1. BACKGROUND

OFR Consultants (OFR) has been appointed by Peterson Group Management Limited to provide fire engineering support to the Great Northern Warehouse. The proposed scheme will be delivered in three phases which are the Deansgate Terraces, the Warehouse and the Leisurebox. This note relates to the design of the Leisurebox which consists of:

- Five-storey car park (B+G+3); and
- Three residential towers above the car park, of 1, 2 and 3-bedroom flats and resident amenity spaces. The proposed towers are 13-storey, 24-storey and 31-storey above the car park with a height of c. 51.4 m, c. 84.0 m and c. 105.2 m respectively (when measured from the fire service access level to the highest occupied floor).

The design is currently at the end of RIBA Stage 2 and the planning application was submitted in November 2022. Feedback has since been received from the HSE (Health and Safety Executive) in their role as a statutory consultee on planning applications. The following comment was made by the HSE on the design:

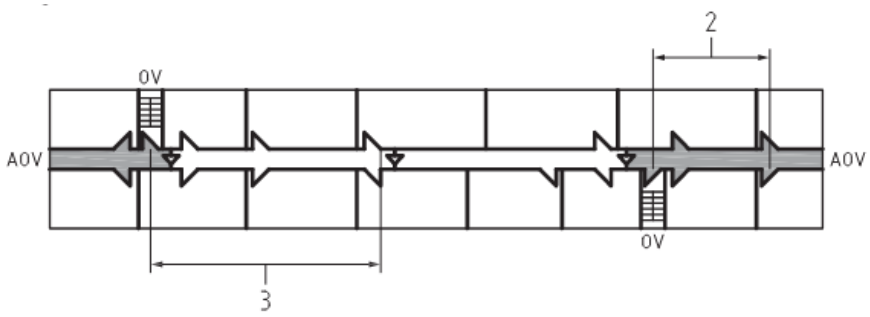
> ***"The firefighter travel distances in Leisure Box block A appear excessive. For instance, the Level 11 drawing indicates a distance of 36m from the firefighting staircase door to the door of the remote flat (labelled A-11-07 3-14-A). Fire safety guidance states that single direction travel distances over 30m in length (measured from the staircase door to the furthest flat entrance door) in common escape routes are considered to present onerous conditions for firefighters. Whilst a secondary escape staircase is available, firefighting operations will be launched from the firefighting staircases. Accordingly, firefighters will be travelling from the firefighting staircases to the remote flats. Design changes necessary to reduce firefighter travel distances will affect land use planning considerations such as the layout and appearance of the development, and the spaces available for, and number of, dwellings"***

This design note considers and addresses this matter raised by the HSE.

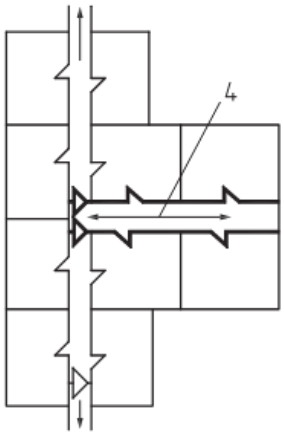
2. STANDARD GUIDANCE RECOMMENDATIONS

The design of the residential levels of the Leisurebox has been developed in accordance with the recommendations of BS 9991:2015 which is considered the most suitable guidance document for the residential buildings within England. The relevant sections of BS 9991 that impact on floor layouts with respect to travel distances and firefighting access are detailed in Section 7.4 and Section 50.2 of BS 9991.

Section 7.4 discusses positioning of stair cores to ensure that travel distances within the corridors do not become excessive. Figure 7b of BS 9991 (extracted below) is the most comparable arrangement to the design of Block A Level 11. The BS 9991 layout allows travel distance of up to 60 m between stair cores and a travel distance of up to 15 m in dead end portions (where escape is available in one direction (given the sprinkler protection).



b) Dwellings with corridor access and with dead ends (see Note 1)



c) T junction with main corridor

Key

1	Maximum travel distance 30 m (max. 60 m if sprinklers are fitted; see **7.4** and **11.2**)
2	Maximum travel distance 7.5 m (max. 15 m if sprinklers are fitted; see **7.4** and **11.2**)
3	Maximum travel distance 30 m
4	Maximum travel distance 7.5 m
AOV	Automatic opening vent (1.5 m² minimum)
OV	Openable vent for fire and rescue service use (1.0 m² minimum)
	Self-closing FD 30S fire door (double swing)
	Self-closing FD 30S fire door
	Area requiring a smoke control system

Sprinkler systems used to permit extended travel distances should be in accordance with BS 9251:2014 or BS EN 12845 (see **7.4** and **11.2**, Table 2).

NOTE 1 The central fire door may be omitted where the maximum travel distance does not exceed 15 m.

NOTE 2 Where all dwellings on a storey have independent alternative means of escape, there are no limitations on travel distance. All parts of the building, however, need to be within 45 m of a fire main, measured along a line on which hose can be laid.

NOTE 3 The openable vents to the stairway may be replaced by an openable vent over the stair.

NOTE 4 The arrangements shown also apply to the top storey.

Figure 1 – BS 9991 Figure 7

It is noted that the guidance in Section 7.4 does not recommend nor rely on ventilation to large sections of residential corridor, provided that the 30m distance between a cross corridor door and a stair is satisfied.

Also Section 7.4 does not specify that the stairs to be designed as firefighting stairs and instead this is addressed by Section 50.2 of BS 9991. Where the floor area exceeds 900 m^{2-} then BS 9991 recommends that two firefighting stairs are provided. In addition to this recommendation BS 9991 also recommends that firefighting stairs are positioned so that every part of every storey is within 60 m (given the sprinkler protection) of a fire main outlet in a firefighting stair on a route suitable for laying hose.

3. Proposed Design

The design of Level 11 of Block A meets the recommendations of BS 9991.

With regards to travel distances the greatest distance between two escape stairs is 26 m as shown in Figure 2 below, which is significantly less than the 60 m allowed under Section 7.4 of BS 9991. The maximum single direction of travel in a dead-end portion of corridor does not exceed 9 m, as shown in Figure 3 which is also less than the maximum of 15 m allowed under BS 9991.

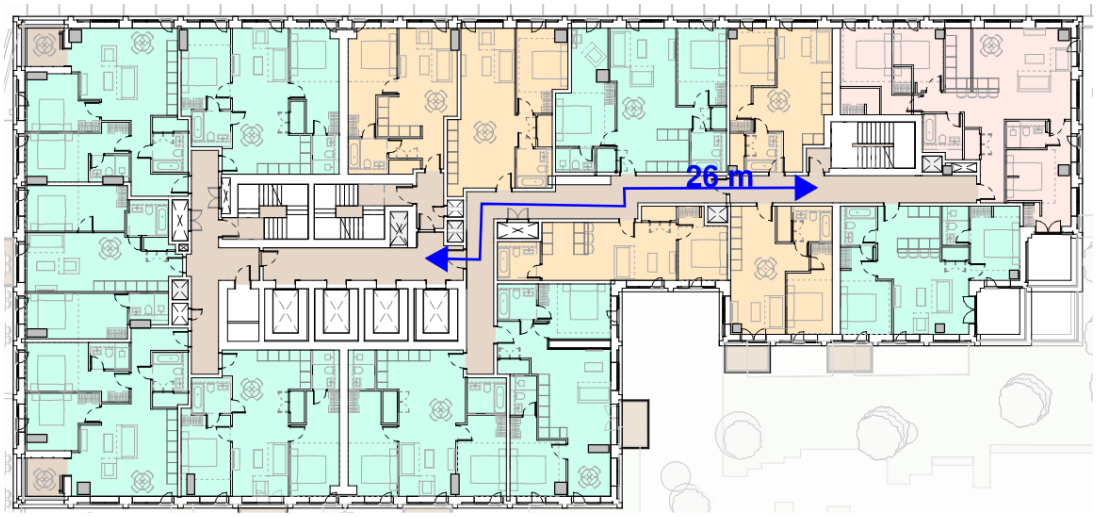


Figure 2 – Proposed Design – Distance between escape stairs

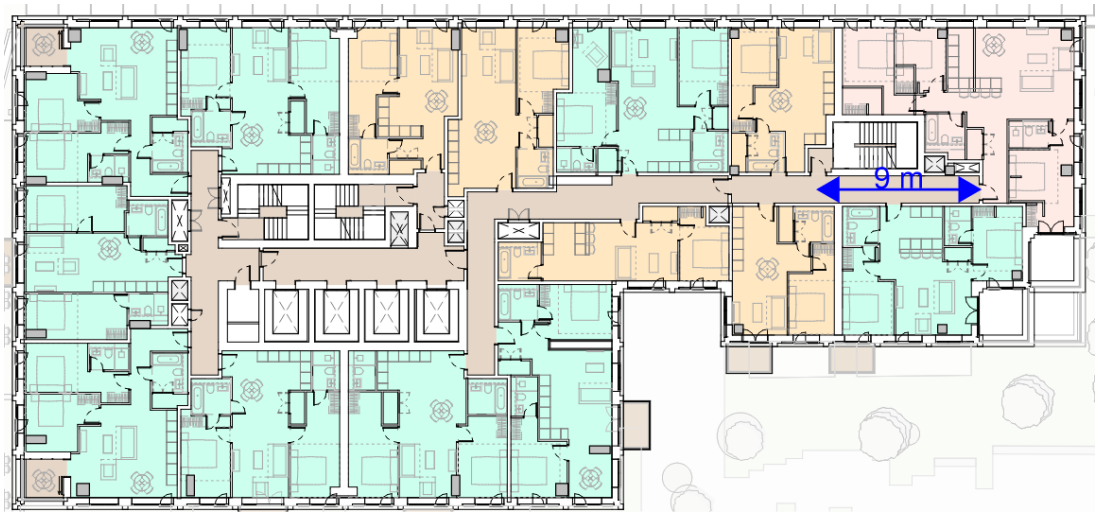


Figure 3 – Proposed Design – Maximum travel distance in a dead-end corridor

With regards to firefighter access the floor area of Level 11 of Block A exceeds 900 m^2 and therefore two firefighting stairs are provided as shown in Figure 4 to meet the recommendations of BS 9991. The two firefighting stairs are also suitably positioned to ensure that hose coverage is sufficient. As shown in Figure 4 below the distance between the most remote point on the storey from an outlet point in a firefighting stair is 54 m, which is less than the 60 m recommendation of BS 9991.

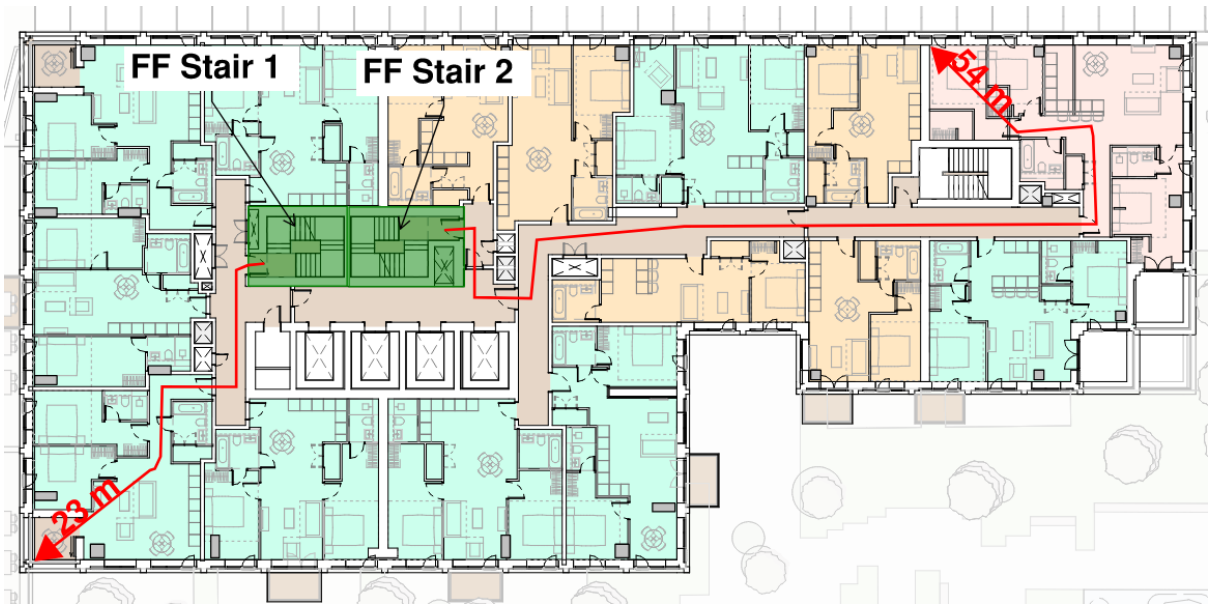


Figure 4 – Proposed Design – Location of firefighting stairs and maximum hose coverage

4. FURTHER DISCUSSION

The current design meets the recommendations of BS 9991 therefore no design changes are proposed. It is acknowledged that the HSE have raised concerns regarding potential conditions for the fire service within the residential corridor.

There is discussion within Section 7.4.1.2 of PD 7974-5:2019 which relates to smoke control systems within extended corridors. As the travel distances within the corridors meet the recommendations of BS 9991 the arrangement is not considered to represent an extended corridor and therefore not applicable to the design.

Notwithstanding this, the intention of this recommendation in PD 7974-5 is to ensure that the fire service would not have to travel a significant distance to reach a relative place of safety in the event that conditions within the corridor deteriorated and they needed to retreat. They would not necessarily need to retreat to a firefighting stair. See extract below:

> Fire-fighters might have to travel along corridors to reach safety in situations where fire conditions deteriorate during tactical operations. Cross-corridor doors provide a high degree of assurance to fire-fighters that under such circumstances they only have to travel a short distance to a place of refuge.

Figure 5 – Extract from Section 7.4.1.2 of PD7974-5

The maximum travel distance the fire service would have to travel within the corridor if they did need to retreat to place of safety would be 9 m to the escape stair or 14 m to the cross corridor door, both considerably less than the 30 m specified in PD 7974-5.

Furthermore, the risk of conditions deteriorating in the corridor is reduced by the fire safety systems specified within the design.

- A sprinkler system is to be installed throughout all apartments which will restrict the size of the fire within the apartments therefore reducing the likelihood of the corridor becoming significantly compromised.
- Smoke control systems are provided within the residential corridors. As noted in the fire strategy the systems are not designed on the basis of equivalence to the minimum standard achieved by the limit smoke management set out in BS 9991 (noting that this includes long sections of corridors with no smoke control), instead, the systems are to be designed to promote tenable conditions for the fire service throughout firefighting operations. Further, the design process for these systems (as per OFR's standard design protocol) will consider system robustness by considering failure mechanisms such as conditions available to firefighters in the event of sprinkler failure.

All in all, the approach to this scheme is to demonstrate that the provisions are appropriate to the needs of residents and the local fire authority. In this specific instance, the package of measures proposed for the scheme exceed those set out in minimum guidance, provide enhanced protection / options for firefighters and in the final design will include full validation through appropriate detailed analyses. The local authority fire service will be fully engaged in developing the objectives and parameters of these analyses and design process in general.

5. QUALITY ASSURANCE RECORD

Rev	Date	Notes	Author	Reviewer	Approver
R00	13/01/2023	For Review by Stakeholders	AR	SFL	SFL