

The provision of smoke movement analysis in flats with unventilated lobbies

Requirements and Specifications

Background

The Building Regulations 1997 – 2024 are made up of 12 Parts, A to M. Each part deals with a separate subject e.g. Part A deals with Structure, Part B with Fire Safety etc. Within each Part, performance requirements for buildings are set. Technical Guidance Documents (TGDs) accompanying each Part offer guidance on how to comply with the requirements of the Regulations.

Part B of the Second Schedule to the Building Regulations and the associated Technical Guidance Document B (TGD B) deals with Fire Safety. Part B sets the legal performance requirements of buildings while the associated TGD provides guidance on how to achieve that performance in practice for common building types. Where works are carried out in accordance with the guidance in TGD B, this will, prima facie, indicate compliance with Part B. Technical Guidance Document B was first published in 1991, and was updated in 1997, and 2006, with additional guidance being published in 2020. The latest version was published in 2024 (TGD B 2024), and came into effect in May 2025

Scope of Study

The Contracting Authority is seeking a tender for the provision of fire engineering (computer simulation of smoke movement) analysis from an individual flat to common areas, in a building containing flats.

The purpose of the study is to determine the likely movement of smoke within the common areas of the notional building.

For the analysis of smoke movement within common areas, a simplified layout is provided (see Drawings below). Designs are based on the minimum standards specified under TGD B 2024.

The building is a four storey (ground + 3 storeys over) building containing flats. There are several flats / apartments per storey. The means of escape from each flat passes through an unventilated common area (lobby) before reaching a storey exit.

The following provisions are applicable in respect of smoke movement analysis for the sample building:

- Ventilation to the stairway is provided by means of an AOV which opens on presence of smoke in the stairway, having regard to specified scenarios.
- There is no ventilation to common lobbies.
- Heat absorption by elements of structure should be based on peer-reviewed values for the given materials.
- All compartment floors are steel reinforced concrete, to achieve 60 Minutes REI, and an imposed load of 2.0 kN/m².
- All Compartment Walls are Masonry – 60 Minutes REI.
- Apartment entrance doorways are E30Sa doors with an assumed smoke leakage rate, in the closed position.
- Design fire size, fire growth and similar parameters to be proposed by the supplier, and agreed, in advance, with the Contracting Authority.

- Boundary conditions to be proposed by the supplier, and agreed, in advance, with the Contracting Authority.
- Any software used to model smoke movement should be validated software.
- Ventilation to the room of fire origin should be provided (a) initially from available air in the room, and (b) by means of window break-out, having regard to peer reviewed values.
- All scenarios should be run for 60 minutes.
- Assumptions and engineering judgements should be clearly identified.
- Probabilities for the given scenario should be provided, e.g. Failure of an AOV, Doors being left in the open position, etc.
- Scenarios 1 - 3 (Base case) should represent a compliant design, to be agreed, in advance, with the Contracting Authority
- Smoke permeation via the entrance door to a flat, whether open or closed, should represent the assessed worst-case scenario
- Tenability conditions to be proposed by the supplier, and agreed, in advance, with the Contracting Authority.
- Fire Service intervention timeframes to be proposed by the supplier, and agreed, in advance, with the Contracting Authority.
- Air inlet / leakage pathways to be proposed by the supplier, and agreed, in advance, with the Contracting Authority.
- The notional building should be provided with a Category L3X fire alarm system, to I.S. 3218.

Design scenarios should be based on simultaneous evacuation. The impact of the open / close cycles of doors to units, appropriate to an activation of the L3X system, and consequent simultaneous evacuation of the building should be included in any scenario. Values should be based on peer-reviewed documentation and agreed with the Contracting Authority.

Information to be submitted

Tenderers should submit:

1. Details of the methodology to be employed in carrying out the fire engineering analysis as outlined in the 'Tender Documentation' and 'Deliverables' paragraphs below. The methodology should incorporate and propose the optimum solution to examine a wide range of outcomes and variables, relevant to the given scenarios. Tenderers should incorporate a process of peer review of modelling input variables. Such a review should be carried out before any variables are submitted to the contracting authority for agreement.
2. Details of the Tenderer's proposed Project Team, identifying the person with overall responsibility for the project, the qualifications, and the experience of the proposed team members. The tender particulars should demonstrate that the project team's competency in respect of Irish building regulations (fire safety), smoke modelling, and fire engineering.
3. Programme and Timeframe for delivery of service, in weeks, to include development milestones, and provision for meetings with the Contracting Authority. The timeframe should identify key stages in the project, to include a kick-off meeting, presentation of input variables and assumptions, interim evaluation meetings and discussions, delivery of draft reports and delivery of the final report. Proposed timeframes should commence from full signing of contracts.

Where responses are required from the contracting authority, e.g. input variables, review of drafts, etc, the timelines should identify and incorporate adequate time for the Contracting Authority to review and respond. The programme timeframe should incorporate the specific timeframe in days for responses by the Contracting Authority.

4. A separate document containing the fee proposal for this Tender, to provide the analysis required in the scenarios below.

Tender Documentation

Tender documentation, to be returned, should include:

- a) The proposed methodology for carrying out the study, including the compartment fire modelling technique, e.g. Zone model, CFD, Monte Carlo Analysis, Deterministic analysis, etc. to include an examination of the adequacy and suitability of the proposed methodology to carry out the analysis.
- b) The proposed software to be used.
- c) Confirmation / proof of validation of the software.
- d) Any added value-added details or information that the Tenderer deems necessary or prudent, to include as part of the Tender package
- e) Project timeframes, in weeks
- f) Project fee proposal – in a separate document.
- g) The compliance documentation as set out in Section 2.2 of the associated RFT document.

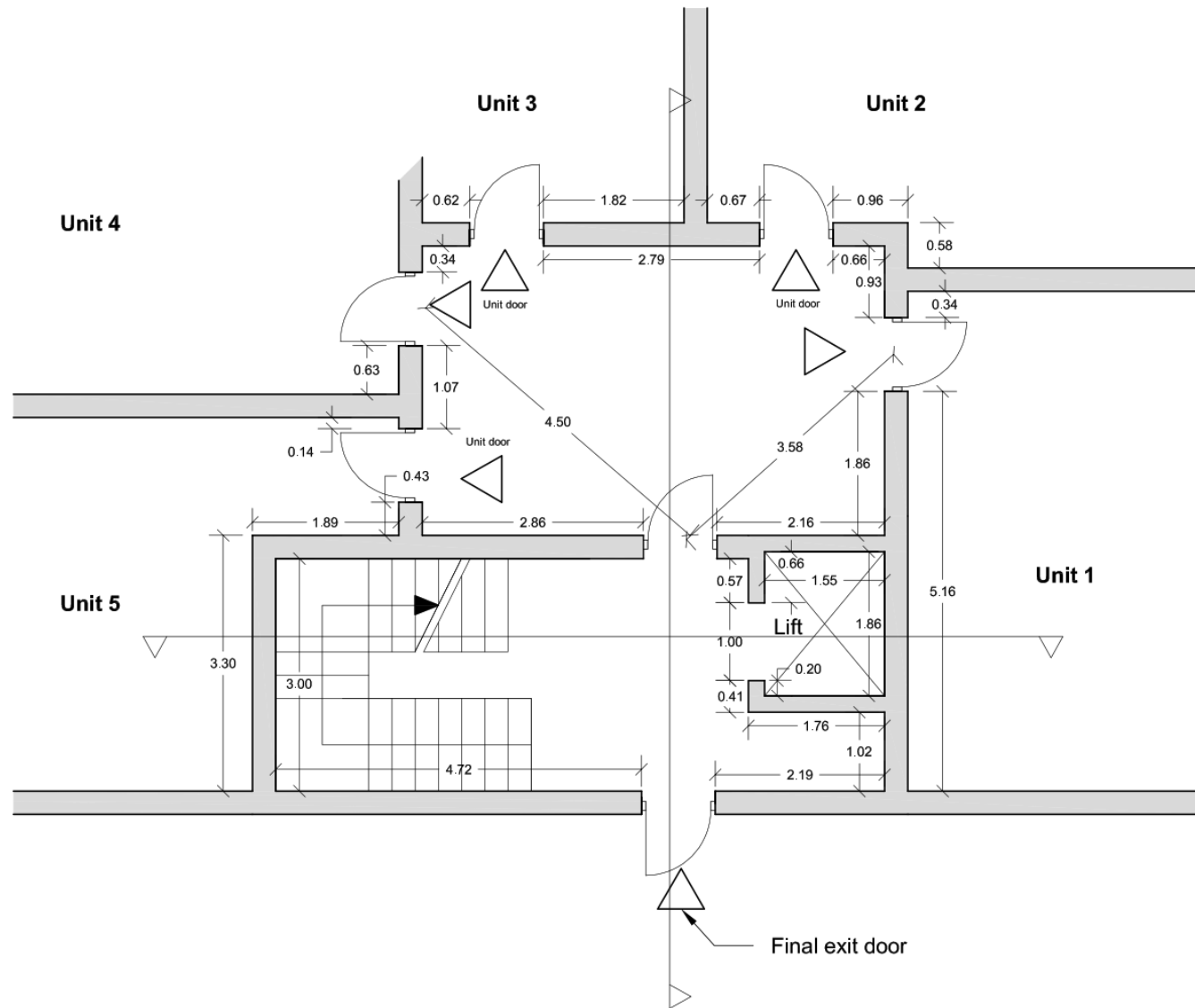
Deliverables

The deliverable is to provide a consolidated report on the analysis of smoke movement in the notional building containing flats, outlined in this RFT, which includes the following:

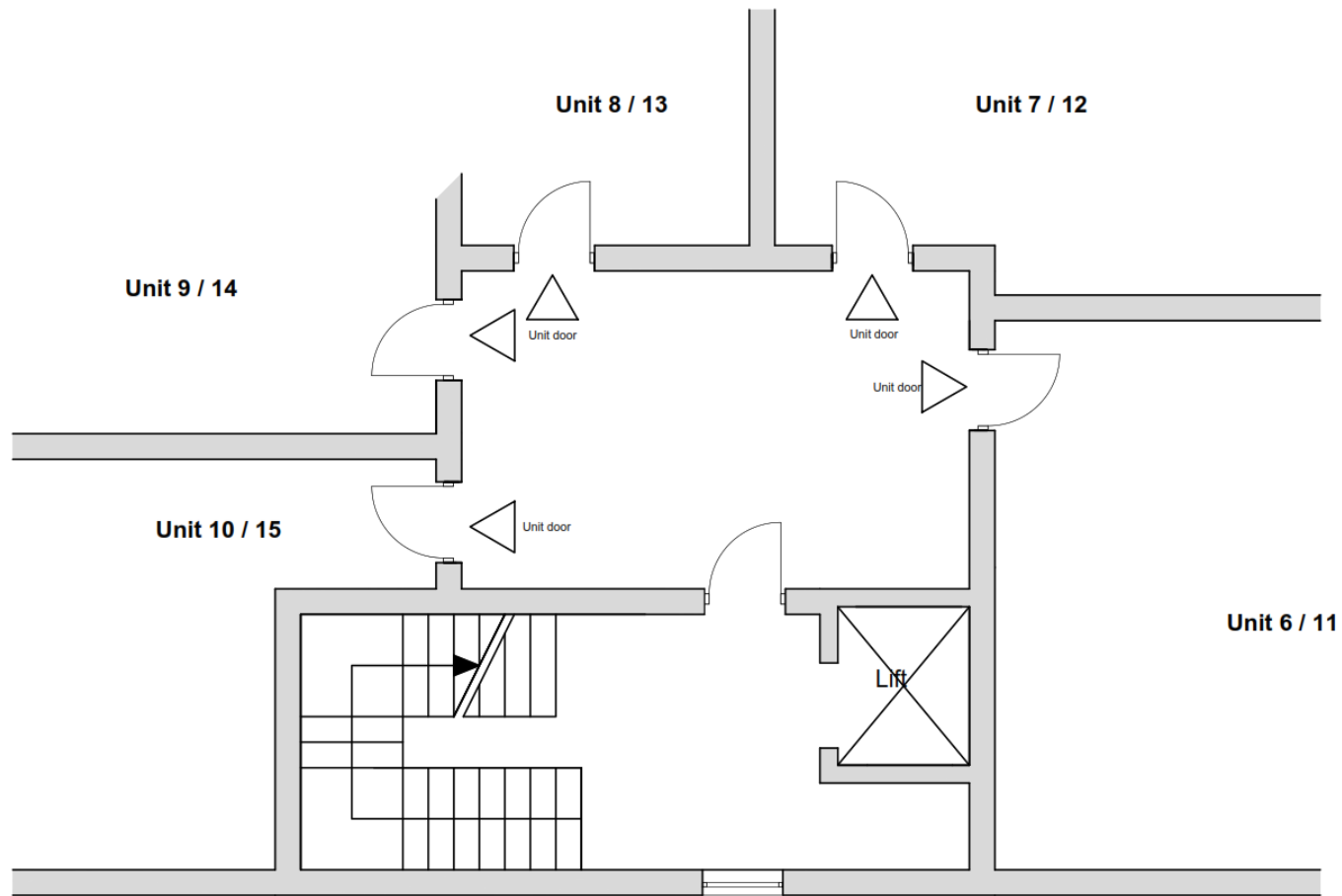
- A report, detailing the study background, modelling methodology, assumptions, validation, results, etc.
- Graphic output files, including animations, stills, etc. generated by the software
- An analysis of the probable timeframe, from ignition to the onset of untenable conditions for evacuation, for each floor level, within the lobbies, and within the stairway enclosure, denoted on the plan and section drawings.
- Characteristics to be analysed and displayed should include but are not limited to smoke temperature and optical density.
- A sensitivity analysis with respect to the probable failures of active and / or passive protection
- A supplementary report detailing the assumptions, and input parameters which formed the basis of the model output
- A copy of any digital files used to create the model
- Any added value-added details or information that the Tenderer deems necessary or prudent, to include as part of the Tender package

Floor Plans

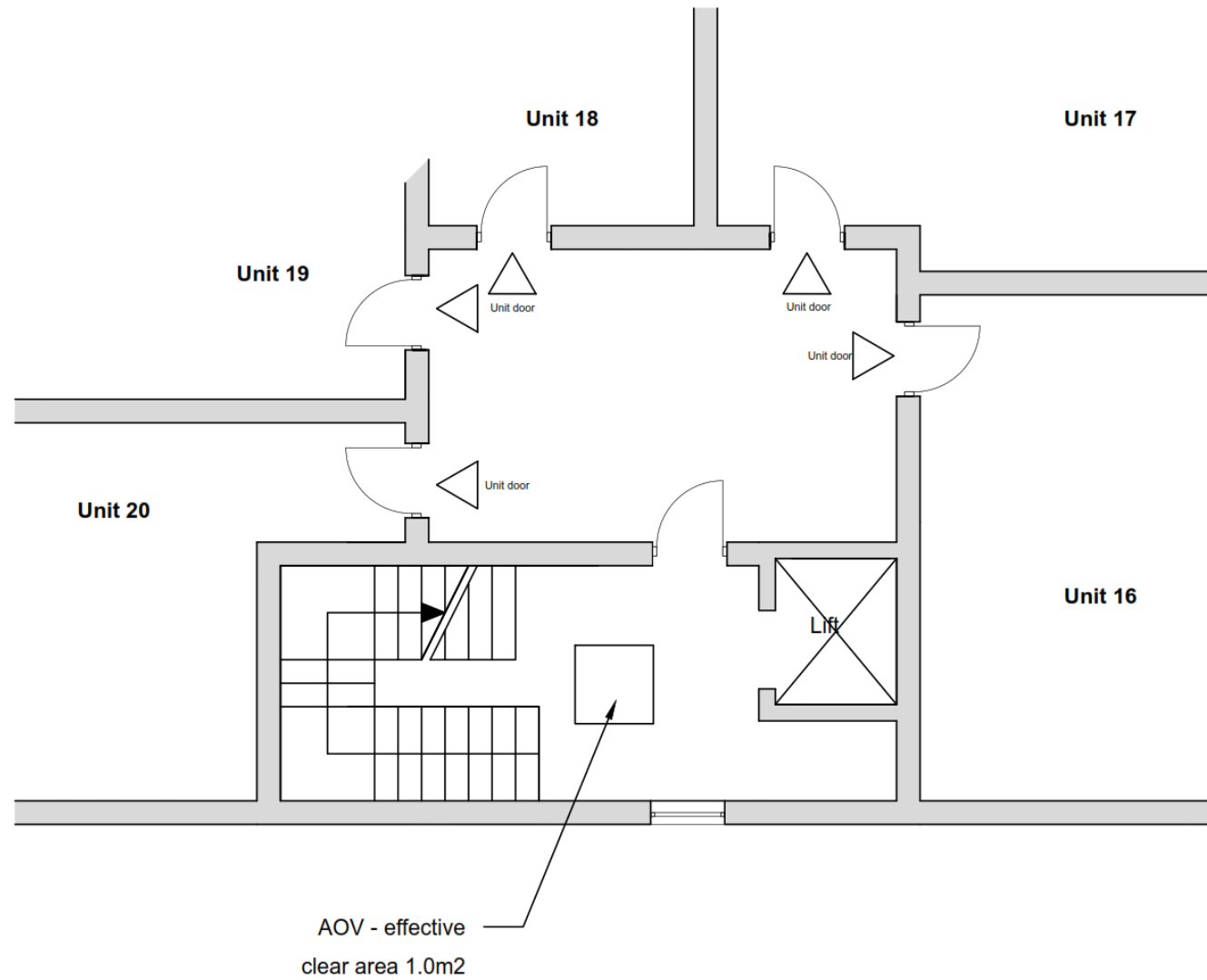
Ground floor plan



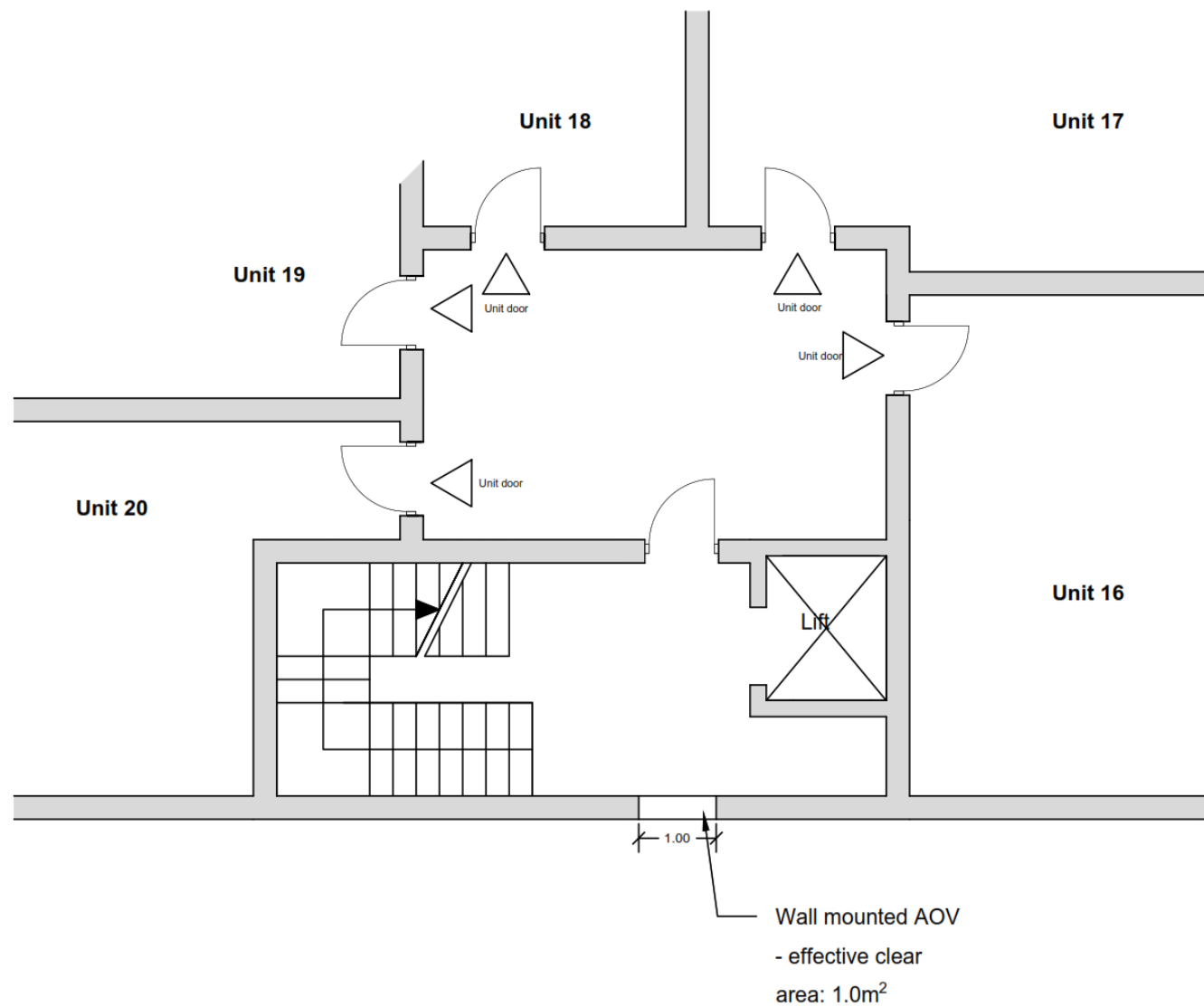
First and Second Floor
Plan



Third Floor Plan

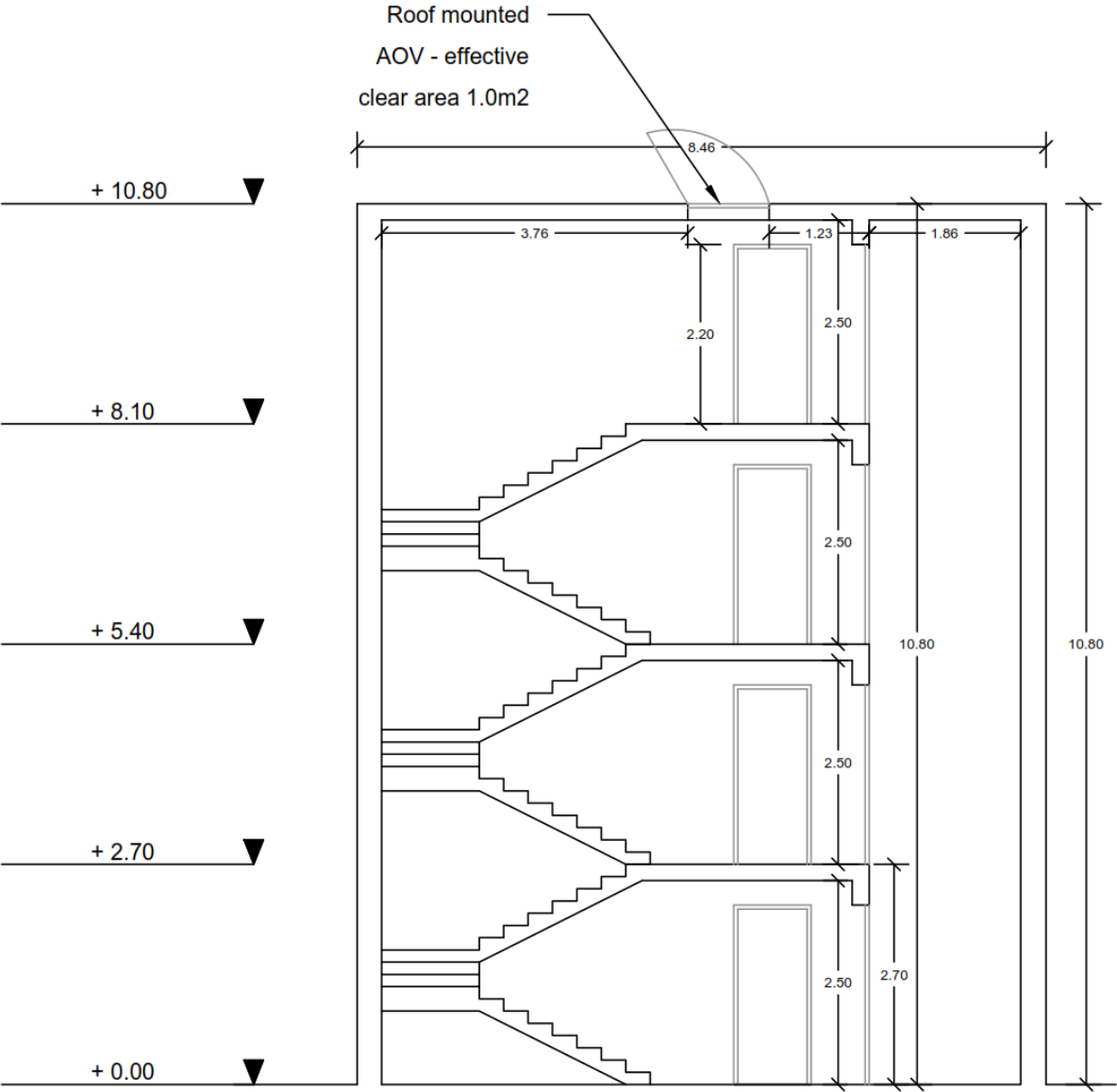


Third Floor Plan
(Alternative)

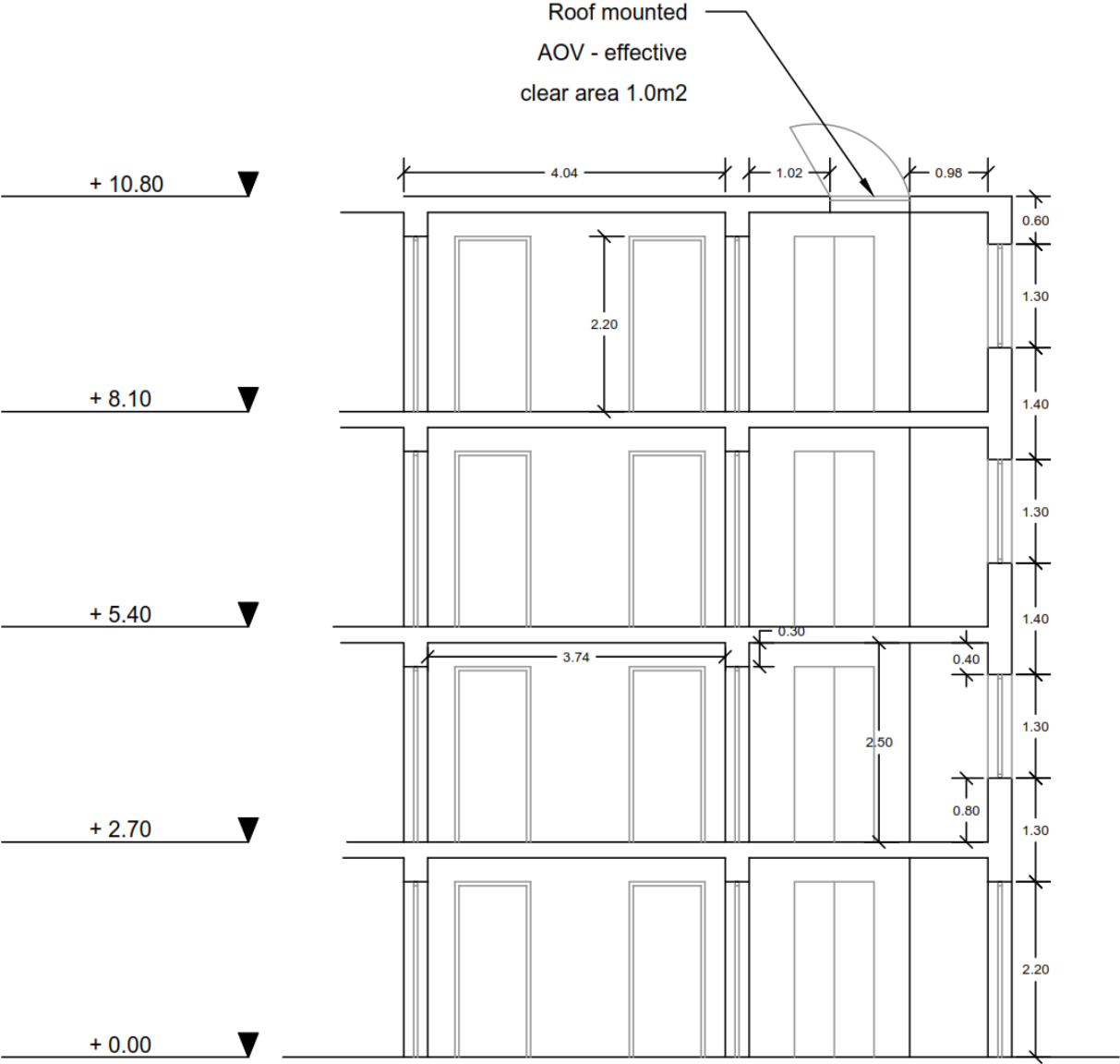


Sections

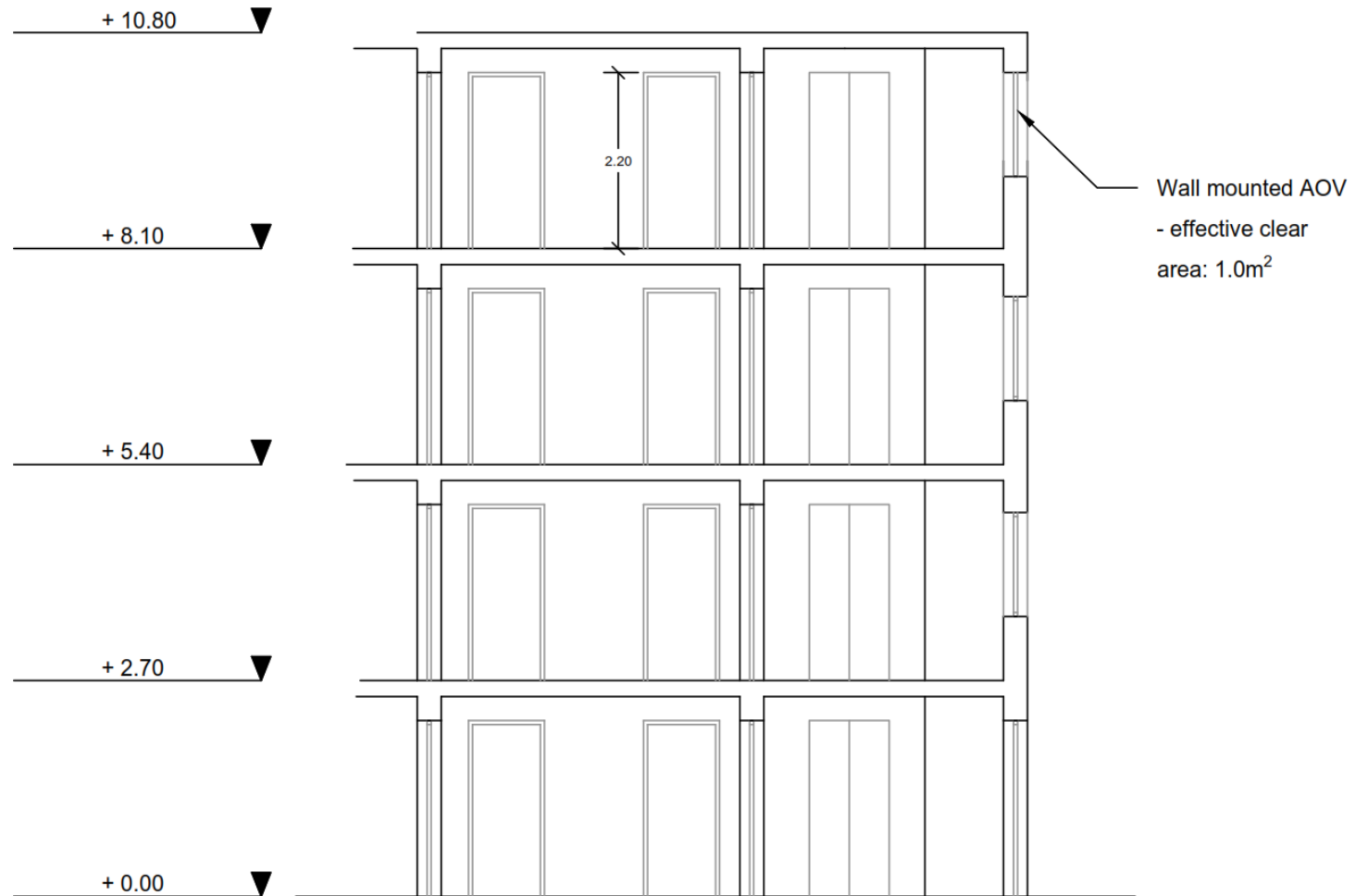
Section 1



Section 2



Section 2 (Alternative)



Scenarios

No.	Unit	Opening 1 Unit on fire	Opening 2 Door from lobby to stair	Opening 3 Door from stair to outside	Lobby detection	Stair detection	Opening 4 AOV	Lift door opening
1	No sprinklers	Open / close	Open / close	Open / close	all lobbies	Top of enclosure and soffit of second floor	Open on detection in stair - Roof mounted	Stair only
2	No sprinklers	Open / close	Open / close	Open / close	all lobbies	Above all landings	Open on detection in stair - Roof mounted	Stair only
3	No sprinklers	Open / close	Open / close	Open / close	all lobbies	Top of enclosure and soffit of second floor	Open on detection in stair - Wall mounted	Stair only
	Interim evaluation – apply the worst case from Scenario's 1 -3 to the scenarios below							
4	No sprinklers	Open / close	Open / close	Open	all lobbies	As per worst case from Scenario's 1 -3	Open on detection in stair - mounting as per worst case from Scenario's 1 - 3	Stair only
5	No sprinklers	Open	Open / close	Open / close	all lobbies	As per worst case from Scenario's 1 -3	Open on detection in stair - mounting as per worst case from Scenario's 1 - 3	Stair only
6	No sprinklers	Open	Open	Open / close	all lobbies	As per worst case from Scenario's 1 -3	Open on detection in stair - mounting as per worst case from Scenario's 1 - 3	Stair only
7	No sprinklers	Open / close	Open	Open / close	all lobbies	As per worst case from Scenario's 1 -3	Open on detection in stair - mounting as per worst case from Scenario's 1 - 3	Stair only
8	No sprinklers	Open	Open	Open	all lobbies	As per worst case from Scenario's 1 -3	Open on detection in stair - mounting as per worst case from Scenario's 1 - 3	Stair only
9	No sprinklers	Open / close	Open	Open	all lobbies	As per worst case from Scenario's 1 -3	Open on detection in stair - mounting as per worst case from Scenario's 1 - 3	Stair only
10	No sprinklers	Open	Open / close	Open / close	all lobbies	As per worst case from Scenario's 1 -3	Closed	Stair only
11	No sprinklers	Open @ ffl	Open / close	Open / close	all lobbies	As per worst case from Scenario's 1 -3	Open on detection in stair - mounting as per worst case from Scenario's 1 - 3	to lobby only
12	No sprinklers	Open @ ffl	Open / close	Open / close	all lobbies	As per worst case from Scenario's 1 -3	Open on detection in stair - mounting as per worst case from Scenario's 1 - 3	to stair and lobby
13	Sprinklers	Open	Open / close	Open / close	all lobbies	As per worst case from Scenario's 1 -3	Open on detection in stair - mounting as per worst case from Scenario's 1 - 3	Stair only