staged simultaneous evacuation. In a single-staged evacuation, the activation of a call point or detector gives an instantaneous warning from all fire alarm sounders for an immediate evacuation.

4.3 Fire Detection and Alarm System

Fire detection and alarm systems are designed to give warning of fire at an early stage to enable all occupants to evacuate the building safely, before the escape routes are impassable owing to the presence of fire, smoke or toxic gases.

The fire detection and alarm system requirements for the proposed Margam Substation development are as follows:

- **The Margam Amenities Building**: the minimum required level of fire detection and fire alarm system is M, in accordance with Table 7 of BS 9999:2017, given the risk profile of A2 in the areas of this building. However, considering the wider purpose of the development as a substation, a Category **L1** system is considered to provide enhanced protection.

- **The Margam GIS Hall**: the minimum required level of fire detection and fire alarm system is M and L2, in accordance with Table 7 of BS 9999:2017, given the risk profile of A2 for the '3rd Party Area' and A3 for the rest of the building, respectively. However, considering the purpose of the different areas within this building and the risks they present, a Category **L1** system is considered to provide enhanced protection.

The category **L1** Fire Detection and Alarm System is to be designed, installed and commissioned in accordance with BS5839-1:2025.

It is recommended that the alarms are interlinked between the Margam Amenities Building and Margam GIS Hall as there may be instances that the Margam GIS Hall will not be occupied in a fire scenario (Section 3.1).

It should be noted that **L1** Fire Detection and Alarm System is to protect the Margam Amenities Building and Margam GIS Hall as a whole, not the individual electrical equipment present in these buildings. The purpose is life safety; property protection is not included. Furthermore, property protection for insurance purposes falls outside the scope of this report and will be reviewed at RIBA Stage 4 with National Grid input.

4.3.1 Fire Alarm System Interfaces

An automatic fire alarm system will have interfaces and links as necessary to operate equipment/devices and a number of examples are indicated below; for more information see BS5839-1:2025:

- Electromagnetic hold-open devices on fire doors – released to closed position.
- Security systems on exit doors – released as required.
- Heating, ventilation and air conditioning systems – shut down to restrict spread of smoke and hot gases.

4.4 Maximum Expected Occupancy Levels

For the purposes of the Fire Safety Strategy the maximum expected occupancy within each area of the building is outlined in Table 8 and Table 9.

Table 8 Maximum expected occupancy levels of the Margam Amenities Building

Space	Area (m^2) [1]	Floor space factor [2],[3]	Maximum Expected Occupancy
Meeting/Mess Room	37	6 m^2 / person	7
Offices (including General Office and Office)	60	6 m^2 / person	10
Archive	10	6 m^2 / person	2
Total:			**19**

Notes:
1. Based on the information provided on [D4] regarding the areas of various spaces within the building.
2. According to the Table 9 of BS 9999:2017.
3. At the time of this report, a normal density, with a floor space factor of 6 m² per person (as per Table 9 of BS 9999:2017), is assumed. This value is also consistent with Table C1 of ADB2:2006 (Wales) and Table D1 of ADB2:2019 (England) for the office area.

Table 9 Maximum expected occupancy levels of the Margam GIS Hall

Space	Area (m^2) [1]	Floor space factor	Maximum Expected Occupancy
Main GIS Hall	1165	-	- [2]
3rd Party Area	125	-	-
Telecom Room	70	-	-
Protection & Control Room	167	-	-
Control Room	68	30 m^2 / person [3]	2 [4]
LV AC/DC Room	81	-	-
Battery Room	72	-	-
Total:			**2**

Notes:
1. Based on the information provided on [D1] regarding the areas of various spaces within the building.

2. GIS hall is largely un-manned. Staff would be located in a separate building unless carrying out maintenance activities, as confirmed by GE Vernova.
3. At the time of this report, a floor space factor of 30 m² per person is assumed, based on Table C1 of ADB2:2006 (Wales) and Table D1 of ADB2:2019 (England) for 'Storage and warehousing', which represents a reasonable value for similar use.
4. The Margam GIS Hall will largely be un-manned with staff only attending occasionally, as confirmed by BakerHicks. Therefore, it is assumed that only the Control Room will be in use and occupied.

4.5 Horizontal Means of Escape

4.5.1 Travel Distances

Travel distance is the actual distance a person needs to travel from any point within a building to the nearest storey/final exit. In accordance with BS 9999:2017, the maximum travel distances depend on whether minimum or additional fire protection measures are provided.

More details can be found in Appendix B.

Every building should incorporate at least the minimum level of fire protection measures, as specified in Clause 18.2 of BS 9999:2017. When only the minimum fire protection measures are provided, the maximum allowable travel distances for each area of the building, based on the relevant risk profiles and with reference to Table 11 of BS 9999:2017, are outlined in Table 10 and Table 11.

Table 10 Maximum permitted travel distances of the Margam Amenities Building

Space	Risk Profile	Maximum Permitted Travel Distance (m)			
		With Only One Escape Route Available		With Alternative Escape Routes Available	
		Layout Known	Layout Unknown	Layout Known	Layout Unknown
Meeting/Mess Room	A2	22	15	55	37
Offices (including General Office and Office)	A2	22	15	55	37
Archive	A2	22	15	55	37

For the risk profile A2 of the proposed development of the Margam Amenities Building, with an unknown layout and single and multiple escape routes available, the maximum travel distances are 15 m and 37 m, respectively.

As illustrated in the Fire Strategy Drawings in Appendix A, all areas of the proposed development of the Margam Amenities Building are compliant with these maximum permitted travel distance values.

Table 11 Maximum permitted travel distances of the Margam GIS Hall

Space	Risk Profile	Maximum Permitted Travel Distance (m)			
		With Only One Escape Route Available		With Alternative Escape Routes Available	
		Layout Known	Layout Unknown	Layout Known	Layout Unknown
Main GIS Hall	A3	18	12	45	30
3rd Party Area	A2	22	15	55	37
Telecom Room	A3	18	12	45	30
Protection & Control Room	A3	18	12	45	30
Control Room	A3	18	12	45	30
LV AC/DC Room	A3	18	12	45	30
Battery Room	A3	18	12	45	30

For the risk profile A2 and A3 of the proposed development of the Margam GIS Hall, with an unknown layout and multiple escape routes available, the maximum travel distances are 37m and 30m, respectively. For 'Telecom Room' with single escape route available, the maximum travel distance is 12m.

As illustrated in the Fire Strategy Drawings in Appendix B, all areas of the proposed development of the Margam GIS Hall are compliant with these maximum permitted travel distance values.

4.5.2 Number of Escape Routes

In the event of a fire within the building, occupants should be provided with a sufficient number of exits to ensure a prompt evacuation of the building prior to escape routes becoming blocked by the effects of fire and smoke. The minimum number of escape routes required from each area is determined based on the maximum expected occupancy of the area as outlined in Table 12, in accordance with Table 10 of BS 9999:2017.

Table 12 Minimum number of escape routes

Maximum Expected Occupancy	Minimum Number of Routes / Exits
Up to 60	1
61-600	2
More than 600	3

All areas of the proposed development of the Margam GIS Hall and Margam Amenities Building have been assessed and are considered to meet the requirements outlined in Table 12.

4.5.3 Minimum Required Exit Widths

In accordance with Clause 16.6.1 of BS 9999:2017 exit widths are to be:

- Not less than required to serve the expected occupancy; and
- Not less than 850mm where unassisted wheelchair access is necessary; and
- Not less than 800mm where unassisted wheelchair access is not necessary.

In accordance with Clause 16.6.1 of BS 9999:2017, the capacity of any exit with an effective clear width of less than 1050mm is calculated as follows:

$$n_{<1050} = 500/m \qquad \text{(Equation 1)}$$

where;

$n_{<1050}$ is the maximum occupancy capacity of the exit with an effective width less than 1050mm
m is the minimum exit width required per person based on the relevant risk profile

Therefore, the maximum occupancy capacity of an exit with an effective clear width less than 1050mm is outlined in Table 13 and Table 14 (based on the relevant risk profiles as per Table 12 of BS 9999:2017).

Table 13 Capacity of exits with an effective width less than 1050mm for the Margam Amenities Building

Space	Risk Profile	Minimum Width Required Per Person, m	Maximum Number of Occupants Served by Exit, $n_{<1050}$
Meeting/Mess Room	A2	3.6	139
Offices (including General Office and Office)	A2	3.6	139
Archive	A2	3.6	139

Table 14 Capacity of exits with an effective width less than 1050mm for the Margam GIS Hall

Space	Risk Profile	Minimum Width Required Per Person, m	Maximum Number of Occupants Served by Exit, $n_{<1050}$
Main GIS Hall	A3	4.6	109
3rd Party Area	A2	3.6	139
Telecom Room	A3	4.6	109
Protection & Control Room	A3	4.6	109
Control Room	A3	4.6	109
LV AC/DC Room	A3	4.6	109
Battery Room	A3	4.6	109

The occupancy capacity of exits with an effective clear width equal to or exceeding 1050mm is calculated as follows:

$$n_{\geq 1050} = W/m \qquad \text{Equation 2}$$

where;

$n_{\geq 1050}$ is the maximum occupancy capacity of the exit with an effective width of 1050mm or more
m is the minimum exit width required per person based on the relevant risk profile
W is the effective clear width of the exit

For the purposes of this report, the width of a doorway is the clear width of the opening between the door leaf and frame (or projecting building hardware or the width between two opening door leaves in the case of double doors) assuming that the door leaf is free to open 90° or more.

It should also be noted that, in accordance with BS 9999:2017, where a space is provided with multiple exits for escape, one of the exits is to be discounted when determining the occupancy capacity of the space (assuming the exit is blocked by the effects of fire/smoke. However, it should be noted that exits in close proximity to each other may be blocked simultaneously.

Where double doors are provided the width of one of the leaves should be not less than 800mm.

All exits of the proposed development of the Margam Amenities Building have an effective width of less than 1050 mm and they have sufficient capacity to serve the maximum expected occupancy as detailed in Table 8.

The Margam GIS Hall will largely be un-manned with staff only attending occasionally, as confirmed by BakerHicks. Therefore, it is assumed that only the Control Room will be in use and occupied. All exits of the proposed development of the Margam GIS Hall have sufficient capacity to serve the maximum expected occupancy as detailed in Table 9.

4.5.4 Minimum Room Exit Widths

All escape doors from rooms are to achieve an effective width of at least 800mm (or 850mm where the door may be expected to serve wheelchair users). However, where the occupancy of a room may be expected to exceed 60 persons it should be ensured to provided door width is sufficient to serve the expected occupancy.

Table 15 and Table 16 outlines the required clear exit widths from all rooms within the Margam Amenities Building and the Margam GIS Hall, respectively.

Table 15 Minimum required exit widths from rooms for the Margam Amenities Building

Space	Risk Profile	Maximum Expected Occupancy [1]	Number of Exits Provided	Minimum Required Clear Width Required Per Exit (mm) [2]
Meeting/Mess Room	A2	7	3	800
Offices (including General Office and Office)	A2	10	2	800
Archive	A2	2	1	800

Notes:
1. As per Table 8
2. Discounting one exit.

Table 16 Minimum required exit widths from rooms for the Margam GIS Hall

Space	Risk Profile	Maximum Expected Occupancy [1]	Number of Exits Provided	Minimum Required Clear Width Required Per Exit (mm) [2]
Main GIS Hall	A3	-	9	800
3rd Party Area	A2	-	3	800
Telecom Room	A3	-	3	800
Protection & Control Room	A3	-	4	800
Control Room	A3	2	4	800
LV AC/DC Room	A3	-	2	800
Battery Room	A3	-	2	800

Notes:
1. As per Table 9
2. Discounting one exit.

It is noted that all exits from all rooms within the Margam Amenities Building and the Margam GIS Hall achieve the minimum required width based on the provided occupancy.

A number of exits do not achieve an effective clear width of 850mm, therefore will not in their current configuration serve wheelchair users. If wheelchair users are expected to be present within the premises, all doors should achieve a minimum effective clear width of 850mm.

4.5.5 Door Opening Direction

As per Clause 15.6.3 of BS 9999:2017, the door leaf of any doorway or exit, should, where reasonably practicable, be hung to open in the direction of escape, and should always to so where an exit may be expected to serve more than 60 persons for escape in a fire scenario.

As per Clause 15.6.3 of BS 9999:2017, with respect to industrial activities where there is a high fire risk with potential for rapid fire growth, it might be necessary (e.g. as a result of risk assessment) for doors to open in the direction of escape regardless of the number of occupants.

Given the functions of the areas within the Margam GIS Hall, the associated fire risks, the assumption of a Category 3 - Fast fire growth rate (as per Table 5), the doors in these rooms may still need to open in the direction of escape (despite serving areas with an expected occupancy of less than 60 persons). Some doors do not open in the direction of escape. It is recommended that National Grid assess the risks of the rooms in the GIS hall where doors do not open in the direction of escape in line with Clause 15.6.3 of BS9999:2017.

4.5.6 Corridors and Escape Routes

As per Clause 16.6.2 of BS 9999:2017, the width of a corridor or escape route should not be less than the calculated width of any door leading onto it, or 1000mm, whichever is the greater (increased to 1200mm where it may be used by wheelchair users).

It is noted that the width of corridors within the Margam Amenities Building and the Margam GIS Hall achieve the minimum required width.

4.6 Vertical Means of Escape

No stairs are provided within the Margam Amenities Building to serve as vertical means of escape.

Within the Margam GIS hall, there is a gantry level, served by two stairs (on either side of a gantry walkway). The clear width of the stairs is approximately 745mm, with the clear width of the gantry upper and lower level walkways as 727mm/821mm respectively, shown in Figure 6.

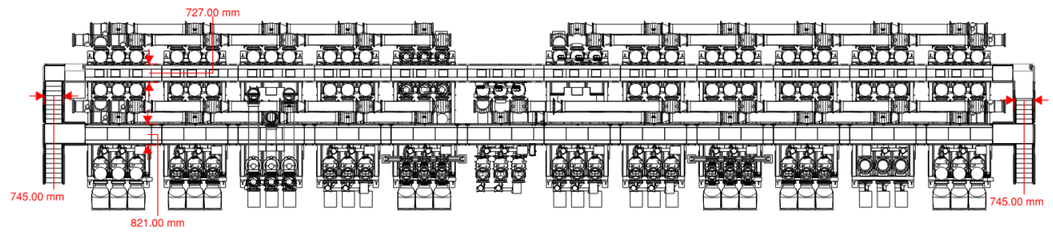


Figure 6 Gantry levels clear widths [D25]

It is recommended that the minimum width of 1000 mm should be achieved for stairs in line with the Clause 17.4.1 of BS 9999:2017. This will be reviewed at RIBA Stage 4.

4.7 Exits

As per Clause 15.6.2 of BS 9999:2017, doors on escape routes (whether or not the doors are fire doors) should either not be fitted with lock, latch or bolt fastenings, or be fitted only with simple fastenings that can be readily operated from the side approached by all people (including disabled and elderly) making an escape. The operation of these fastenings should be readily apparent and without the use of a key and without having to manipulate more than one mechanism.

On activation of the fire alarm all electronic locks on means of escape doors from the evacuation zone in alarm are to fail-safe open. All escape doors to be provided with an electronic lock are also to be provided with a green break glass.

5 Internal Fire Spread (Linings)

Functional Requirement B2:

1. To inhibit the spread of fire within a building, the internal linings shall -

a. Adequately resist the spread of flame over their surfaces; and

b. Have, if ignited, either a rate of heat release or a rate of fire growth, which is reasonable in the circumstances.

2. In this paragraph, 'internal linings' means the materials or products used in lining any partition, wall, ceiling or other internal structure.

5.1 Internal Fire Spread (Linings)

It should be noted that this section focused on life safety, and the requirements may differ from those for property protection. For property protection, the related requirements should be consulted separately.

The choice of materials for walls and ceilings can significantly affect the spread of a fire and its rate of growth, even though they are not likely to be the materials first ignited. It is particularly important in circulation spaces where linings may offer the main means by which fire spreads and where rapid spread is most likely to prevent occupants from escaping.

For the purposes of satisfying Requirement B2 of Schedule 1 to the Building Regulations 2010 (as amended) the internal wall and ceiling linings should adequately resist the spread of flame over the surfaces and have, if ignited, a rate of heat release/growth rate which is reasonable in the circumstances.

Therefore, the internal surface linings are to be in accordance with Table 17 throughout the building.

Table 17 Internal lining requirements

Location	European Performance Class [1]
Non-residential rooms having an area not more than 30m^2	D-s3, d2
All other rooms	C-s3, d2
Other circulation spaces	B-s3, d2

Notes
1. Relates to performance determined in accordance with BS EN 13501-1:2018

The surface linings of the walls and ceilings should generally conform to the classifications outlined in Table 17. However, parts of walls in rooms may be of a lower class but not lower than Class D-s3, d2 (European class) provided that the total of those parts in any one room does not exceed 50% of the floor area of the room (subject to a maximum of 60m^2 in non-residential areas).

For the purposes of internal surface lining requirements, the following definitions should be noted:

Room:	An enclosed space within a building that is not used solely as a circulation space. The term includes not only conventional rooms, but also cupboards that are not fittings and large spaces such as warehouses and auditoria. The term does not include voids such as ducts, ceiling voids and roof spaces;
Circulation space:	A space (including a protected stairway) mainly used as a means of access between a room and an exit from the building or compartment.

Table 18 outlines the inclusions/exclusions regarding the definitions for walls and ceilings for the purposes of internal surface spread of flame requirements.

Table 18 Internal lining inclusions/exclusions

	Walls	Ceilings
Definition includes	• The surface of glazing (except glazing in doors) • Any part of a ceiling which slopes at an angle of more than 70o to the horizontal	• The surface of glazing • Any part of a wall which slopes at an angle of 70^o or less to the horizontal • The underside of a mezzanine or gallery • The underside of a roof exposed to the room below
Definition excludes	• Doors and door frames • Window frames and frames in which glazing is fitted • Architraves, cover moulds, picture rails, skirtings and similar narrow members • Fireplace surrounds, mantle shelves and fitted furniture	• Trap doors and trap door frames • The frames of windows or rooflights and frames in which glazing is fitted • Architraves, cover moulds, picture rails, exposed beams and similar narrow members

6 Internal Fire Spread (Structure)

Functional Requirement 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.

3. Where reasonably necessary to inhibit the spread of fire within the building, measures shall be taken to an extent appropriate to the size and intended use of the building, comprising either or both of the following:

a. Sub-division of the building with fire-resisting construction; and

b. Installation of suitable automatic fire suppression systems.

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.

6.1 Elements of Structure

6.1.1 Margam Amenities Building

For the purposes of the Fire Safety Strategy, the top occupied storey of the Margam Amenities Building is 0m above ground level, as per Section 1.4.2. Therefore, the required fire resistance for the elements of structure of the Margam Amenities Building is presented in Table 19, in accordance with BS 9999:2017.

Table 19 Fire resistance periods for elements of structure of the Margam Amenities Building

Space	Risk Profiles	Minimum periods of fire resistance, in minutes
Meeting/Mess Room	A2	30[1]
Offices (including General Office and Office)	A2	30[1]
Archive	A2	30[2]

Notes:
1. In accordance with Clause 30.2 and Table 23 of BS 9999:2017.
2. As per Table 29 of BS 9999:2017, an ancillary area falling under the category of 'storage areas greater than 1 m² but not greater than 450 m² (other than refuse storage areas)'

In accordance with Clause 30.2 and Table 23 of BS 9999:2017, the Margam Amenities Building with a risk profile of A2 and a top occupied storey height not exceeding 5 m above access level requires a minimum fire resistance period of 30 minutes for elements of structure.

The structure of the roof and the structure that supports only the roof need not to be fire rated unless the roof:

- Forms part of an escape route; or
- Function as a floor; or
- Is part of a portal frame structure where the roof and the supporting stanchions form a single element of structure; or
- Is integral to the stability of a fire-resisting external wall.

6.1.2 Margam GIS Hall

As per Clause 3.1.2 of TS_2.10.06, *'In particular, the following equipment shall be considered a Fire Hazard and shall be installed with appropriate fire protection measures to minimise consequential damage to designated Elements at Risk:*

- Mineral Oil-filled Transformers, including earthing transformers, auxiliary transformers;
- Mineral Oil-filled Reactors;
- Diesel Generators;
- Mineral Oil Storage Tanks (Including Fuel Oil);
- Mineral Oil Circuit Breakers;
- Mineral Oil Handling Plant;
- Mineral Oil-filled Cables and Cable Sealing Ends'

Although sitting outside the scope of this report, a diesel generator and existing transformers are shown on the provided site plan, as this equipment sits externally, this should be designed and installed as per relevant NGET guidance. The design of the Amenities building and GIS Hall has considered the impact and basis of assumptions within this report to minimise consequential damage to designated elements at risk.

This will be reviewed with the relevant design specialists at RIBA Stage 4.

BakerHicks has provided following statement:

'It is BakerHicks understanding that the gas is non-combustible and inert. As such the room would be classed as medium hazard.'

and GE Vernova has provided following statement:

'**GIS is filled with G3 gas. There is no oil based switchgear in the GIS hall'**.

Based on the high voltages and relevant ancillary use of the GIS Hall, it is assumed that fire hazards are present. This will be reviewed at RIBA Stage 4 in line with the relevant designs provided by specialist subcontractors for hazard rooms within the GIS Hall.

As per Clause 3.2.3 of TS_2.10.06, *'Unless otherwise specified by National Grid, the following items shall be designated as Elements at Risk requiring protection from the consequential effects of a fire developing in any Fire Hazards:*

a) *All third party land, property or infrastructure developments unless defined otherwise in the Scheme Specification or agreed with National Grid;*

b) *Other Fire Hazards;*

c) *Any equipment, structure or building which, if destroyed or seriously damaged, would cause or force consequential outages of other transmission circuits;*

d) *Any control, protection, data acquisition or communications equipment essential to the safe operation of the substation or transmission system;*

e) *Any other equipment or structures as defined in the Scheme Specification;*

f) *Substation buildings which are occupied;*

g) *Oil storage tanks;*

h) *Access routes that are considered essential for the purposes of fighting a fire and operation of the substation during a fire.*

i) *All low fire risk fluid filled transformers, quad boosters, and reactors.'*

Based on Clause 3.2.3 of TS_2.10.06, all spaces within the Margam GIS Hall have been assessed against the criteria for Elements at Risk, which require protection from the consequential effects of fire developing in any Fire Hazards. The assessment is outlined in Table 20. This will be reviewed at RIBA Stage 4.

Table 20 Elements at Risk for the Margam GIS Hall according to Clause 3.2.3 of TS_2.10.06

Space	Consideration as Elements at Risk
Main GIS Hall	Yes, as it contains essential electrical equipment (c, d, i)
3rd Party Area	Yes, as per (a) third party land or property
Telecom Room	Yes, as it houses communications equipment (d)
Protection & Control Room	Yes, contains control and protection equipment (d)
Control Room	Yes, essential for safe operation (d)
LV AC/DC Room	Yes, contains electrical equipment (c, d)
Battery Room	Yes, electrical equipment requiring protection (c, d)
Access Corridor	Yes, essential access route for firefighting and operation (h)

As per Table 20, all elements in the Margam GIS Hall are classified as Elements at Risk and require protection from the consequential effects of a fire developing in any Fire Hazards.

For protection purely from the effects of heat from fire, Clause 3.3.4 of TS_2.10.06 shall be followed:

'Where fire protection measures are required for the effect of heat and flame, the choice of installation method shall, as far as reasonably practicable, be made following the preferential hierarchy as below:

a) *Use of low fire risk fluid instead of mineral oil.*

b) *Physical separation in accordance with this specification between the Fire Hazard and the Element At Risk.*

c) *Installation of Fire Barriers in accordance with this specification between the Fire Hazard and Element At Risk'.*

As per Clause 4.3.1 of TS_2.10.06, '*The following hierarchy shall apply for equipment defined as a Fire Hazard installed in buildings:*

a) *No other equipment installed in same building;*

b) *Fire Hazard contained within a compartment of 4 hours Fire Resistance;*

c) *Fire Hazard protected by an Active Automatic Fire Protection System'*.

As fire hazards are present, relevant fire resistance periods specified to meet compliance in line with NGET guidance are required. This is will be reviewed at RIBA Stage 4.

Considering that all elements in the Margam GIS Hall are classified as Elements at Risk per Table 20, as per Clause 4.3.1 of TS_2.10.06, it is recommended that compartment walls and floors with a minimum of 4 hours fire resistance be provided in this building.

As per Clause 3.3.2 of TS_2.10.06, *'A Fire Damage Zone shall be considered for each piece of equipment which is considered to be a Fire Hazard, in accordance with 3.1.2*'. The type or specifications of equipment inside the Margam GIS Hall including location and dimensions will be specified at RIBA Stage 4. At RIBA Stage 4 , detailed assessments will be carried out such as the sizing of Oil Retaining Areas and the specific calculation of Fire Damage Zones as outlined in this clause and related NGET Manuals by the relevant specialist subcontractor.

'Fire Barriers shall be provided on a 'line-of-sight' basis to protect the Element at Risk from the calculated Fire Damage Zone and flame height, in accordance with Clause 5.2'. The calculated Fire Damage Zone and flame height will be conducted by the specialist subcontractor at RIBA Stage 4 and will be reviewed and incorporated into the Fire Strategy at this stage.

Given the functions of the areas within the Margam GIS Hall and the associated fire risks, a minimum fire resistance rating of 4 hours is recommended for the elements of structure of the Margam GIS Hall.

The fire safety strategy drawings contained in Appendix B meet the specified guidance as above.

6.2 Portal Frame Structures

If the stability of an external wall is linked to that of the portals, the column and rafter members should have fire resistance to avoid premature failure of the relevant external wall.

If the stability of the external wall is not linked to that of the portal, the foundations and their connection to the portal frame should be designed to transmit the overturning moment caused by the fire-induced collapse of unprotected rafters, purlins and some roof cladding, whilst allowing the external wall to retain is stability/integrity.

6.3 Compartmentation

The maximum compartment size based on the relevant risk profiles, in accordance with Clause 31.2 of BS 9999:2017, are outlined in Table 21.

Table 21 Maximum floor area on each floor of a compartment

Building	Risk Profile	Maximum Area on Any Floor (m^2)
Margam Amenities Building	A2	No Limit
Margam GIS Hall	A3	14000

The floors areas of the Margam Amenities Building and the Margam GIS Hall do not exceed the maximum values as stated above and therefore further compartmentation to limit the areas within each building is not required.

6.3.1 Compartment Floors

As per Clause 31.3.2 of BS 9999:2017, the Margam Amenities Building and the Margam GIS Hall have an A occupancy characteristics, however the floor areas do not exceed the values shown in Table 21, does not have a floor greater than 30m above ground level and does not have a basement storey, therefore compartment floors are not required.

It is recommended in National Grid manual of TS_2.10.06 that compartment floors with a minimum of 4 hours fire resistance be provided in the Margam GIS Hall. Preference was given to the National Grid manual, as it is assumed that National Grid manuals account for potential risks or factors relevant to this type of building.

As no upper floors are present (except for the gantry level), no compartment floors are required for the GIS Hall or Amenities building.

As per Clause 14.1 of BS 9999:2017, it should be noted that where large quantities of readily combustible products are stored or displayed beneath a mezzanine with a solid floor, there is a significant risk of rapid fire growth and flame spread beyond the mezzanine edge.

6.4 Fire Doors

The fire resistance requirements for the fire doors as per BS 9999:2017 are outlined in Table 22.

Table 22 Fire door fire resistance requirements

Location		Minimum Fire Resistance [1] (minutes)
Compartment Wall	All other compartment walls	[2] [3]
	Compartment walls with a minimum fire resistance of 240 minutes	[4][5]
Compartment Floor		[3]
Common Protected Lobby / Corridor		FD30S [5]

Notes
1. When tested in accordance with the relevant parts of BS476 or equivalent European standard.
2. Smoke seal only required where compartment wall is utilised for progressive horizontal evacuation, as per Table 30 of BS 9999:2017.
3. As for the wall or floor in which it is fitted, as per Table 30 of BS 9999:2017.
4. **Any openings in the required construction should be protected by doors having a fire resistance of not less than** 12**0 minutes.**
5. A fire door that is required to resist the passage of smoke at ambient temperature conditions (i.e. with suffix 'S') should either:

a) have a leakage rate not exceeding 3m3/h/m, when testing in accordance with BS476-31.1 with a threshold taped and subjected to a pressure of 25Pa; or
b) meet the classification requirement of Sa when tested in accordance with BSEN1634-3.

As per clause 4.13.3 of TS_2.10.10, '*Doors giving access from a corridor to a room housing operational equipment shall be designated Fire Doors. These doors shall be automatically self-closing'*. No additional requirements are provided in the National Grid manuals listed in Section 2.2.

It should be noted, as stated in Section 6.1, a minimum fire resistance rating of 4 hours (240 minutes) was adopted for the compartment walls of the Margam GIS Hall. However, as TS_2.10.10 does not reference fire doors performance requirements, FD120S doors have been recommended for the 4-hour compartment walls of the Margam GIS Hall. This fire resistance period is considered to meet the functional requirement B3 of Building Regulations 2010 (as amended) as the fuel load (combustible materials) near a wall is generally greater than near a door opening.

6.5 Limitations on Non-Insulating Glazing

Restrictions apply to the use of non-insulating fire-resisting glazed elements because of the risks that they pose from their relative inability to afford adequate protection against transmitted heat (see Table 27 of BS 9999:2017). In this respect there are four possible hazards to assess, even if the integrity of the glazed element as a flame and smoke barrier is maintained. These are:

- Direct exposure to potentially high levels of radiant heat with the risk of burns to exposed skin;
- Convective heating of the atmosphere in the escape way;
- Smouldering smoke generation (before ignition) from floor coverings, fixtures and fitting in the corridor;
- Secondary ignition and flaming of fixtures and fittings in the escape way.

Note: similar considerations also govern the use of integrity with insulation fire-resisting glazed elements, instead of integrity-only fire-resisting glazed elements, for the protection of property against fire, when fire exposure can be prolonged.

To minimise the risk of ignition of adjacent floorings or floor coverings, non-insulating glazed areas in fire resisting structures should be at least 100mm above floor level. The risk of smouldering combustion before flaming occurs can also be heightened on the nominally protected side of non-insulated glazing under-developed fire conditions. It might be therefore appropriate to raise the limiting height above the floor level for non-insulated fire-resisting glass (e.g., from 100mm to at least 500mm), to minimise the risk of smoke generation in the escape way affecting safe escape of fire-fighter access, depending on the anticipated fire load and escape conditions.

Glazed elements that are fire-resisting in terms of integrity only (i.e., non-insulating) should be in accordance with Table 27 of BS 9999:2017 for the appropriate position and number of escape stairs. Glazed elements that are fire-resisting in terms of both integrity and insulation the required level may be used without restriction (see Clause 20.2 of BS 9999:2017 for information regarding their location in fire-fighting shafts).

6.6 Ductwork

Where air handling ducts pass through compartmentation / fire-resisting construction the integrity of these compartments should be maintained. There are four basic methods in order to prevent smoke and flame spread through the building or compartment. For more information see Clause 32.5.2 of BS 9999:2017.

The requirements for each option are as follows:

Method 1 – Thermally actuated fire dampers

- Fire dampers are not suitable for protected escape routes;
- Fire dampers that are thermally operated can be provided where ductwork goes through fire-resisting construction.

Note: Fire dampers should be tested to BS EN 1560:2010

Method 2 – Fire-resisting enclosures

- Method 2 can only be used on ductwork that passes through an escape route, providing the ductwork does not serve the escape route is passes through;
- The fire resisting enclosures should achieve the same fire resistance as the wall the ductwork penetrates, which then forms a compartment known as a protected shaft. This allows a multiplicity of services to be transferred together within the duct to transverse a number of compartments within the building without the need for further subdivisions. Fire dampers (thermally or actuated by automatic fire detector – AFD) will only be required where the ductwork enters or leaves the protected shaft.

Method 3 – Protection using fire-resistant ductwork

- The ductwork itself forms a protected shaft. The ductwork should achieve the same fire resistance as the wall the ductwork penetrates. The fire resistance can be achieved by the ductwork material itself of through the application of a protective material;
- Method 3 can only be used on ductwork that passes through an escape route, providing the ductwork does not serve the escape route it passes through.

Note: the supporting hangers should be capable of supporting the ductwork for not less than the period of fire resistance of the ductwork.

Method 4 – Automatically actuated fire and smoke dampers triggered by smoke detectors

- Method 4 may be used for extract ductwork passing through the enclosures of protected escape routes, both where the ductwork does and does not serve the escape route.

Note: Method 4 is not suitable for serving kitchens.

6.7 Fire Stopping

If the fire separating element is to be successful, every joint or imperfection of fit, or opening to allow services to pass through the element, should be adequately protected by sealing or fire stopping so that the fire resistance of the element is not impaired. Fire stopping is to be provided at the following locations:

- Joints between fire-separating elements;
- In line with fire rated walls and floors where there is a penetration of the wall/floor in order to maintain the fire resistance integrity of the wall/floor;
- Between fire rated walls/floors (where the floor forms part of a fire rated enclosure of a compartment floor) and an external wall to ensure the fire resistance integrity of the wall/floor is maintained to the external wall.

Where fire stopping is provided, it is to achieve the same level of fire resistance as required for the wall/floor it replaces. For more information see Clause 32.6 from BS 9999:2017.

As per clause 6.4.2 of TS_2.10.06, '*Vertical cable risers shall be provided with horizontal fire stops of 4 hours Fire Resistance to prevent a chimney effect. Fire and smoke stops shall also be included at points where cables pass from a cableway / tunnel into switchgear, relay cubicles etc'*.

As per clause 4.13.11 of TS_2.10.10, '*Where cables pass between floors of a building, any ducts or slots in the floors shall be sealed to prevent possible spread of fire. The sealant shall have equal Fire Resistance to that of the floor through which the cables pass'*.

As per clause 4.13.13 of TS_2.10.10, '*All trenches or cable ducts shall be effectively sealed to prevent the spread of fire, smoke, CO2 etc, into adjoining compartments. Those entering a building shall be effectively sealed whether or not cables have been installed. Where ducts and trenches pass under, over or through compartment walls, the sealing of the opening shall have a Fire Resistance equal to that of the compartment wall'*.

6.8 Cavity Barriers

In accordance with BS 9999:2017 cavity barriers are to be provided in the cavity of:

- an external wall at all cavity edges and around all openings in the external wall (i.e. windows);
- an external wall in line with a compartment floor where it meets the external wall;
- an external wall in line with a compartment wall where it meets the external wall;
- an internal cavity wall at the junction with a fire rated wall/floor (where the wall/floor forms part of a fire rated enclosure or a compartment wall/floor).

It should be noted that cavity barriers need not be provided within internal or external cavity walls where the following conditions are met:

- Cavity closers are provided around all edges and openings in the cavity wall (cavity closers need not achieve a specific performance in relation to fire resistance); and
- The cavity is enclosed within two leaves (one either side) of either concrete or masonry each at least 75mm thick.

Cavity barriers should also be provided in cavities to prevent the excessive spread of unseen fire and smoke. Cavity barriers are to be provided to ensure the maximum dimensions of undivided concealed spaces do not exceed the requirements outlined in Table 23.

Table 23 Maximum dimensions of concealed spaces

Location of Cavity	Class of Surface/Product Exposed in Cavity	Maximum Distance In Any Direction
	European Class [1]	
Between Roof and Ceiling	Any	20m
Any Other Cavity	Class A1, Class A2, Class B or Class C	20m
	Any Other Class	10m

Notes
1. Relates to performance determined in accordance with BSEN13501-1:2018

As per clause 4.13.2 of TS_2.10.10, '*Cavity barriers shall be formed in roof spaces or beneath computer flooring to form a continuous barrier such that the cavity does not exceed 20m in any direction. The cavity barriers shall have a minimum Fire Resistance of 1 hour*'. As no further detail is provided within NGET guidance in terms of insulation/integrity, it is a reasonable assumption that the cavity barriers should achieve 60 mins fire resistance for integrity and insulation.

Refer to Clause 33.1 of BS 9999:2017 for further information with regard to cavity barrier provisions, construction and fixing requirements.

7 External Fire Spread

Functional Requirement 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 building.

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.

7.1 Fire Spread to Adjacent Properties

In order to prevent fire spread between properties it should be ensured sufficient separation distance is provided between fire compartments within the building and the relevant boundaries based on the extent of unprotected area to the fire compartments.

External fire spread analysis has been conducted based on the Maximum Percentage Area method as described in BR187:2014.

It should be noted that the External Fire Spread Analysis in this section is based on the methodology outlined in BS 9999:2017 and BR 187:2014, as well as the provided site plan.

In addition, the site plan shows overhead power lines near the Margam Amenities Building and Margam GIS Hall. The potential impact of these overhead power lines on boundary distances will be reviewed by National Grid at RIBA Stage 4 and incorporated into the Fire Strategy.

7.1.1 Maximum Percentage Area Method

The maximum percentage area method allows for calculation of maximum allowable percentage area using the following formula:

$$U = 100\frac{(\frac{d}{F})^2}{wh}\% \qquad \text{(Equation 3)}$$

where:

U:	Maximum allowable unprotected percentage
F:	A factor given in section 2.2.4 of BR 187 (2014)
d:	Boundary distance (m)
W:	Width of the elevation (m)
H:	Height of the elevation (m)

The methodology for this analysis is summarised below:

- A plane of reference is defined which 'touches' the elevation under consideration at least once but does not pass through it;
- A rectangle is constructed enclosing the elevation to be assessed, with height and width measurements taken;
- Factor F is defined using the methodology outlined in section 2.2.4 of BR 187 (2014);
- (Equation 3 is used to calculate the allowable maximum unprotected percentage for the façade.

7.1.2 External Fire Spread Analysis Assumptions

External fire spread analysis in accordance with BR187:2014 is based on the following assumptions:

- All parts on the elevation to the fire compartment are considered 'unprotected' except the following:
  - All parts of the elevation that meet the fire resistance requirements for elements of structure.
  - Small unprotected areas (less than $1m^2$) and groups of unprotected areas (within an area not exceeding $1m^2$) that are separated from all other unprotected areas on the compartment elevation by at least 4m (reduced to 1.5m where one of the unprotected areas does not exceed $0.1m^2$).
- The relevant boundary distance is taken from the plane of reference to the adjacent site boundary except where the adjacent boundary is to a public roadway or river etc. In the case the adjacent boundary is a public roadway or river the relevant boundary distance may be taken to the middle of the road or river etc.
- Analysis for each fire compartment is to be conducted based on the relevant occupancy characteristic of the compartment.
- The analysis will consider the 'worst-case' scenario for each elevation (i.e. compartment with greatest extent of unprotected area closest to the relevant boundary). Providing the analysis for the worst case demonstrates compliance it is considered acceptable to assume all other compartments on the elevation are also acceptable with regard to external fire spread.
- For the purposes of this analysis, the Margam Amenities Building and the Margam GIS Hall are assumed to contain a higher fire load.
- It is assumed that the only occupied buildings are the Margam Amenities Building and the Margam GIS Hall.
- Notional boundaries have been noted as follows:
  - Amenities Building: North (to middle of car park), East (midpoint between Amenities and GIS Hall), South (Midpoint between Amenities and proposed workshop), West (red line boundary)
  - GIS Hall: North (to middle of access road), East (red line boundary), South (Fence line), West (midpoint between Amenities and GIS Hall)
- The existing transformers (existing electricity distribution site) are assumed to be protected via fire resistant construction of minimum 240 minutes in line with TS_2.10.06. This will be reviewed at RIBA stage 4.

7.1.3 External Fire Spread Analysis for the Margam Amenities Building

Relevant Boundary Distances

The maximum relevant boundary distances from each elevation are illustrated on the site plan in Figure 7.

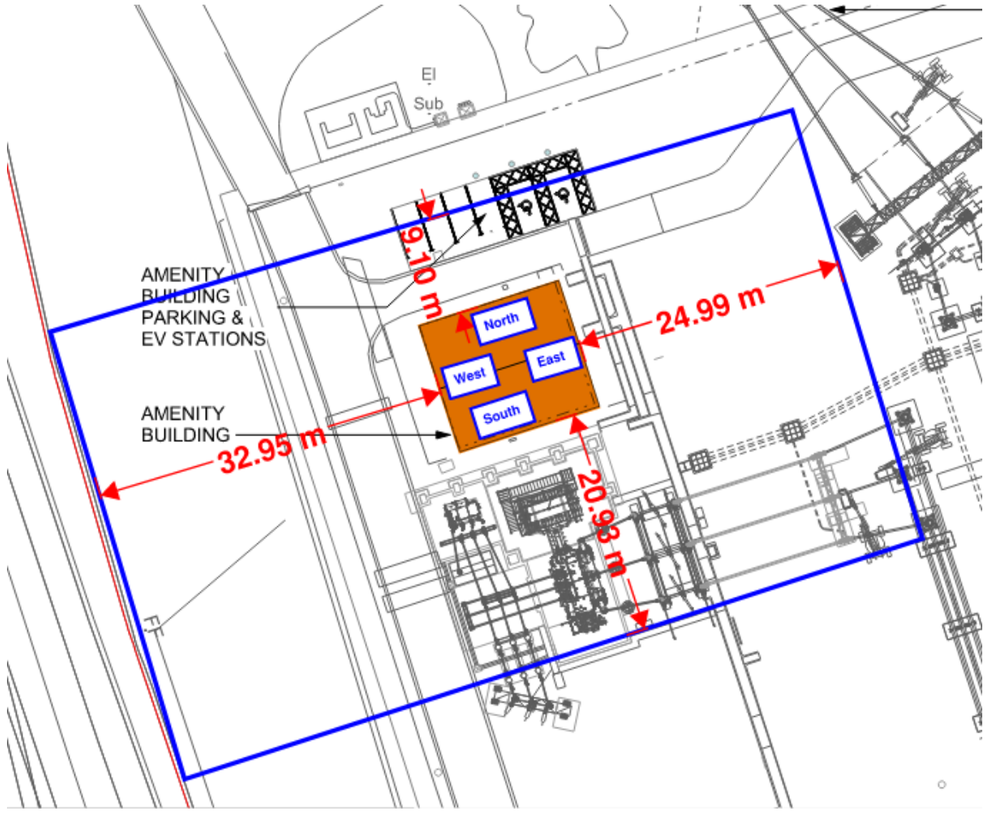


Figure 7 Relevant boundary distances for the Margam Amenities Building

The boundary distances were measured based on the provided site plan. If there are high-value assets or other factors that may affect the boundary distances shown in Figure 7, this will be reviewed at RIBA stage 4.

North Elevation

The extent of unprotected area for the North elevation is illustrated in Figure 8. The largest compartment is considered to be the office space which is assessed as the reasonable worst-case scenario.

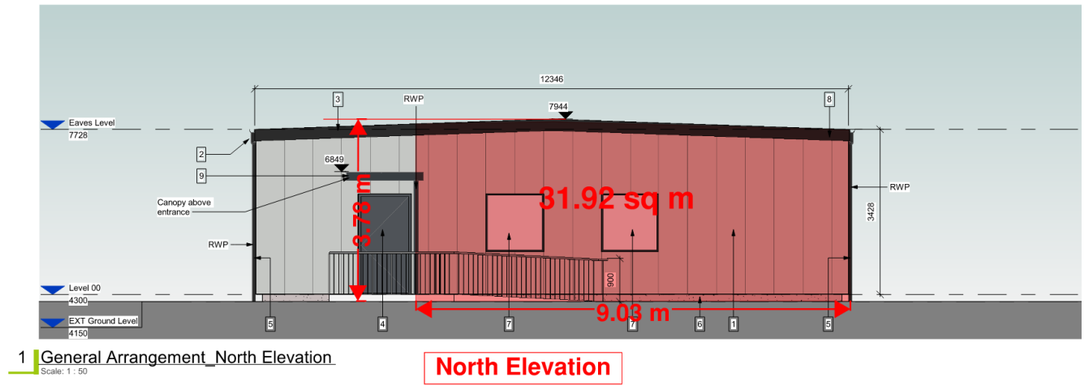


Figure 8 North elevation unprotected area for the Margam Amenities Building

The plane of reference for this analysis is taken to be parallel to the elevation. The compartment elevation is approximately 31.92m^2 (enclosing rectangle 3.78m high x 9.03m wide), and the actual distance from the plane of reference to the adjacent relevant boundary is 9.10m.

Based on Equation 3, the maximum permitted percentage of unprotected area on the exposed compartment elevation is 100%. As the worst case scenario compartment on this elevation has 100% permitted unprotected area, the other compartments are considered to have 100% unprotected area of the external façade.

South Elevation

The extent of unprotected area for the South Elevation is illustrated in Figure 9. The largest compartment is considered to be the office space (which spans the entire elevation) which is assessed as the reasonable worst-case scenario.

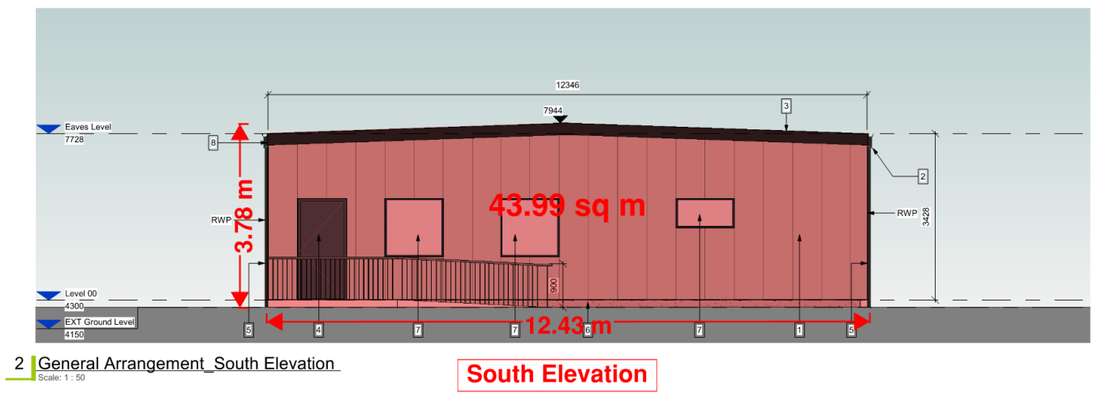


Figure 9 South elevation unprotected area for the Margam Amenities Building

The plane of reference for this analysis is taken to be parallel to the elevation. The compartment elevation is approximately 43.99m^2 (enclosing rectangle 3.78m high x 12.43m wide), and the actual distance from the plane of reference to the adjacent relevant boundary is 20.93m.

Based on Equation 3, the maximum permitted percentage of unprotected area on the exposed compartment elevation is 100%.

East Elevation

The extent of unprotected area for the East Elevation is illustrated in Figure 10. The largest compartment is considered to be the office space (which spans the entire elevation) which is assessed as the reasonable worst-case scenario.

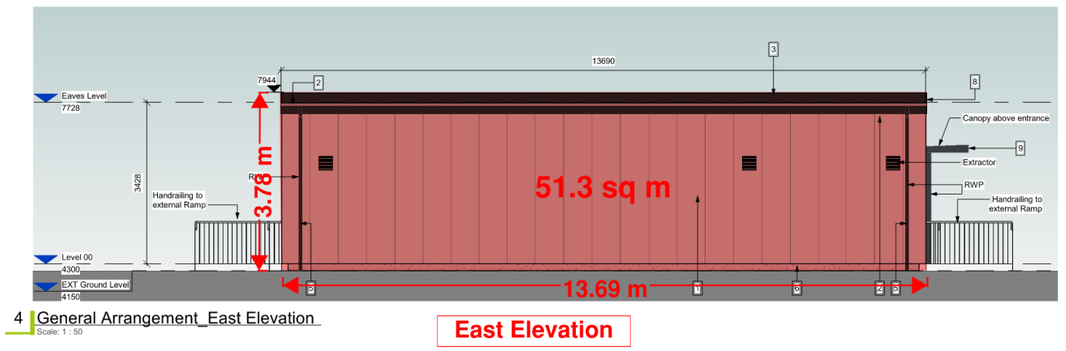


Figure 10 East elevation unprotected area for the Margam Amenities Building

The plane of reference for this analysis is taken to be parallel to the elevation. The compartment elevation is approximately 51.3m^2 (enclosing rectangle 3.78m high x 13.69m wide), and the actual distance from the plane of reference to the adjacent relevant boundary is 24.99m.

Based on Equation 3, the maximum permitted percentage of unprotected area on the exposed compartment elevation is 100%.

West Elevation

The extent of unprotected area for the West Elevation is illustrated in Figure 11. The largest compartment is considered to be the office space which is assessed as the reasonable worst-case scenario.

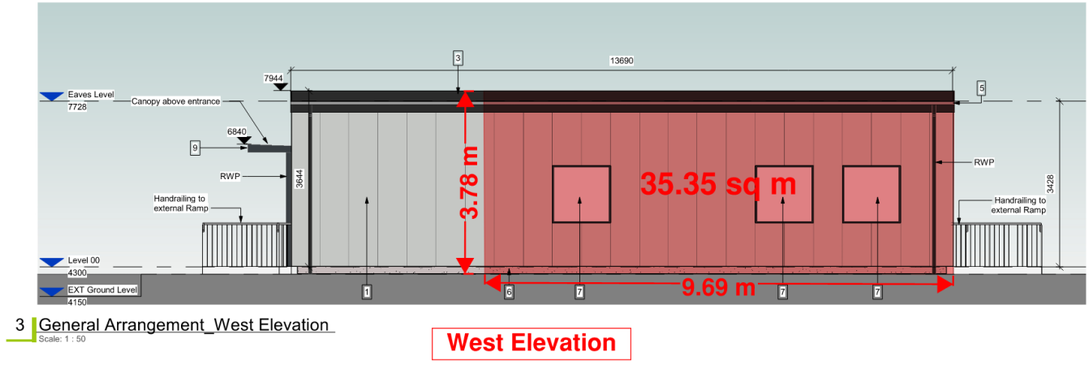


Figure 11 West elevation unprotected area for the Margam Amenities Building

The plane of reference for this analysis is taken to be parallel to the elevation. The compartment elevation is approximately 35.35m^2 (enclosing rectangle 3.78m high x 9.69m wide), and the actual distance from the plane of reference to the adjacent relevant boundary is 32.95m.

Based on Equation 3, the maximum permitted percentage of unprotected area on the exposed compartment elevation is 100%. As the reasonable worst-case scenario compartment on this elevation has 100% permitted unprotected area, the other compartments are considered to have 100% unprotected area of the external façade.

7.1.4 External Fire Spread Analysis for the Margam GIS Hall

Relevant Boundary Distances

The maximum relevant boundary distances from each elevation are illustrated on the site plan in Figure 12.

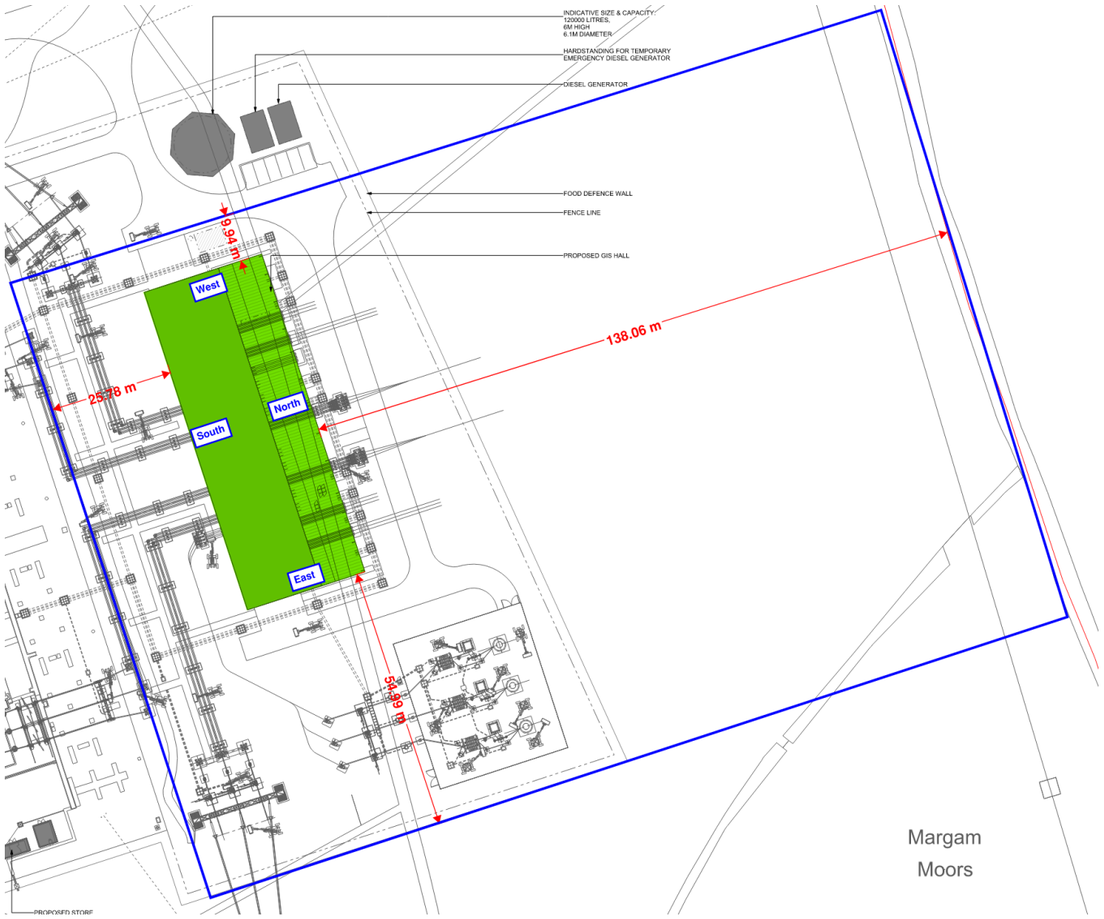


Figure 12 Relevant boundary distances for the Margam GIS Hall

The boundary distances were measured based on the provided site plan. If there are high-value assets or other factors that may affect the boundary distances shown in Figure 12, this will be reviewed at RIBA stage 4.

North Elevation

The extent of unprotected area for the North elevation is illustrated in Figure 13. The largest compartment is considered to be the protection and control room which is assessed as the reasonable worst-case scenario.

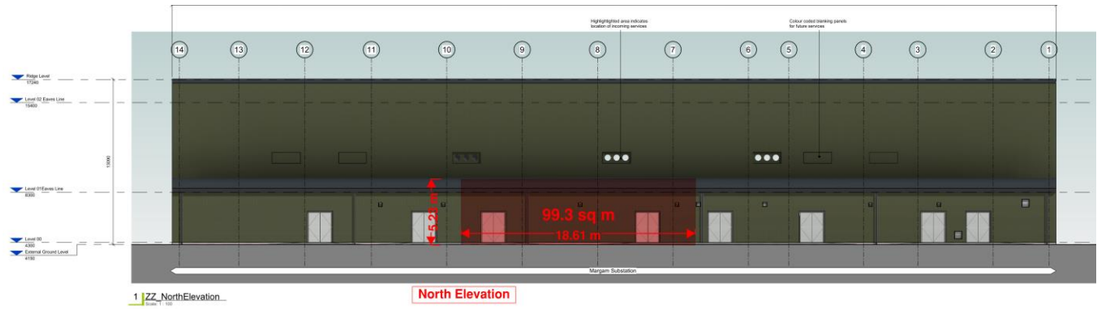


Figure 13 North elevation unprotected area for the Margam GIS Hall

The plane of reference for this analysis is taken to be parallel to the elevation. The compartment elevation is approximately 99.3m^2 (enclosing rectangle 5.23m high x 18.61m wide), and the actual distance from the plane of reference to the adjacent relevant boundary is 138.06m.

Based on Equation 3, the maximum permitted percentage of unprotected area on the exposed compartment elevation is 100%. As the worst case scenario compartment on this elevation has 100% permitted unprotected area, the other compartments are considered to have 100% unprotected area of the external façade.

South Elevation

The extent of unprotected area for the South Elevation is illustrated in Figure 14. The largest compartment is considered to be the GIS Hall (which spans the entire elevation) which is assessed as the reasonable worst-case scenario.

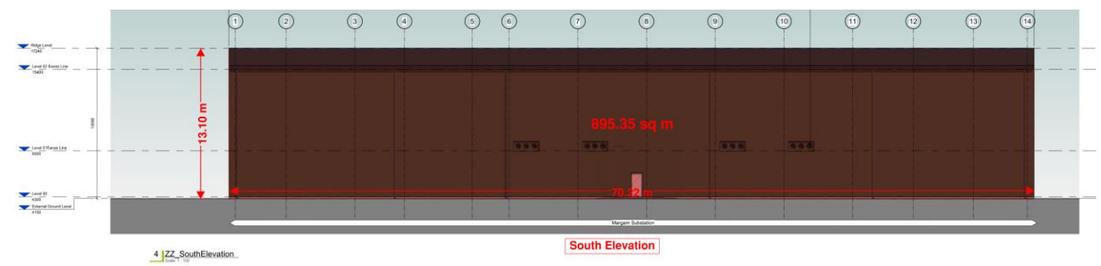


Figure 14 South elevation unprotected area for the Margam GIS Hall

The plane of reference for this analysis is taken to be parallel to the elevation. The compartment elevation is approximately 895.35m^2 (enclosing rectangle 13.10m high x 70.22m wide), and the actual distance from the plane of reference to the adjacent relevant boundary is 25.78m.

Based on Equation 3, the maximum permitted percentage of unprotected area on the exposed compartment elevation is 87.9%. The remaining exposed area on the compartment elevation should be protected in line with the requirements listed in Section 6.1. It should be noted that it is recommended to distribute the unprotected areas in a manner that ensures a uniform radiation pattern in the event of a fire, thereby avoiding the creation of areas with high concentrations of radiant heat.

East Elevation

The extent of unprotected area for the East Elevation is illustrated in Figure 15. The largest compartment is considered to be the GIS Hall which is assessed as the reasonable worst-case scenario.

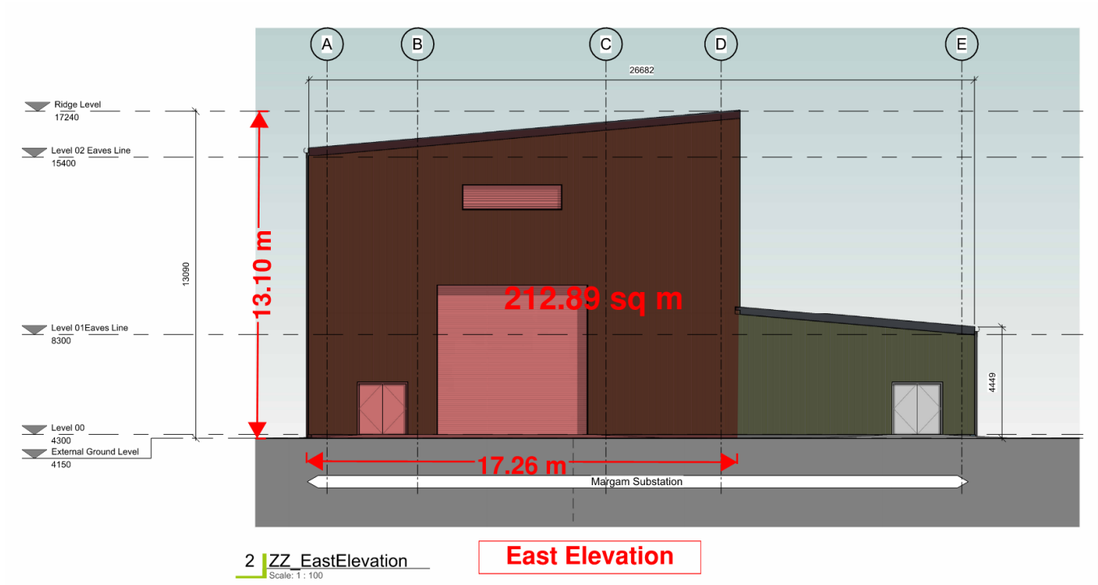


Figure 15 East elevation unprotected area for the Margam GIS Hall

The plane of reference for this analysis is taken to be parallel to the elevation. The compartment elevation is approximately 212.89m^2 (enclosing rectangle 13.10m high x 17.26m wide), and the actual distance from the plane of reference to the adjacent relevant boundary is 54.99m.

Based on Equation 3, the maximum permitted percentage of unprotected area on the exposed compartment elevation is 100%. As the reasonable worst-case scenario compartment on this elevation has 100% permitted unprotected area, the other compartments are considered to have 100% unprotected area of the external façade.

West Elevation

The extent of unprotected area for the West Elevation is illustrated in Figure 16. Due to the proximity of the boundary both the GIS Hall and battery storage areas of the elevation will be assessed.

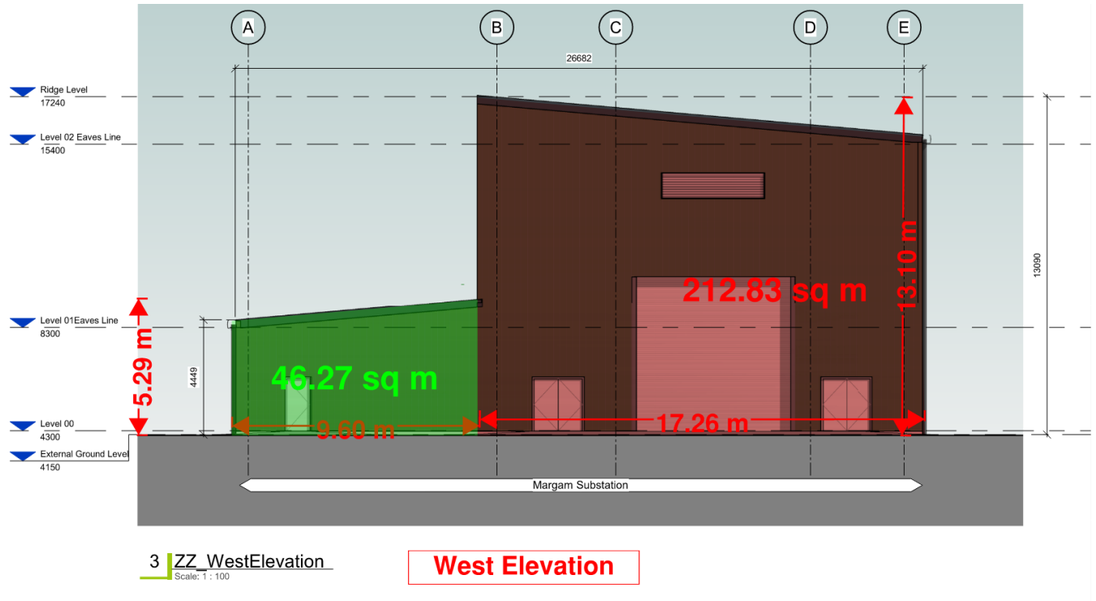


Figure 16 West elevation unprotected area for the Margam GIS Hall

GIS Hall Compartment (denoted in red above)

The plane of reference for this analysis is taken to be parallel to the elevation. The compartment elevation is approximately 212.83m^2 (enclosing rectangle 13.10m high x 17.26m wide), and the actual distance from the plane of reference to the adjacent relevant boundary is 9.94m.

Based on Equation 3, the maximum permitted percentage of unprotected area on the exposed compartment elevation is 46.8%. The remaining exposed area on the compartment elevation should be protected in line with the requirements listed in Section 6.1. It should be noted that it is recommended to distribute the unprotected areas in a manner that ensures a uniform radiation pattern in the event of a fire, thereby avoiding the creation of areas with high concentrations of radiant heat.

Battery Storage Room Compartment (denoted in green above)

The plane of reference for this analysis is taken to be parallel to the elevation. The compartment elevation is approximately 46.27m^2 (enclosing rectangle 5.29m high x 9.60m wide), and the actual distance from the plane of reference to the adjacent relevant boundary is 9.94m.

Based on Equation 3, the maximum permitted percentage of unprotected area on the exposed compartment elevation is 100%.

7.2 Building Façade

External walls should be constructed using a material that does not support fire spread and therefore endanger people in or around the building. Flame spread over or within an external wall construction should be controlled to avoid creating a route for rapid fire spread bypassing compartment floors or wall. It should also be ensured external walls close to relevant boundaries are not readily ignitable to avoid fire spread between buildings.

In accordance with clause 35.5 of BS 9999:2017, external walls should either meet the performance criteria of BR135 when testing accordance with BS8414-1 or BS8414-2 or should meet the following requirements:

- Where the external wall is within 1m of a relevant boundary the external surface is to achieve the following requirement:
    - Class B-s3, d2 or better (European class). Profiled or flat steel sheet at least 0.5mm thick with an organic coating of no more than 0.2mm thickness is also acceptable.
- Where a part of the building is considered risk profile B2 or B3 all external wall surfaces up to 10m above ground level and up to 10m above a roof any part of the building to which the public have access to are to achieve the following requirement:
    - Class B-s3, d2 or better (European class). Profiled or flat steel sheet at least 0.5mm thick with an organic coating of no more than 0.2mm thickness is also acceptable.
- Cavity barriers are to be provided as outlined in Section 6.8.

7.3 Roof Coverings

As per Table 36 of BS 9999:2017, since the minimum relevant boundary distance for both the Margam Amenities Building and the Margam GIS Hall is greater than 6 m and less than 12 m, the roof covering is to achieve a minimum classification of at least C_{ROOF}(t4). However, it is recommended the roof covering to achieve a classification of B_{ROOF}(t4).

As per Clause 31.4.5 of BS 9999:2017, where the roof covering passes over a compartment wall, the roof covering should be situated on top of a deck of material of Class A2-s3, d2 or better, for at least 1,500mm either side of the compartment wall. It should be noted that this requirement is not considered necessary where the roof achieves a fire resistance (from the underside) equivalent to that of the compartment wall (e.g. where the roof is a concrete slab).

Compartment walls should be fire-stopped up to the roof construction.

8 Facilities for Firefighting

Functional Requirement B5:

1. The building shall be designed and constructed so as to provide reasonable facilities to assist firefighters 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.

8.1 General

The following section describes the arrangements for firefighting provisions in the event of a fire in order to comply with B5 of Schedule 1 to the Building Regulations 2010 (as amended).

In addition, the site plan shows overhead power lines near the Margam Amenities Building and Margam GIS Hall. A consultation with the fire service is recommended to assess any potential impact of overhead power lines and how they affect firefighting operations, this is recommended to take place at RIBA Stage 4. It may be advisable to refer to the document 'Guidance for UK Fire and Rescue Services: Dealing with Incidents on or Near National Grid High Voltage Overhead Lines', where applicable.

8.2 Firefighting Access

8.2.1 Access Routes

Fire Service vehicular access to the premises is to meet the recommendations outlined in Table 20 of BS 9999:2017, which is summarised in Table 24. Turning facilities should be provided in any dead-end access route that exceeds 20m in length. In buildings that are not fitted with fire mains, access points should be within 18m of a fire appliance parking position.

Table 24 Example of measurements for a typical vehicle access route

Appliance Type	Min. Width of Road Between Kerbs (m)	Min. Width of Gateways (m)	Min. Turning Circle Between Kerbs (m)	Min. Turning Circle Between Walls (m)	Min. Clearance Height (m)	Min. Carrying Capacity (t)
Pump	3.7	3.1	16.8	19.2	3.7	12.5

Note: Whilst current guidance recommends a minimum carrying capacity of 12.5 tonnes for a pump appliance, the actual weight of a pump appliance is likely to be significantly greater e.g., 18 tonnes. This should be taken into consideration when designing the access routes.

Document D11 is used to provide details for the Margam Amenities Building and the Margam GIS Hall regarding Fire Service access routes.

Table 25 presents the fire and rescue service vehicle access requirements for buildings under 11 metres in height that are not fitted with fire mains. The accessible perimeters of both the Margam Amenities Building and the Margam GIS Hall are compliant with the requirements of Clause 21.2 and Table 19 of BS 9999:2017

Table 25 Fire and rescue service vehicle access to buildings

Building	Total floor area of building (m^2)	Position of access (% of perimeter) [1]	Available accessible perimeter (%) [2]
Margam Amenities Building	150 [3]	15 [4]	50
Margam GIS Hall	1812 [5]	15 [4]	51.5

Notes:
1. As per Clause 21.2 and **Table 19 of BS 9999:2017.**
2. According to measurements presented in Appendix D for Fire Service access routes.
3. Based on the information provided on [D4].
4. As per Clause 21.2 of BS 9999:2017, vehicle access should be provided to small buildings (i.e. buildings up to 2000 m² with a top storey less than 11 m above ground level) to within 45 m of every point on the projected plan area or 'footprint' of the building, or to 15% of the building perimeter, whichever is the less onerous. For Margam Amenities Building and the Margam GIS Hall, 15% of the building perimeter is the less onerous.
5. **Based on the information provided on [D1].**

Fire service access routes for the Margam Amenities Building and the Margam GIS Hall are shown in Figure 17. More details can be found in Appendix D for Fire Service access routes. A swept path analysis [D24] was provided by National Grid, considering the fire appliance vehicle profile, shown in Figure 18 for the Margam GIS Hall. The analysis confirms that the fire service access routes in Figure 17 align with the vehicle tracking shown in Figure 18.

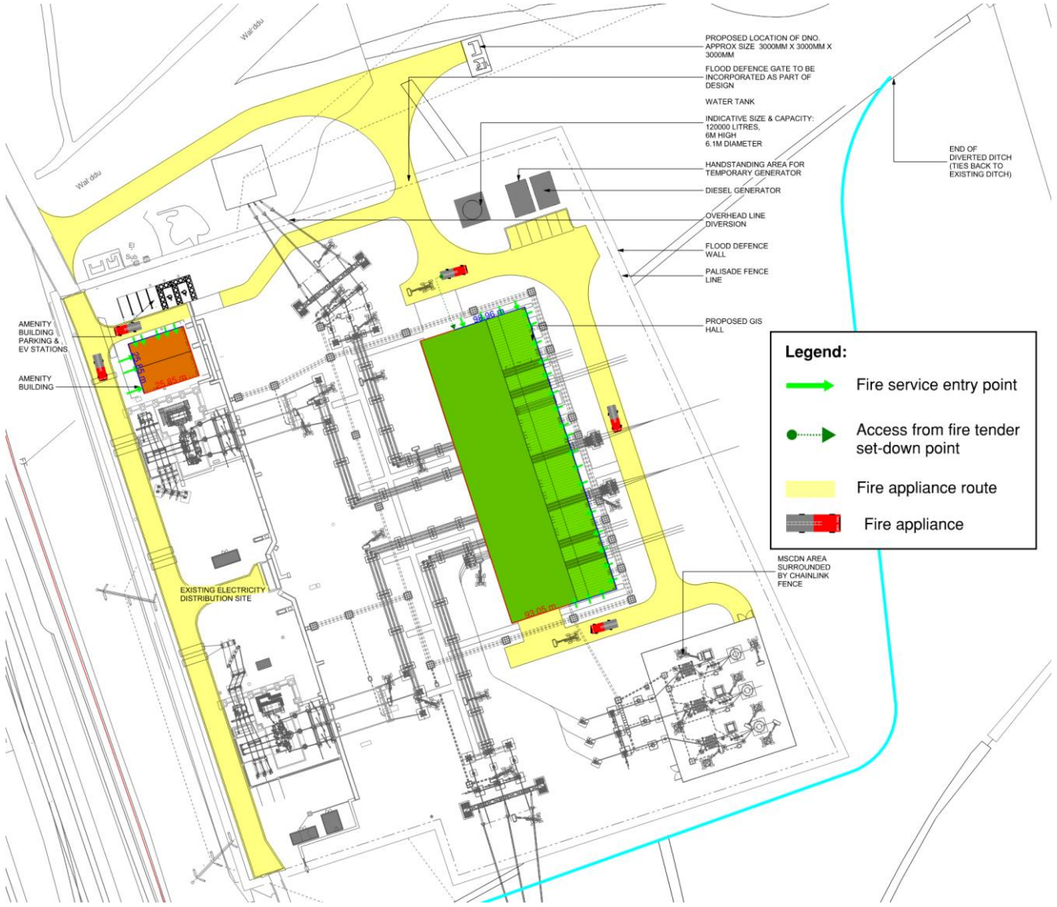


Figure 17 Fire Service access routes for the Margam Amenities Building and the Margam GIS Hall

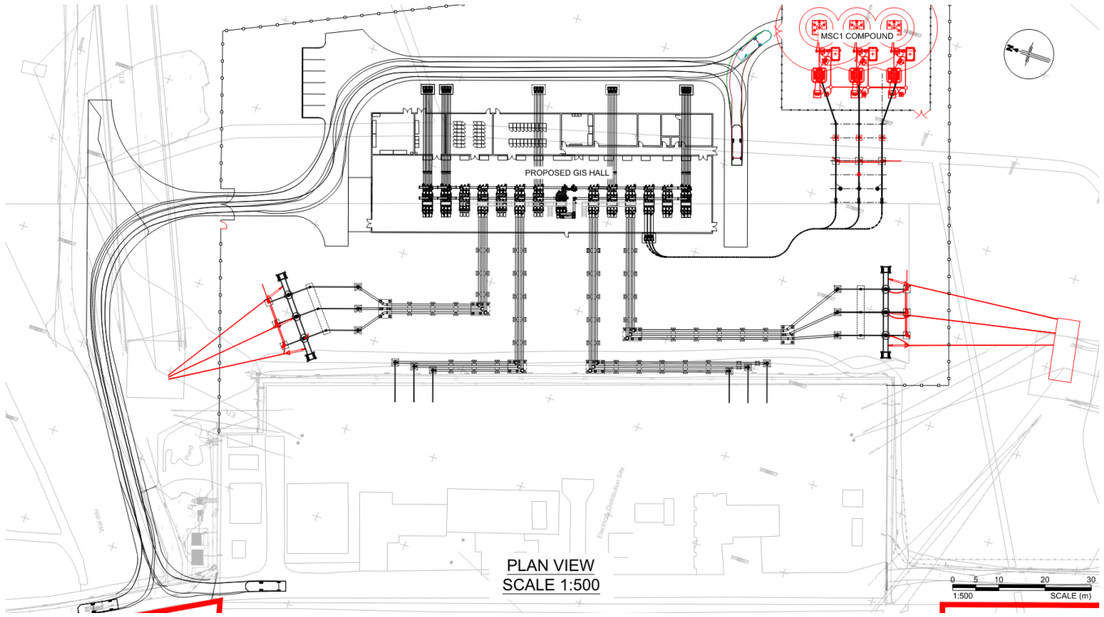


Figure 18 The swept path analysis [D24] for the Margam GIS Hall considering the fire appliance vehicle profile

8.2.2 Fire Appliance Access Requirements

For buildings not fitted with fire mains, vehicle access should be provided in accordance with Table 19 of BS 9999:2017.

Every elevation to which vehicle access is provided should have suitable door(s) not less than 750mm wide giving access to the interior of the building. Doors should be provided such that there is no more than 60m between each door and/or the end of that elevation (e.g. a 150m elevation would require a minimum of 2 doors).

Based on the plans provided, the proposed arrangement is considered to meet these requirements.

8.2.3 Firefighting Shaft Provisions

As per Clause 20.1.1 of BS 9999:2017, firefighting shafts are not required.

8.3 Fire Mains

As per Clause 22.1 of BS 9999:2017, fire mains should be installed in buildings where any floor is higher than 11m above firefighting access level. Therefore, fire mains are not required.

8.4 Fire Hydrants

In accordance with Clause 22.2 of BS 9999:2017, the Margam Amenities Building and the Margam GIS Hall should be provided with fire hydrants within 90m of an entry point of the building, the hydrants should be located not more than 90m apart.

Water mains and hydrants should be capable of delivering a sufficient flow of water to enable effective firefighting to be undertaken. The water supple should comprise one or a combination of the following:

- Hydrants provided by the water supply company on the street mains.
- Private hydrants designed and installed in accordance with BS 9990, ideally forming part of a ring main system.
- A static or natural water supply.

The location of any existing or proposed hydrants should be confirmed by National Grid and will be reviewed at RIBA stage 4.

As per Clause 4.2.2 of TS_2.10.06, '*Where reasonably practicable, the water supply shall be obtained from hydrants connected to a suitable water main. Hydrants shall be provided within 90m of all equipment and buildings*'.

As per Clause 4.2.6 of TS_2.10.06, '*Where no suitable alternative water supply is available, static water tanks shall be provided to meet the requirements above. Tanks shall be suitable for service without emptying, cleaning, maintenance or repair for a period of not less than 15 years. Tanks shall be fitted with a suitable fire and rescue service inlet/outlet*'.

9 Fire Protection Systems

This section describes the fire protection systems to be provided with the development in order to ensure the safety of occupants and Fire Service personnel in the event of a fire.

9.1 Emergency Lighting

As per Clause 15.4 of BS 9999:2017, suitable lighting should be provided to all premises to enable the safe movement of persons along escape routes to a place of relative or ultimate safety. Emergency escape lighting, when needed, should be provided in accordance with Table 8, BS 5266-1 and BS EN 1838. If the mains electricity power supply fails, escape lighting should illuminate the routes listed below.

- All common escape routes
- All toilet accommodation with a minimum floor area of 8m^2
- Electricity and generator rooms
- Switch room/battery room for emergency lighting system
- Emergency control rooms

As per clause 4.13.4 of TS_2.10.10, '*Unless otherwise agreed with National Grid, emergency lighting shall be of the self-contained, self-maintained type. This shall clearly show the route to the nearest exit'*.

9.2 Smoke Ventilation

It is not required to provide smoke control to the building in order to meet the minimum requirements of the Building Regulations 2010 (as amended).

However, in many fires, smoke is the greatest contribution to the damage of property as it serves to transport heat and effluents to many parts of a building. Smoke damage often results in the replacement of structural and architectural elements such as glazing and decorative items.

Severe smoke damage within a building can result in interruption to business whilst repair is undertaken. Smoke damage is often more severe than that resulting from the radiative effects of fire. A well designed, strategic smoke ventilation system can serve to maintain the resulting smoke layer within a reservoir; at a temperature and a height above which damage could be caused within the main building. A smoke control system would actuate on the detection of smoke within the building. Smoke ventilation can be designed to provide natural or mechanical extract smoke ventilation.

As per Clause 3.3.5 of TS_2.10.06, *'the hazards of smoke shall be assessed at the 4.2 optioneering stage of the project. At this stage a request shall be submitted to the National Grid design assurance engineer to carry out a smoke risk assessment. Where mitigation is required the use of low fire risk fluid units shall be considered'*. This is the responsibility of National Grid to appoint an appropriately competent design assurance engineer and will be undertaken at RIBA Stage 4.

9.3 Fire Suppression Systems

As the proposed building is less than 30m in height, it is not required to be sprinkler protected throughout, according to the Clause 30.2.2 of BS 9999:2017. If sprinklers are to be incorporated as an enhanced protection measure and to reduce the risk profile of the occupants within the building, they should be designed and installed in accordance with BS EN 12845.

As per clause 3.3.7 of TS_2.10.06, '*The protection of the Fire Hazard by an Active Automatic Fire Protection System shall be adopted by exception and only in agreement with National Grid. Where this measure is proposed, a Technical Deviation shall be submitted in accordance with SR188'*. It is assumed that no Active Automatic Fire Protection System is provided in these buildings.

9.4 Battery rooms

Plante type Batteries are present within Battery Room of the Margam GIS Hall as confirmed by GE Vernova. With Plante batteries, there is a potential explosion hazard from hydrogen gas generated during charging, which could contribute to the ignition or escalation of a fire.

However, detailed information regarding material specifications, relevant fire test results, and an advanced risk assessment are required to understand the fire risks this battery room may pose. This is to be undertaken at RIBA stage 4.

As per Clause 4.13.8 of TS_2.10.10, '*Battery rooms shall be adequately ventilated so as to prevent accumulation of gas generated by the battery charging process.'* BakerHicks has provided following statement:

'The room is subject to Hydrogen build-up. However, a Low Level has been included, additionally the room will be equipped with appropriate sensors and alarms. Due to the nature of the gas, the room would be classed as high hazard and travel distances have been accounted for in this respect.'

As noted in Section 4.3, an L1 Fire Detection and Alarm System is proposed to protect the Margam GIS Hall as a whole, rather than individual electrical equipment within the building. Where planned sensors and alarms in the battery room are to be integrated with the building-wide fire alarm system and any other relevant systems, this is the responsibility of specialist system sub-contractor to review and will be incorporated into the fire strategy at RIBA Stage 4.

All aspects related to the fire safety of the battery room, including detailed design, ventilation, and related assessments, are outside the scope of this report.

It should be noted that the Dangerous Substances and Explosive Atmospheres Regulations (DSEAR) assessment needs to be done for the battery room. BakerHicks has confirmed that a DSEAR risk assessment will be undertaken for the Battery Room.

10 Provisions For Disabled Occupants

The Equality Act became law in October 2010. It replaced previous legislation (Disability Discrimination Act 1995) and provides employers and employees information on what they need to do to make their workplaces a fair environment and comply with the law.

With regard to fire safety, it is generally assumed that disabled occupants will be able to escape to a place away from danger without assistance from the Fire Service. However, there will be a certain proportion of building occupants, such as those who are non-ambulant, i.e. wheelchair users, who will not be able to negotiate stairs unaided; therefore, an evacuation management procedure for disabled occupants will need to be incorporated into the Fire Safety Management Strategy. This is the responsibility of the end user of the building or 'The Responsible Person'.

Fire safety procedures will therefore, where appropriate, make provision for occupants who might need assistance to make their way to a place of ultimate safety in a fire. If there is a need to make specific arrangements, then it is assumed that consultation with the individual(s) or representative organisations should take place at the earliest opportunity.

10.1 Personal Emergency Evacuation Plans (PEEPs)

PEEPs should be produced for all people requiring assistance to leave the building. Individual PEEPs should be produced for disabled people who are regularly on the premises, such as staff and for any visitors or building users.

Provision of an accessible means of escape should be an integral part of fire safety management in all buildings. Fire safety management should consider the full range of people who might use the premises, paying particular attention to the needs of disabled people.

An evacuation plan should not rely on the assistance of the fire and rescue service. This is an important factor that should be considered in the building design.

It cannot be assumed that facilities provided in a building to make it accessible will be usable in a fire evacuation. For example, lifts that are not appropriately designed for emergency evacuation might not be usable for evacuation. This should be considered at the design stage when it is relatively easy to incorporate accessible escape features which will make evacuation planning more effective, an evacuation easier to manage and help to preserve the dignity of disabled people in an evacuation.

Personal emergency evacuation plans (PEEPs) are recommended for all people requiring assistance to leave the building. Through the recording of PEEPs, the management team or Responsible Person shall be made aware of the amount of support or provision required for each evacuation.

Individual PEEPs should be developed for occupants (occupying for long term) requiring assistance to evacuate the building. Following discussions with an individual, a plan can be developed for their specific needs, which should contain details of how they will evacuate the premises. By taking into account the individual needs of a person when preparing a PEEP, management will be able to make any reasonable adjustments to the premises or procedures that are necessary.

It is recommended the Responsible Person carry out frequent monitoring and review of residents requiring PEEPs. PEEPS should be one of the three following types:

1. **Individual PEEP for disabled people who are regularly in the premises, for example staff and regular visitors.** Following discussions with an individual, a plan can be developed for their specific needs which should contain details of how they will evacuate the premises. By taking into account the individual needs of a person when preparing a PEEP, management are able to make any reasonable adjustments to the premises or procedures that are necessary. They are also able to make provision for actions to be taken in the event of a false alarm, or if the person cannot return to the building after a fire.

2. **PEEPs for visitors who will makes themselves known to staff, such as expected guests.** Visitors who are likely to require assistance in the event of an evacuation should be encouraged to make themselves known to staff on arrival. Management should be encouraged to have available, especially at reception, staff who are trained in disability awareness. This makes the process more comfortable for disabled people and more effective for management. The generic PEEPs should provide a wide range of guidance for differing disabilities and be adapted for the individual premises. They should include what the visitor needs to do in an evacuation, and what the management response will be. They should also reflect what specific fire safety provisions are provided for disabled people on the premises, e.g. fire alarms adapted for people who are Deaf or hard of hearing. The generic PEEP should be discussed with each visitor and their particular needs taken into account where possible.

3. **PEEPs for visitors not previously identified to staff, such as unexpected visitors / audience members.** The standard evacuation plan should include measures to make evacuations suitable for all persons on the premises. Information for disabled people should be noted in fire action notices and in the fire management plan. Staff should be trained so that they are aware of the facilities and their responsibility to evacuate disabled people, and know how to use features such as evacuation lifts or refuges. Enough staff should be available at all times to make sure that evacuation plans are viable, including situations where features such as carry-down procedures are to be adopted to evacuate mobility-impaired people.

11 Fire Safety Management

11.1 Management Level

There is to be appropriate fire safety management for the premises when in use. In accordance with BS 9999:2017 The Margam Amenities Building and the Margam GIS Hall are to be provided with at least Level 2 management provisions.

11.2 Management Requirements

The Fire Safety Manager (or person nominated to monitor and control management of fire safety) should define the fire risk management system and method of implementing the overarching policy within a 'Fire Risk Management Strategy'.

The 'Fire Risk Management Strategy' is to consider at least the principal factors listed in Table 26.

Table 26 Principal factors for consideration within Fire Safety Management Strategy

Principal Factor	Overview
Fire Risk Assessments	A pre-occupation fire risk assessment should be undertaken to ensure a smooth transition from the design and construction phase to the operation phase of the premise. Fire risk assessments should be undertaken (reviewed regularly and kept up-to-date) whilst the building is occupied.
Resourcing and Authority	Those with fire safety responsibilities should be empowered and able to command sufficient resources to maintain the system.
Fire Safety Training	Sufficient numbers of staff should be trained in fire prevention, fire protection and evacuation procedures, and be able to use the appropriate extinguishing equipment (and media), so as to provide full coverage of the building, with provision for contingencies, sickness or holiday absences.
Control of Work Onsite	A work control system should include clear lines of responsibility communicated to contractors; a permit system which takes into account the risks to relevant persons; logging and work control audit processes; and routine checking and supervision.
Maintenance and Testing	Processes should be determined for maintenance and testing of fire safety systems including an accurate record of fire precautions, and procedures for operating and maintaining any fire protection measures within the building
Communications	Adequate internal and external communications procedures should be in place to ensure all persons involved in the management of risk provided with relevant information in an effective and timely manner.
Emergency Planning	Procedures for identifying and responding to unplanned events, potential emergencies or disasters. Where fire is concerned, liaison with the fire and rescue service should include: emergency shut-down of equipment, effective arrangements for notifying the fire and rescue service of changes to the occupancy, periods of abnormal occupancy, fire growth characteristics, and other relevant factors

Appendix A – National Grid manuals

The following manuals from the 'Generic Electricity Substation Design (NGET) Manual for Civil, Structural, and Building Engineering (TS_2.10 series)' were advised by National Grid to be considered:

- TS_2.10.01 – Oil Containment– Issue 2, December 2020
- TS_2.10.06 – Limitation of Fire Risk at Electricity Substations– Issue 2, August 2024
- TS_2.10.10 – GIS and Other Substation Buildings Design– Issue 2, April 2017

The purpose of this section is to outline the fire-relevant clauses of these NGET Manuals, clarify how this report addresses those aspects within its defined scope, and explain how compliance with National Grid requirements is to be ensured. All potentially applicable clauses have been included to provide National Grid with a comprehensive overview and to clarify the extent to which this falls within the scope of this report.

A.1.1 TS_2.10.01

This section focuses specifically on the proposed development of the Margam GIS Hall and does not cover the Margam Amenities Building.

- As per Clause 1.2.1, *'the objective of this technical specification is to ensure National Grid discharges its legal and social responsibilities with regard to protecting the environment from the damaging effects of any Oil it uses in carrying out its business activities at electricity substations and other operational sites'*.

  However, this lies outside the scope of this fire safety strategy report, which is focused primarily on life safety, rather than property protection, business continuity, or environmental impact.

- As per Clause 2.3.3, '*where an Underground Oil Containment Facility is installed (Type 2), it shall always be connected to an Oil Retaining Area via a free-draining closed gravity system such that leaked Oil, being a potential fuel supply, would quickly be removed from the source of the fire and then stored at a safe separation for a specified period of time'*.

  It is assumed that no Underground Oil Containment Facility is present based on the following statements:

  GE Vernova has provided this statement:

  'GIS is filled with G3 gas. There is no oil based switchgear in the GIS hall'.

  BakerHicks has provided this statement:

  'It is BakerHicks understanding that the gas is non-combustible and inert. As such the room would be classed as medium hazard'.

  The risks associated with G3 gas in the event of a fire, either to people evacuating the building or to the fire service during firefighting operations, should be assessed. It is recommended that the fire service be informed of the presence and use of G3 gas.

  The compliance with this clause will be confirmed by the relevant design specialists at RIBA stage 4.

- As per Clause 2.3.5, *'flame traps shall be installed as necessary to ensure that any fire accompanying a catastrophic equipment failure is extinguished prior to the leaked Oil draining into an Oil Draw-Off system or an Underground Oil Containment Facility'*.

  This will be confirmed by the relevant design specialists at RIBA stage 4.

  Additionally, Clause 5.2 provides further design guidance on flame traps. Specifically, Clause 5.2.2 states: *'The metal grating used to support the loose stone shall be designed such that it does not excessively deform or lose a significant proportion of its strength in the event of a fire'*.

  The design of flame traps is outside the scope of this report. Design considerations, including compliance with applicable standards, regulations, and National Grid requirements, will be reviewed by the relevant design specialists at RIBA stage 4.

- As per Clause 4.2.2, '*all 'bunds' (Oil Retaining Areas) connected to 'dump tanks' are required to have a minimum gross capacity. Where an active automatic fire protection system is fitted to the associated equipment, there is no requirement to increase this capacity to allow for the additional volume of fluid'*.

  It should be noted that the design of bunds, tanks, and all components of the electrical substation and equipment is outside the scope of this report.

  Detailed investigations and risk assessments should be carried out to ensure that any fire involving the electrical substation and equipment does not compromise the life safety of persons using the building or the surrounding neighbourhood. These risk assessments will be required prior to the commission of the building at RIBA Stage 5.

- Clause 4.3 provides requirements on *'Oil Retaining Area dimensions and clearances'*.

  The design of Oil Retaining Areas is outside the scope of this report and compliance with this clause will be confirmed by the relevant design specialists at RIBA stage 4.

- As per Clause 4.4, *'the Fire Damage Zone is an area around specified types of Oil filled plant within which all items are assumed to be at risk from the damaging effects of a fire due to a catastrophic failure of that Oil filled plant. This is an important concept when considering the siting of Oil Containment features. The process for calculating the dimensions of the Fire Damage Zone is detailed in TS 2.10.06 Limitation of Fire Risk in Electricity Substations'*.

  The type or specifications of equipment inside the Margam GIS Hall including location and dimensions will be specified at RIBA Stage 4. At RIBA Stage 4 , detailed assessments will be carried out such as the sizing of Oil Retaining Areas and the specific calculation of Fire Damage Zones as outlined in this clause and related NGET Manuals by the relevant specialist subcontractor.

- Clause 5.1 provides requirements on *'Element Design Requirements for Oil Retaining Area Design'*.

The design of Oil Retaining Areas is outside the scope of this report and compliance with this clause will be confirmed by the relevant design specialists at RIBA stage 4.

- As per Clause 5.1.6, *'all impermeable internal surfaces shall be designed to maintain their load bearing function (criteria 'R') and integrity (criteria 'E') in the event of a fire for the standard fire exposure up to 240 minutes in accordance with BS EN 1991-1-2, BS EN 1992-1-2 and the associated UK National Annexes. This minimum requirement is based on the prescriptive approach taken from the tabulated method of BS EN 1992-1-2, Table 5.4 for load bearing walls, for criteria REI 240 with wall exposed on one side with ratio of axial load = 0.35'*.

  The relevant fire resistance periods of the structure and fire rated enclosures of the GIS Hall are specified in line with the stated NGET guidance and are shown within Appendix B.

- To calculate the fire resistance of elements within the '*Fire Damage Zone'*, more advanced calculation methods may be employed in accordance with applicable standards and regulations, subject to agreement with National Grid. This will be reviewed by the relevant design specialists at RIBA Stage 4.

- In the case of the presence of Underground Oil Containment Facilities integral with plant foundations, Clause 5.4.11 states that *'Pipework within the Fire Damage Zone shall have a 4-hour fire resistance. This will generally be best achieved by direct burying wherever practicable'*.

  The design of such pipework or Underground Oil Containment Facilities integral with plant foundations will be undertaken by the relevant specialists at RIBA stage 4 to ensure compliance with related requirement.

- At the time of this report, it is assumed that the Margam GIS Hall does not include Standby or Permanent Diesel Generators. Diesel generators are located as shown in the site plan however are external to both the Amenities and GIS Hall. If *Standby or Permanent Diesel Generators* are present, the fire safety requirements outlined in Clause 5.10 of this NGET Manual will be reviewed by the relevant design specialists at RIBA stage 4.

  GE Vernova has provided this statement:

  'GIS is filled with G3 gas. There is no oil based switchgear in the GIS hall'.

- In the case of the presence of Pedestrian Walkway Systems, Clause 8.3.6 states: *'Panels shall be non-combustible with a minimum fire resistance of Class 2 to BS 476-7'*.

  The pedestrian access to the Amenities and GIS Hall buildings is externally with no elevated walkway systems. Compliance with this clause will be reassessed at RIBA Stage 4.

A.1.2 TS_2.10.06

This section focuses specifically on the proposed development of the Margam GIS Hall and does not cover the Margam Amenities Building.

- As per Clause 2.1.2, '*For designs for new sites, a fire risk assessment shall be produced by the Designer'*.

  Stantec as part of our scope of works have provided a fire strategy that sets out how the building should be designed to comply with the functional requirements (B1-B5) of Building Regulations 2010 (as amended) and relevant NGET guidance.

- As per Clause 3.1.1, '*The Designer shall identify Fire Hazards'*.

  Fire Hazard is defined as plant or equipment capable of starting and/or fuelling a fire.

  Fire hazards have been identified and referenced within this report, appropriate means of compartmentation in line with relevant National Grid Guidance have been specified and are shown in Appendix B. A formal review of the relevant fire hazards will be undertaken at RIBA Stage 4 and will be incorporated into the fire strategy.

- As per Clause 3.1.2, *'In particular, the following equipment shall be considered a Fire Hazard and shall be installed with appropriate fire protection measures to minimise consequential damage to designated Elements at Risk:*

  - *Mineral Oil-filled Transformers, including earthing transformers, auxiliary transformers;*
  - *Mineral Oil-filled Reactors;*
  - *Diesel Generators;*
  - *Mineral Oil Storage Tanks (Including Fuel Oil);*
  - *Mineral Oil Circuit Breakers;*
  - *Mineral Oil Handling Plant;*
  - *Mineral Oil-filled Cables and Cable Sealing Ends'*

  Although sitting outside the scope of this report, a diesel generator and existing transformers are shown on the provided site plan, as this equipment sits externally, this should be designed and installed as per relevant NGET guidance. The design of the Amenities building and GIS Hall has considered the impact and basis of assumptions within this report to minimise consequential damage to designated elements at risk.

  This will be reviewed with the relevant design specialists at RIBA Stage 4.

- As per Clause 3.2.3, *'Unless otherwise specified by National Grid, the following items shall be designated as Elements at Risk requiring protection from the consequential effects of a fire developing in any Fire Hazards:*

  j) All third party land, property or infrastructure developments unless defined otherwise in the Scheme Specification or agreed with National Grid;

  k) Other Fire Hazards;

  l) Any equipment, structure or building which, if destroyed or seriously damaged, would cause or force consequential outages of other transmission circuits;

m) Any control, protection, data acquisition or communications equipment essential to the safe operation of the substation or transmission system;

n) Any other equipment or structures as defined in the Scheme Specification;

o) Substation buildings which are occupied;

p) Oil storage tanks;

q) Access routes that are considered essential for the purposes of fighting a fire and operation of the substation during a fire.

r) All low fire risk fluid filled transformers, quad boosters, and reactors.'

Element at Risk is defined as plant, buildings, structures or any other items designated as requiring protection from the damaging effects of a Fire Hazard.

Based on Clause 3.2.3, all spaces within the Margam GIS Hall have been assessed against the criteria for Elements at Risk, which require protection from the consequential effects of fire developing in any Fire Hazards. The assessment is outlined in Table 27.

Table 27 Elements at Risk for the Margam GIS Hall according to Clause 3.2.3 of TS_2.10.06

Space	Consideration as Elements at Risk
Main GIS Hall	Yes, as it contains essential electrical equipment (c, d, i)
3rd Party Area	Yes, as per (a) third party land or property
Telecom Room	Yes, as it houses communications equipment (d)
Protection & Control Room	Yes, contains control and protection equipment (d)
Control Room	Yes, essential for safe operation (d, f)
LV AC/DC Room	Yes, contains electrical equipment (c, d)
Battery Room	Yes, electrical equipment requiring protection (c, d)
Access Corridor	Yes, essential access route for firefighting and operation (h)

As per Table 19, all elements in the Margam GIS Hall are classified as Elements at Risk and require protection from the consequential effects of a fire developing in any Fire Hazards.

For protection purely from the effects of heat from fire, Clause 3.3.4 shall be followed:

'Where fire protection measures are required for the effect of heat and flame, the choice of installation method shall, as far as reasonably practicable, be made following the preferential hierarchy as below:

d) Use of low fire risk fluid instead of mineral oil.

e) Physical separation in accordance with this specification between the Fire Hazard and the Element At Risk.

f) Installation of Fire Barriers in accordance with this specification between the Fire Hazard and Element At Risk'.

- As per Clause 3.2.2, *'National Grid has business requirements for continuity of operations, which are supplementary to the basic fire safety requirements of the Fire Safety Order'*.

  The continuity of operations primarily relates to business resilience matter and fall outside the scope of this report unless it is specifically requested to be addressed in relation to the fire safety strategy concerning life safety, provided sufficient information is available.

  This will be confirmed by National Grid and incorporated into the fire strategy at RIBA Stage 4.

- As per Clause 3.2.4, '*EV chargers and their associated parking spaces shall not be located within 6 meters of Elements at Risk*'.

  It is the responsibility of National Grid to confirm the presence and positioning of EV chargers in relation to Elements at Risk. Compliance with this requirement will be reviewed at RIBA Stage 4.

- As per Clause 3.3.1, *'the Designer shall evaluate the risk of a fire occurring, evaluate the risk to people from fire, remove or reduce Fire Hazards, and remove or reduce the risks to people'*.

  Section 3 of this report employs a risk-based approach in accordance with BS 9999:2017, where a risk profile is assigned to each occupancy type within the building. This risk profile consists of an occupancy characteristic and an expected fire growth rate based on the anticipated fire load in each space, reflecting the requirements of Clause 3.3.1.

  The fire strategy is based upon these risk profiles and will be reviewed at RIBA Stage 4.

- As per Clause 3.3.5, *'the hazards of smoke shall be assessed at the 4.2 optioneering stage of the project. At this stage a request shall be submitted to the National Grid design assurance engineer to carry out a smoke risk assessment. Where mitigation is required the use of low fire risk fluid units shall be considered'*.

  The specified compartmentation alongside the level of alarm and detection is such to provide early warning to occupants of the buildings and would allow for a satisfactory means of escape in lien with specified travel distances within this report. The hazards of smoke will be assessed at RIBA Stage 4 by the specialist subcontractors of the equipment installed within the GIS Hall.

- As per Clause 3.3.6, *'where transformers are installed indoors, low fire risk fluid units shall be specified'*.

  As per the site plan and GAs provided transformers are located externally.

- As per clause 3.3.7, '*The protection of the Fire Hazard by an Active Automatic Fire Protection System shall be adopted by exception and only in agreement with National Grid. Where this measure is proposed, a Technical Deviation shall be submitted in accordance with SR188*'.

  It is assumed no Active Automatic Fire Protection System are present.

  Active Automatic Fire Protection System is defined as an 'intelligent' system which detects a fire and extinguishes it. If an Active Automatic Fire Protection System is deemed necessary (by a direct request from National Grid, it should comply with the requirements set out in Clauses 6.9 and 6.10.

Vehicular Access:

- Regarding *Clause 4.1.1*. The firefighting access has been assessed in line with BS9999:2017 and meets the minimum requirements. Where additional assessments are carried out by specialist subcontractors that impact the vehicular access, including the layout of the substation, the delineation of Fire Damage Zones, and the configuration of vehicular access routes, this will reviewed at RIBA Stage 4.

Water Supplies for Fire Fighting Purposes

- As per Clause 4.2.1, *'A supply of water shall be available at all Substations for use by the fire and rescue service in the first hour for fire fighting purposes'*. It is the responsibility of National Grid to confirm the compliance with this requirement. This will be reviewed at RIBA Stage 4 with the fire service to ensure they are satisfied that the requirements are met.

- As per Clause 4.2.1, *'120,000 litres of water shall be available on sites containing oil-filled plant'*. As the GIS Hall and Amenities building will be constructed within an existing electricity distribution site, any oil-filled plant should already be incorporated into the site design (for the water supply as detailed above). It is the responsibility of National Grid to confirm the compliance with this requirement. This will be reviewed at RIBA Stage 4 with the fire service to ensure they are satisfied that the requirements are met.

- As per Clause 4.2.2, '*Where reasonably practicable, the water supply shall be obtained from hydrants connected to a suitable water main. Hydrants shall be provided within 90m of all equipment and buildings*'.

- As per Clause 4.2.6, '*Where no suitable alternative water supply is available, static water tanks shall be provided to meet the requirements above. Tanks shall be suitable for service without emptying, cleaning, maintenance or repair for a period of not less than 15 years. Tanks shall be fitted with a suitable fire and rescue service inlet/outlet*'.

Fire Hazard Equipment in Buildings

- As per Clause 4.3.1, *'The following hierarchy shall apply for equipment defined as a Fire Hazard installed in buildings:*

  d) No other equipment installed in same building;

  e) Fire Hazard contained within a compartment of 4 hours Fire Resistance;

  f) Fire Hazard protected by an Active Automatic Fire Protection System'.

  It is assumed that hazards are present. Considering that all elements in the Margam GIS Hall are classified as Elements at Risk per Table 20, as per Clause 4.3.1 of TS_2.10.06, it is recommended that compartment walls and floors with a minimum of 4 hours fire resistance be provided in this building.

- As per Clause 4.5.1, '*Single phase transformers or similar plant forming part of the same circuit shall be separated by distance according to the Fire Damage Zone and appropriately sized Fire Barrier walls'*.

  This will be reviewed by the relevant design specialists at RIBA Stage 4 and incorporated where it impacts the fire safety of the Amenities and GIS hall buildings.

Fire Damage Zone

- Clause 5.1 outlines how to calculate the *Size of Fire Damage Zone*.

  As per Clause 3.3.2, *'A Fire Damage Zone shall be considered for each piece of equipment which is considered to be a Fire Hazard, in accordance with 3.1.2*'.

  As per Clause 5.1.4, *'Any part of an Element at Risk that lies within the Fire Damage Zone requires fire protection measures, applying the hierarchy given in Clause 3.3.4'*.

  As per Clause 3.3.3, *'no protective measures for the effects of heat and flame from a fire are required where:*

  - *The Element At Risk is outside the Fire Damage Zone;*
  - *Fire Hazards contain synthetic oil.'*

  The type or specifications of equipment inside the Margam GIS Hall including location and dimensions will be specified at RIBA Stage 4. At RIBA Stage 4, detailed assessments will be carried out such as the sizing of Oil Retaining Areas and the specific calculation of Fire Damage Zones as outlined in this clause and related NGET Manuals by the relevant specialist subcontractor.

- *'Fire Barriers shall be provided on a 'line-of-sight' basis to protect the Element at Risk from the calculated Fire Damage Zone and flame height, in accordance with Clause 5.2'*. *Clauses 3.6.4 and 3.6.5* also should be considered for the design of fire barriers.

  The calculated Fire Damage Zone and flame height will be conducted by the specialist subcontractor at RIBA Stage 4 and will be reviewed and incorporated into the Fire Strategy at this stage.

Fire Resistance

- As per Clause 6.1.1, *'Unless otherwise specified, all Fire Barriers shall have a minimum Fire Resistance of 4 hours to BS 476'*.

- As per Clause 6.1.2, '*Where a building, or part thereof, is situated within the Fire Damage Zone its walls and roof (as appropriate) may be provided with 4 hour Fire Resistance as an alternative to a free standing Fire Barrier, subject to the requirements of Section 3.6'*.

- As per Clause 6.6.1, '*The construction of any building housing oil storage tanks shall be in non-combustible materials with one hour Fire Resistance. Adequate natural ventilation shall be provided to disperse oil vapour and fumes'.*

  Given the functions of the areas within the Margam GIS Hall and the associated fire risks, a minimum fire resistance rating of 4 hours is recommended for the elements of structure of the Margam GIS Hall.

  The fire safety strategy drawings contained in Appendix B meet the specified guidance as above.

  Once the equipment specifications are confirmed for the GIS Hall, any ventilation requirements will be reviewed by the relevant design specialists at RIBA Stage 4and incorporated into the fire strategy.

Fire Detectors & Alarm

- Clause 7.1 outlines the requirements for the *Fire Detectors & Alarm*.

A.1.3 TS_2.10.10

- As per Clauses 1.1.2 and 1.1.3, it has been confirmed that the site is a 275kV GIS substation site, to which this specification applies.
- As per Clause 1.2.1, '*The Construction (Design and Management) Regulations 2015 (CDM 2015) applies to building works*'.
- As per Clause 1.2.2, while the works may be exempt from Building Regulations due to their status as Statutory Undertaker works, all building work shall nonetheless comply with the relevant requirements of the Building Regulations unless stated otherwise. Where full compliance is not achievable, an agreed standard based on the Building Regulations shall be applied.
- As per Clause 1.2.3, *'The Equality Act 2010 applies to National Grid works. Reasonable provision shall be made for access to the Amenities Block, including for wheelchair access. Other buildings, including Switch Hall, Ancillary Plant Room Buildings, Storage Unit and Workshop Unit, should not be made fully accessible'*.
- As per Clause 2.1.2, substation buildings are categorised into four groups:
    a) *Switch Hall (GIS Substation only)*
    b) *Ancillary Plant Room Buildings (GIS & AIS Substations)*
    c) *Amenities Block (GIS & AIS Substations)*
    d) *Storage & Workshop Units (GIS & AIS Substations)*

Table 28 Group classification for the proposed development of the Margam substation

Building	Spaces	Group as per Clause 2.1.2
Margam GIS Hall	Main GIS Hall	a
	3rd Party Area	b
	Telecom Room	
	Protection & Control Room	
	Control Room	
	LV AC/DC Room	
	Battery Room	
	Access Corridor	
Margam Amenities Building	Meeting/Mess Room	c
	Offices (including General Office and Office)	
	Archive	
	Entrance Lobby	
	Changing/Locker Room	
	Accessible / Female WC	
	Male WC	
	Shower	

- As per Clause 3.1.1, '*Design work shall comply with this standard and where appropriate, the suite of National Grid Technical Specifications (NGTSs and TSs), European Standards and National Annexes, British Standards and Codes of Practice as appropriate. Where the requirements of this document or any other relevant project specifications are in conflict those specifically detailed within this document shall take precedence otherwise National Grid shall be informed and will instruct accordingly*'.
- As per Clause 3.5.1, *'Refer to TS 2.10.06 for general requirements for limitation of fire risk at substations. This section provides requirements for buildings'*.
- As per Clause 3.5.2, *'Building materials shall meet the minimum criteria specified in Table 29 when tested in accordance with BS 476, except where greater fire resistance is required, for example where:*
    - *The elements of a building a required to act as a Fire Barrier;*
    - *A Fire Hazard is contained within the building or compartment (refer to TS 2.10.06);*
    - *There is a boundary condition in accordance with the Building Regulations.'*

Table 29 Reproduction of Table 1 of TS 2.10.10 - Fire resistance requirements

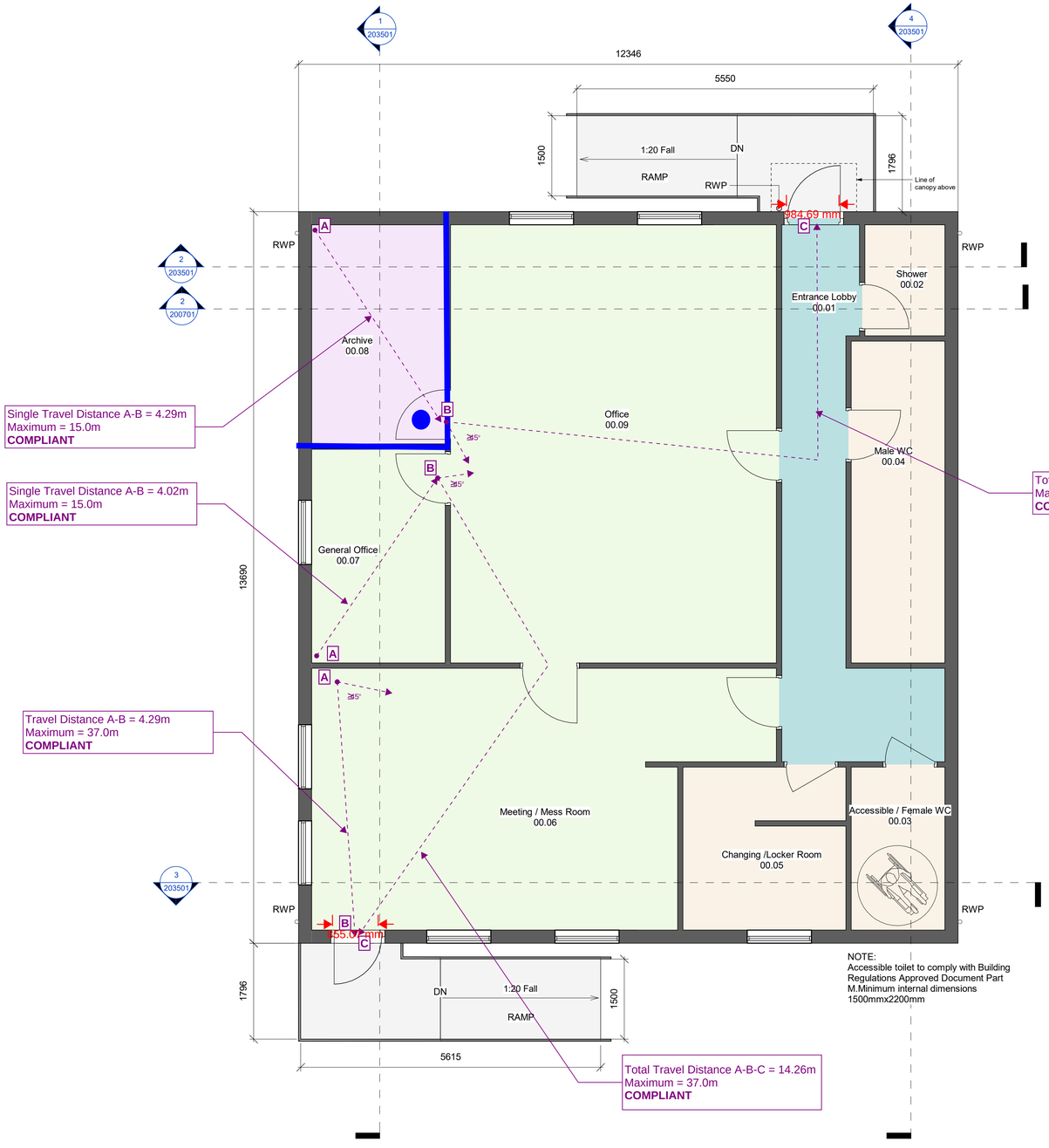
Element	Requirement
Control buildings	1 hour fire resistance
Buildings housing GIS (except where such buildings share walls or other dependent elements with control buildings)	½ hour fire resistance
Other buildings (outside to in)	0 hour fire resistance
Other buildings (inside to out)	½ hour fire resistance
Surfaces of walls, ceilings, floors	Class O as defined by the Building Regulations
Internal walls, floors (above ground), internal doors to rooms housing operational equipment	½ hour fire resistance
Ceilings and Floors in Battery Rooms	½ hour fire resistance

- As per Clause 4.13.1, '*Refer to TS 2.10.06 Limitation of Fire Risk in Substations for general requirements for fire detectors, alarms, signage and automatic fire protection systems, where relevant.'*
- As per Clause 4.13.3, '*Doors giving access from a corridor to a room housing operational equipment shall be designated Fire Doors. These doors shall be automatically self-closing*.'

Battery rooms

- As per Clause 4.11.11, '*The ventilation requirements of battery rooms shall be calculated in accordance with Annex A of BS 6133.'*
- As per Clause 4.13.8, '*Battery rooms shall be adequately ventilated so as to prevent accumulation of gas generated by the battery charging process.'*
- As per Clause 4.13.9, '*For guidance on the prevention of explosive atmospheres forming, and on other safety aspects of operating stationary cells and batteries (unsealed type) reference should be made to BS EN 50272.'*
- As per Clause 4.13.10, '*Where sealed cell batteries are installed only normal ventilation is required*.'
- As per Clause 6.1.6, '*Battery rooms shall comply with the requirements of BS EN 50272-1:2010 'Safety requirements for secondary batteries and battery installations. General safety information'. They shall be adequately ventilated to prevent the accumulation of gas from battery charging and shall use explosion proof fittings throughout. A "Belfast" style sink incorporating an overflow shall also be included in these rooms for washing purposes*.' It is noted that BS EN 50272-1:2010 has been superseded by BS EN IEC 62485-1:2018.
- As per Clause 6.11.7, *'The ventilation requirements of battery rooms shall be calculated in accordance with Section 8 of BS EN 50272-2 'Safety requirements for secondary batteries and battery installations. Part 2: Stationary batteries', or Section 6 of BS EN 50272-3 'Safety requirements for secondary batteries and battery installations. Part 3: Traction batteries'.'* BS 6133 has been superseded by BS EN 50272-1:2010, which has itself been replaced by the current standard BS EN IEC 62485-1:2018.

Appendix B – Fire Strategy Drawings



1 Level 00 General Arrangement Plan

Scale: 1 : 50

Department Legend

- Circulation
- Sanitary
- Staff Facilities
- Storage

Legend:

- FD30S fire door
- FD120S fire door
- 30 minute fire rated construction
- 60 minute fire rated construction
- 120 minute fire rated construction
- 240 minute fire rated construction
- Single travel distance

Stantec

Drawing Title

Fire Safety Strategy Drawings

Project Title

Margam Substation:
Margam Amenities Building

Project Number

331201497

Scale @ A1		Date
1:50		01/09/25
Drawn	Checked	Rev.
SA	ML	02

0.5 0 0.5 1 1.5 2 2.5

SCALE 1:50 m

For Planning

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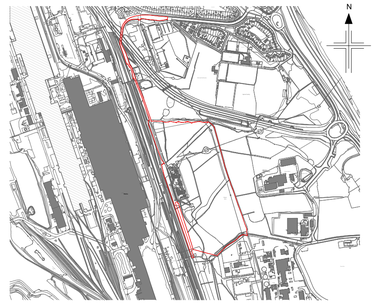

KEYPLAN

Margam Amenities Schedule of Accomodation

Number	Name	Department	Area
00.01	Entrance Lobby	Circulation	16 m²
00.02	Shower	Sanitary	3 m²
00.03	Accessible / Female WC	Sanitary	5 m²
00.04	Male WC	Sanitary	11 m²
00.05	Changing /Locker Room	Sanitary	9 m²
00.06	Meeting / Mess Room	Staff Facilities	37 m²
00.07	General Office	Staff Facilities	10 m²
00.08	Archive	Storage	10 m²
00.09	Office	Staff Facilities	50 m²

P05	S3 For Review and Comment: Planning drawings updated following feedback with NPT	AL	OTr / PC	05/08/25
P04	Issued for planning, comments incorporated following client feedback	GP	OTr / RC	24/04/25
P03	Updated drawing to reflect material changes as agreed with LOR	MY	OTr / RW	24/02/25
P02	For Planning	MY	OTr / RW	10/02/25
P01	Issued For Comment	OTr	JM / JK	20/01/25
Rev	Description	Cre'd	Chk'd / App'd	Date

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Master Scheme No:	Sub-Scheme No:	Site:
101677		MARGAM

Scheme Name: Margam Substation

Document Title: Margam Amenities Building - (Level 00 General Arrangement_Proposed Plan)

Created by:	Date:	Checked by:	Date:	Approved by:	Date:
MQ	16/01/25	JM	16/01/25	JK	16/01/25
Development Eng:	Document Type:	Scale:	Format:	Sheet(s):	Rev:
	DWG	1 : 50	A1	1 OF 1	P05

National Grid Document Number: 20_LOR_0045

FEED Document Number: MARPT-BHK-01-00-DG-A-201510

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THIS IS A TP500 STAGE 4.2 DRAWING AND IS FOR DEVELOPMENT PURPOSES ONLY

Department Legend

- 3rd Party Space
- Circulation
- Plant
- Sanitary
- Workshop

Legend:

- FD30S fire door
- FD120S fire door
- 30 minute fire rated construction
- 60 minute fire rated construction
- 120 minute fire rated construction
- 240 minute fire rated construction
- Single travel distance

1 Level 00 GA Plan Proposed Planning
Scale: 1 : 100

SCALE 1:100 m

For Planning

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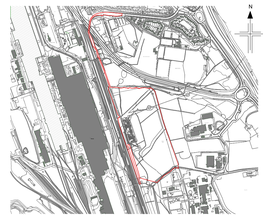

KEYPLAN

Margam GIS Hall Schedule of Accomodation

Number	Name	Department	Area	Room Height
B01.00.C0001	ACCESS CORRIDOR	Circulation	34 m²	4149
B01.00.C0002	ACC. WC	Sanitary	5 m²	2400
B01.00.P0005	CONTROL ROOM	Plant	68 m²	4031
B01.00.P0003	LV AC/DC ROOM	Plant	77 m²	4000
B01.00.P0004	BATTERY ROOM	Plant	71 m²	4000
B01.00.P0006	PROTECTION & CONTROL ROOM	Plant	168 m²	4000
B01.00.P0007	TELECOM ROOM	Plant	70 m²	4000
B01.00.P0008	3RD PARTY AREA	3rd Party Space	125 m²	4000
B01.00.P0009	GIS HALL	Workshop	1163 m²	4000
B01.00.P0010	MODULAR DECONTAMINATION AREA	Sanitary	Not Placed	0
B01.00.P0011	WORKSHOP	Workshop	13 m²	2400

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Drawing Title: **Fire Safety Strategy Drawings**

Project Title: Margam Substation: Margam GIS Hall

Project Number: 331201497

Scale @ A0: 1:100 — Date: 01/09/25

Drawn: SA — Checked: ML — Rev: 02

Rev	Description	Crw'd	Chk'd / Appr'd	Date
P06	S3 For Review and Comment: Planning drawings updated following feedback with NPT	AL	OTr / PC	05/08/25
P05	Issued for planning, comments incorporated following client feedback	GP	OTr / RC	24/04/25
P04	Updated GA Plans and Elevations to show Overall Heights and Widths	OTr	PC / RW	24/02/25
P03	Issued For Planning	GW	OTr / RW	10/02/25
P02	Updated For Planning Issue	DB	RW / JK	27/01/25
P01	First Issue	MQ	OT / RW	30/09/24

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Master Scheme No: 101677 — Sub-Scheme No: — Site: MARGAM

Scheme Name: Margam Connection

Document Title: Margam GIS Hall - Level 00 General Arrangement

Created by:	Date:	Checked by:	Date:	Approved by:	Date:
MQ	30/09/24	OTr	30/09/24	RW	30/09/24

Development Eng:	Document Type:	Scale:	Format:	Sheet(s):	Rev:
	DWG	1 : 100	A0	1 OF 1	P06

National Grid Document Number: 20_LOR_0001

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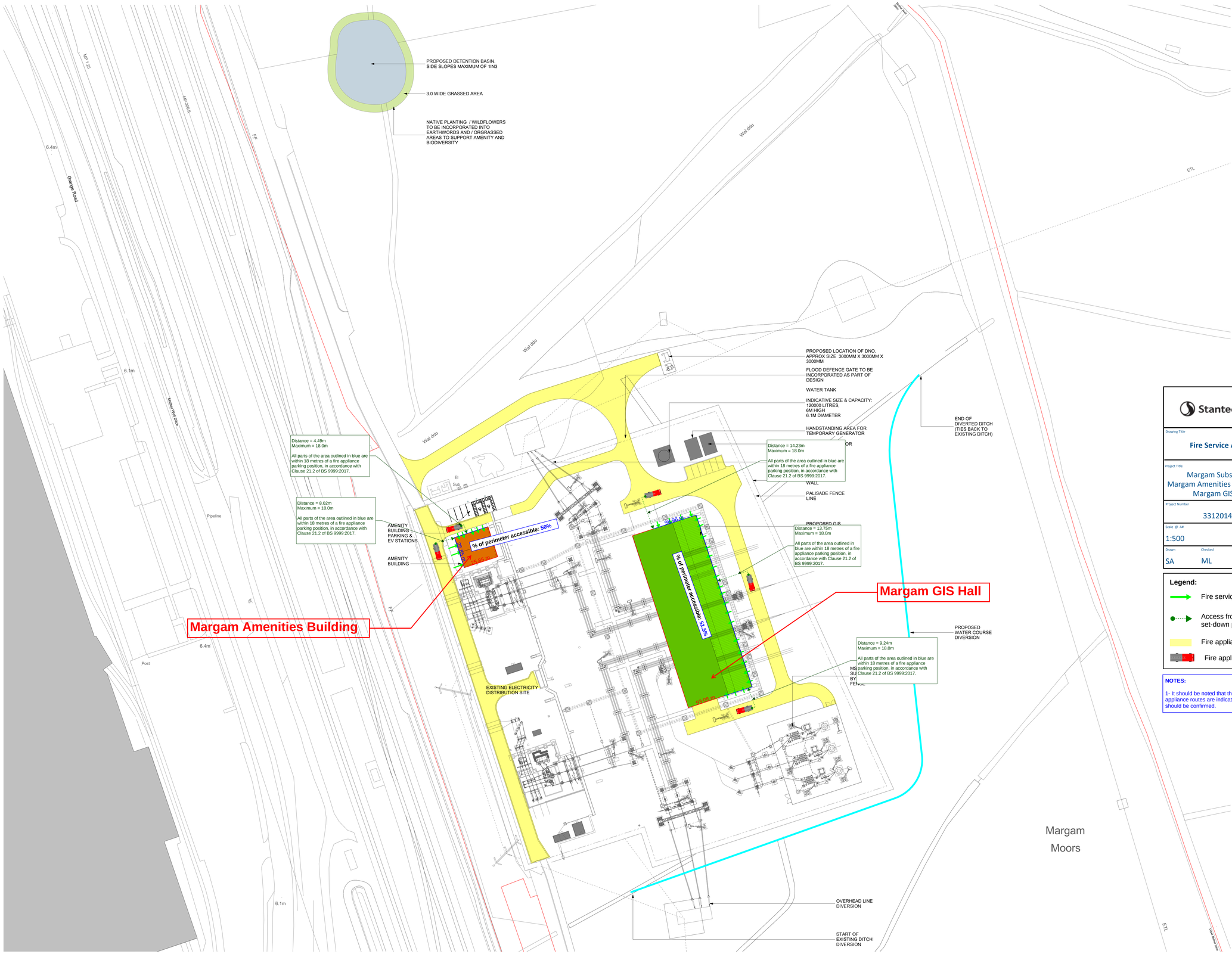
Appendix C – Fire Service Access Arrangements



1 Margam Site Plan - Proposed
Scale: 1 : 500

5 0 5 10 15 20 25
SCALE 1:500 m

For Planning

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KEYPLAN

SITE KEY

SITE BOUNDARY

SITE AREA: (154648.052 m2) (15.46 Hectares) (38.20 Acres)

BUILDINGS

PROPOSED WATERCOURSE DIVERSION

NOTE:

DRAWING TO BE PRINTED IN COLOUR

REFER TO PEAT MANAGEMENT STRATEGY FOR AREAS OF PEAT BURIAL LOCATIONS

Stantec

Drawing Title: **Fire Service Access**

Project Title: Margam Substation: Margam Amenities Building and Margam GIS Hall

Project Number: 331201497

Scale @ A#	Date
1:500	01/09/25

Drawn	Checked	Rev
SA	ML	02

Legend:

- Fire service entry point
- Access from fire tender set-down point
- Fire appliance route
- Fire appliance

NOTES:

1- It should be noted that the shown fire appliance routes are indicative and they should be confirmed.

P05	S3 For Review and Comment: Planning drawings updated following feedback with NPT on 24/07/25	MY	OTr / PC	29/07/25
P04	S3 - For Review & Comment: Updated Proposed Site Layout following Planning Consultant Feedback	OTr	OT/RC	30/06/25
P03	Issued for planning, comments incorporated following client feedback	GP	OTr / RC	24/04/25
P02	Issued For Planning	DSB	OTr / RW	10/02/25
P01	First Issue	DSB	RW / JK	03/02/25
Rev	Description	Cnr'd	Chk'd / App'd	Date

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Master Scheme No:	Sub-Scheme No:	Site:
101677		MARGAM

Scheme Name: Margam Substation

Document Title: Margam GIS Hall - Proposed Site Plan

Created by:	Date:	Checked by:	Date:	Approved by:	Date:
DSB	30/01/25	RW	30/01/25	JK	30/01/25

Development Eng:	Document Type:	Scale:	Format:	Sheet(s):	Rev:
	DWG	1 : 500	A0		P05

National Grid Document Number: 13_LOR_0066

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