

A large, stylized flame graphic composed of several curved, overlapping segments in shades of red, orange, and yellow, positioned on the left side of the page.

## *Fire Spread Risk Assessment*

**JN8535A:** Silk Street, Failsworth, Manchester

**Clients:** Rowlinson Constructions Limited

*Draft No. 1*

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## Quality Check-sheet

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|          |                                                            |        |          |            |
|          |                                                            |        |          |            |

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# 1 Introduction

## 1.1 Background

Fire-Q Ltd (Fire-Q) have been engaged by Paul Slater at Rowlinson Constructions Ltd to provide a construction fire spread risk assessment for the proposed development at Silk Street, Failsworth in Manchester. The instruction was received on 14<sup>th</sup> May 2021.

## 1.2 Purpose and Scope

The purpose of this document is to provide a construction fire spread risk assessment which includes:

1. Risk of fire spread to buildings beyond the site boundary and,
2. Risk to isolated (single direction) off-site escape routes.

**Stage 1:** Analysis of the risks and production of the initial draft report, which details the estimated risk and possible mitigation measures.

This is reviewed by the Client and following consultation, the optimum strategy is identified.

**Stage 2:** Production of the final draft including the agreed mitigation strategy. After a final review this is published for the project record.

This report is the initial draft that contains the risk estimates and initial recommendations for mitigation measures. This can be adjusted as and when new information becomes available.

The fire risk mitigation method recommended in this report is for life protection only. The proposals in this report do not necessarily stop fires but is there for life safety of the persons outside the site boundary. Should a fire occur damage may occur to properties for examples glass cracking, plastic materials and rain water pipes damage but the fire is assessed not to cause ignition of the neighbouring properties or create prolonged heat to stop persons escaping the neighbouring properties site should a fire occur.

The proposals in this report are a desktop exercise and rely on the information being confirmed by the client. Fire-Q are to be informed if the information taken on the neighbouring buildings or project design varies from that presented in this report.

The assumptions noted in terms of escape routes and separation distances are as given in section 1.3. If there is any differences to the assumptions made Fire-Q are to be informed so a review of life safety can on site fire risks, including escape off the scaffold and from the building, are outside the scope of this report.

The Principal Contractor to comply with the following duties:

1. To follow the STA 16 steps in this development.
2. To inform the local fire service that the construction is taking place.

3. To inform the relevant neighbouring building occupants of the fire evacuation procedures and alarm types being adopted, and to be aware of the fire alarm types and muster points for the neighbours if that is appropriate.

4. Check that local business muster points are not opposite the site but away from the site.

5. Check what the fire alarm procedures are for a fire in the surrounding business premises.

This assessment is regarding the risk to persons off-site only; please refer to the on-site Fire Risk Assessment for this information.

### **1.3 Extent**

This report refers to the development at Silk Street, Failsworth in Manchester, and is site specific – it cannot be transferred to any other development, as the configuration factors estimated are unique and only apply to this layout.

## 2 Development Description

### 2.1 Development Layout

This proposed development consists of a number of two-/three-story buildings will be constructed from timber frame. The nearby buildings appear to be residential and commercial, which are in close proximity to the site. There are also three blocks of flats on the site to be built with steel structure.

Timber frame buildings built in proximity to occupied buildings can constitute a fire spread risk, therefore, an appropriate strategy for mitigation has been developed in this report. In addition to this, there is consideration of any risk to single escape route conditions that could be adversely affected.

*Figure 2.1: Site plan*



Figure 2.2: Satellite Image hybrid and off-site risks

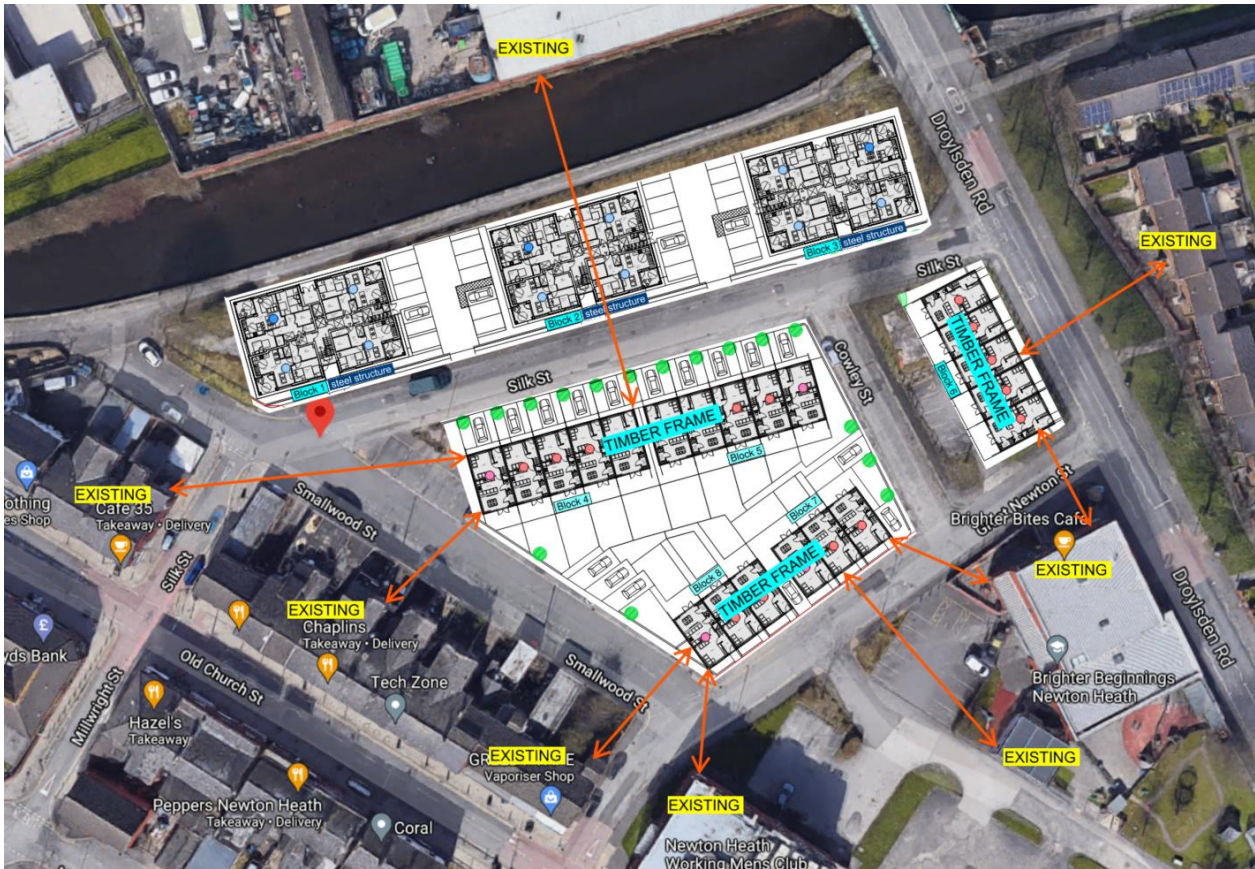
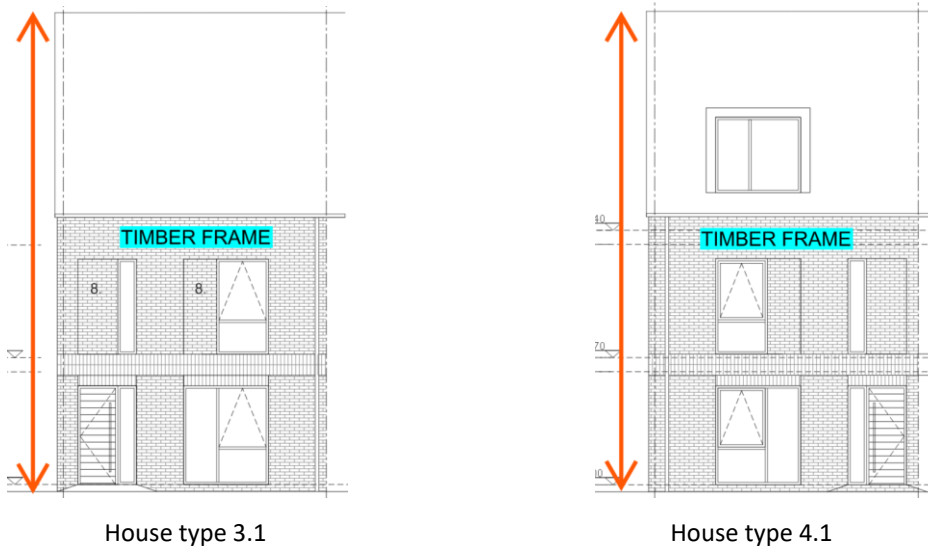


Figure 2.3: Front Elevations



## 3 Construction Fire Spread Risk Assessment

### 3.1 Fire Spread Assessment Method

#### 3.1.1 Estimation of Radiant Heat Flux

This risk assessment has been completed using the Fire-Q RT radiant heat estimation tool, which has been adapted from a tool originally developed by FERMI Ltd in consultation with the HSE and Leeds University. Inputs into the model are:

1. The dimensions of the possible emitter (the relevant face of the timber frame) and receivers (the buildings in proximity to the frame)
2. The configuration of the emitter and receivers (distance between them and relative size and position)
3. Properties of the emitter (temperature, emissivity) and ambient conditions

The method is detailed in the FERMI Report No. 1 and the UKTFA guidance note and supporting documents, which can be accessed from the UKTFA, HSE websites. For this development we have published the results in a table, which shows the distance between receiver and emitter the estimated radiant heat flux in the event of a fully developed fire in the timber frame. These results are compared with the acceptance criterion (see Section 2.1.2). The estimation considers the risk from a Category A timber frame system.

#### 3.1.2 Acceptance Criteria

The generally accepted criterion for assessing the hazard is  $12.6 \text{ kW.m}^{-2}$ ; i.e. RHF that could cause pilot ignition of wood after ten minutes. RHF of  $> 29 \text{ kW.m}^{-2}$  can cause auto-ignition of wood and other materials. When the RHF exceeds  $12.6 \text{ kW.m}^{-2}$  there is also a potential RHF hazard to occupants of buildings through windows and anyone walking in the vicinity unable to move rapidly away from the fire. Furthermore, large fires in construction sites have caused significant damage to housing and local infrastructure. Therefore, the acceptance criterion of  $12.6 \text{ kW.m}^{-2}$  (which is used as the basis for BR 187) is considered a reasonably conservative threshold for fire spread risk estimation.

NB: for comparison, the incident heat flux in the UK on a hot summer day is approximately  $0.5 \text{ kW.m}^{-2}$  and people can tolerate exposures of up to  $2.5 \text{ kW.m}^{-2}$  for periods of about 30 seconds [7]. Wood will ignite spontaneously after a long exposure to a heat flux of  $30 \text{ kW.m}^{-2}$ . Plastics will ignite in the presence of a pilot flame with exposures in the range  $15\text{-}25 \text{ kW.m}^{-2}$ .

### 3.2 Fire-Q Radiant Heat Flux Modelling Results

The results showed in Table 3.1 were obtained assuming the building will be constructed as category A timber frame (unprotected). The face reference numbers corresponding to the risk points are highlighted in Figure 3.1. If there are other occupied buildings around the site that are facing the site and potentially at risk, the client should notify Fire-Q so these risks can be assessed.

Figure 3.1: Fire Spread Risk Assessment - Reference Points



### 3.3 Off-site Single Escape Route Analysis

As part of this assessment we are required to ensure that there are no buildings in the surrounding area that have single (dead end) escape routes that could receive radiant heat flux greater than  $2.5\text{kW/m}^2$  (this is considered the tenability limit for humans, but can be endured by the average human for around 30 seconds).

It is shown in Figure 3.2 that most escape routes from the nearby buildings are directly away from the site and sufficiently shielded (also refer to Figure 3.3), except for single escape routes E1 and E2, which may be subject to RHF from the site in the event of a fire. If there are other single escape routes from the nearby buildings are facing the site and potentially at risk, the client should notify Fire-Q so these risks can be assessed.

The RHF to these escape routes will be assessed to ensure that a fire in the site should not compromise any off-site means of escape.

Figure 3.2: Off-Site Escape Route Assessment

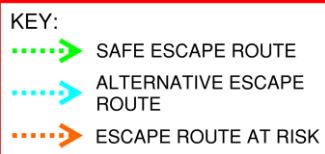
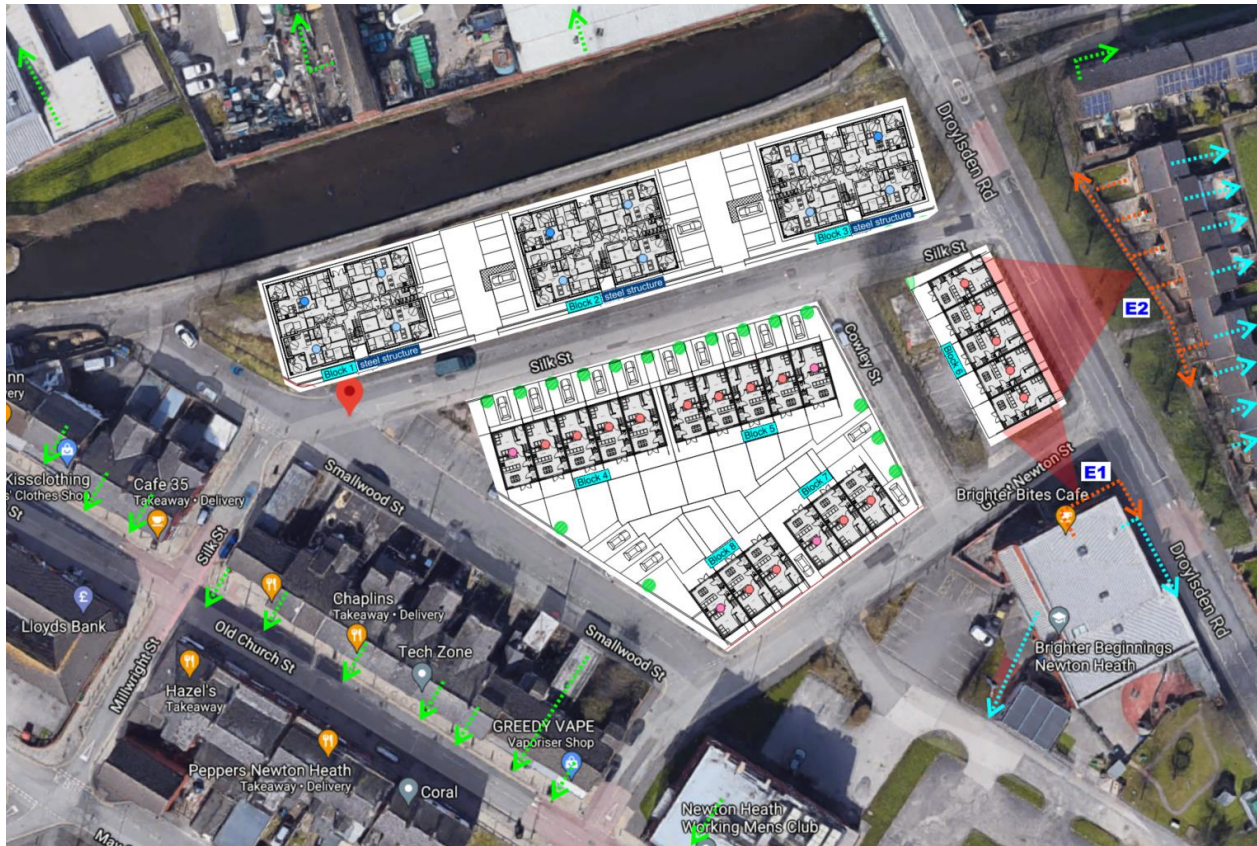


Figure 3.3: Street view of buildings off Great Newton Street



Table 3.1: Fire Spread Risk Assessment Results

| Face Ref No.   | Approx. Distance/s to Receiver (m) | Estimated Max RHF (kW/m <sup>2</sup> ) | Comment                                                             |
|----------------|------------------------------------|----------------------------------------|---------------------------------------------------------------------|
| Off-site Risks |                                    |                                        |                                                                     |
| 1              | 18.2                               | 6.5                                    | < Acceptance criteria for fire spread risk; considered acceptable   |
| 2              | 17.4                               | 4.4                                    | < Acceptance criteria for fire spread risk; considered acceptable   |
| 3              | 16.2                               | 6.6                                    | < Acceptance criteria for fire spread risk; considered acceptable   |
| 4              | 35.6                               | 3.4                                    | < Acceptance criteria for fire spread risk; considered acceptable   |
| 5              | 17.2                               | 6.1                                    | < Acceptance criteria for fire spread risk; considered acceptable   |
| 6              | 17.0                               | 5.2                                    | < Acceptance criteria for fire spread risk; considered acceptable   |
| 7              | 28.3                               | 3.9                                    | < Acceptance criteria for fire spread risk; considered acceptable   |
| 8              | 27.4                               | 3.4                                    | < Acceptance criteria for fire spread risk; considered acceptable   |
| 9              | 47.0                               | 1.1                                    | < Acceptance criteria for fire spread risk; considered acceptable   |
| E1             | 16.3                               | 5.5                                    | > Acceptance criteria for single escape routes; see recommendations |
| E2             | 22.3                               | 7.2                                    | > Acceptance criteria for single escape routes; see recommendations |

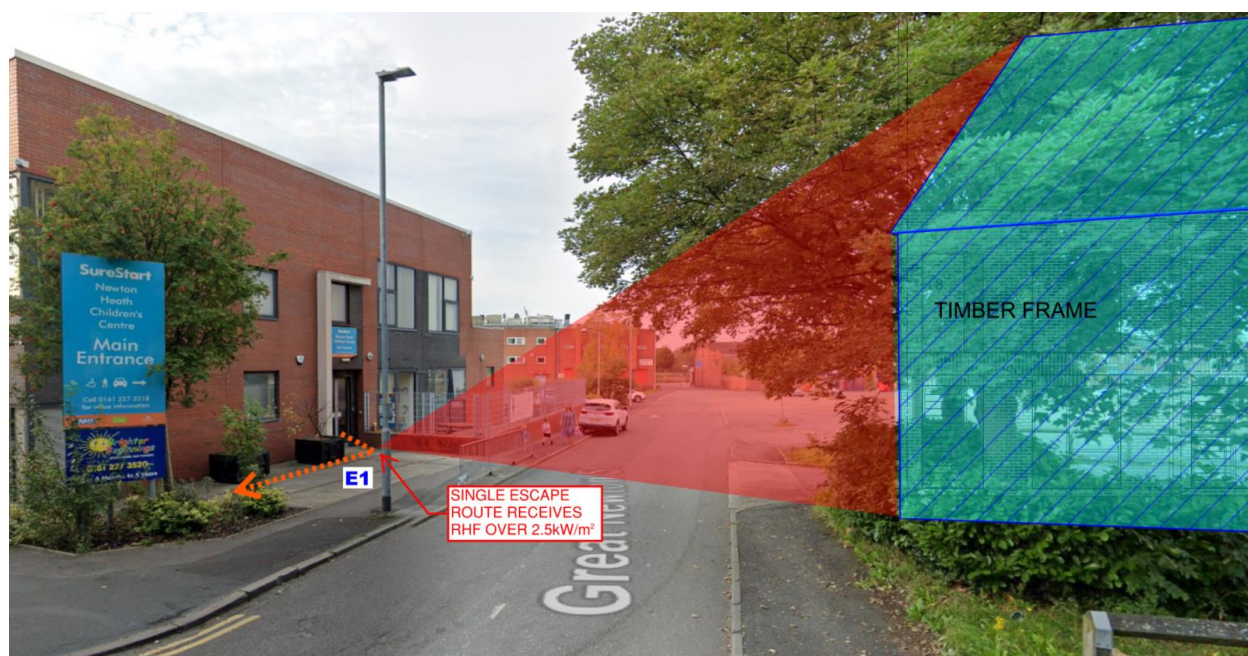
## 4 Recommendations

### 4.1 Initial Recommendations Overview

The radiant heat flux assessment has demonstrated that there are no points on the surrounding buildings that may receive unacceptable levels of fire spread risk from the buildings under construction. However, single escape routes E1 and E2 may receive unacceptable radiant heat flux from the site, as illustrated in Figure 4.1.

In the event of a fire within site, the workers may be subject to potential fire risk. It is not in the scope of this report to assess the on-site risks. Appropriate preparatory actions or measures should be taken by the client to ensure the safety of the workers.

*Figure 4.1: Illustration of risk to the single escape routes from nearby buildings*



### 4.2 Risk Mitigation to Timber Frame

The following is the recommended strategy to mitigate this risk to within acceptable margins. We are recommending the external walls of some plots are sheathed with non-combustible board at the outer side to protect escape routes E1 and E2, as shown in Figure 4.2.

However, if the houses at the east have alternative escape routes as indicated by the blue lines in Figure 3.2, the protection to the external wall facing E2 will not be required. If the Children's Centre at the south has an alternative escape route as indicated by the blue line in figure 3.2, the non-combustible board to the external wall facing E1 will not be required.

Figure 4.2: Risk Mitigation Strategy

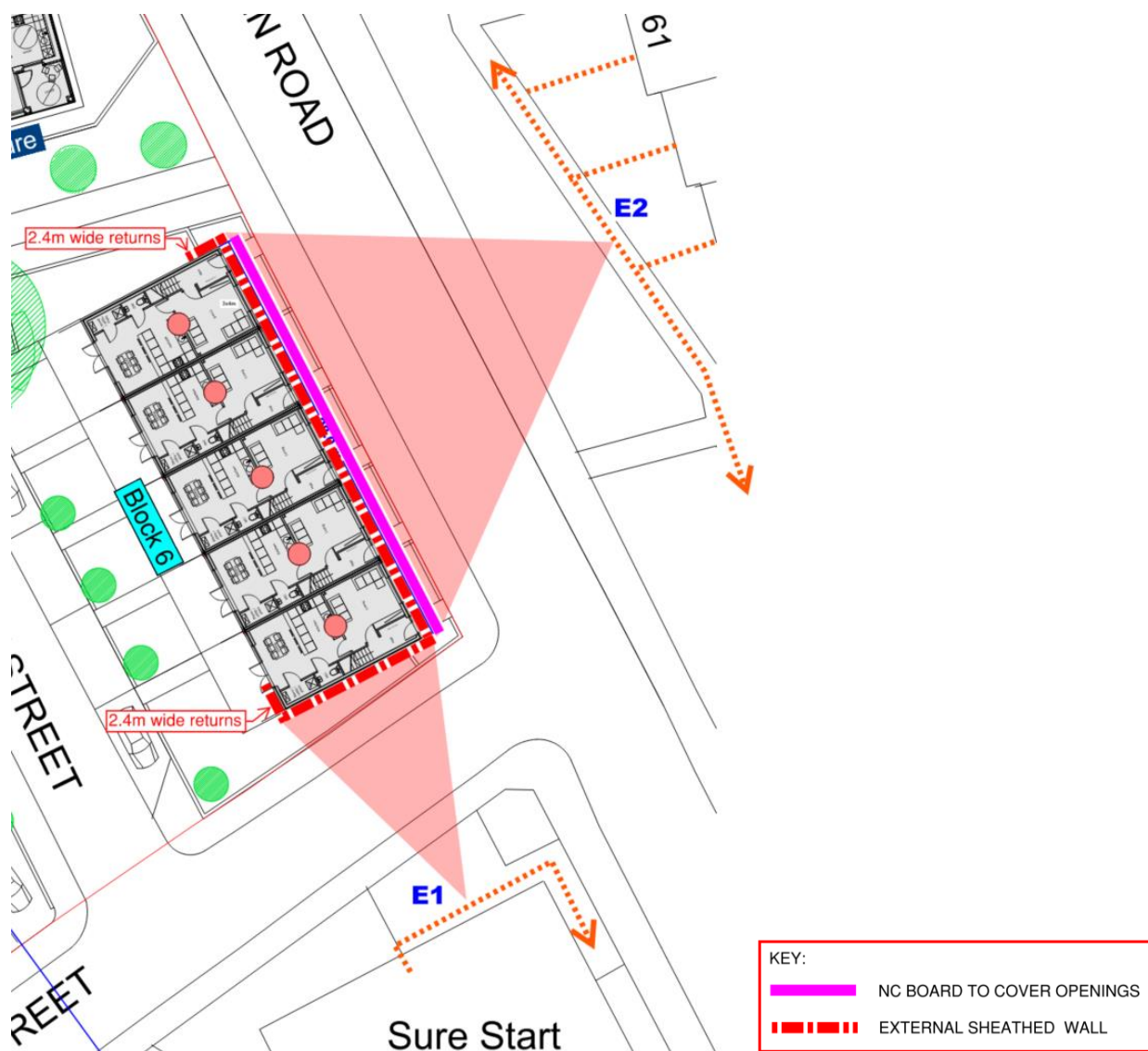


Figure 4.2 above illustrates a protection system, which effectively reduces the radiating area and the fire spread potential within site. This in turn equates to reduced RHF estimations on the risk points noted in Table 4.1. Figures 4.3-4.4 illustrate the specific protection material requirements for all floors in order to achieve acceptable residual RHF values calculated in Table 4.1.

### 4.3 Residual RHF Assessment

In order to demonstrate that the recommended protection system meets the acceptance criteria in all risk areas, residual estimations have been undertaken. The results and Risk points are shown in Table 4.1.

The results show that the proposed protection approach can be considered to mitigate the fire spread risk to acceptable levels. This takes into account the requirement that at least one escape route from each of the buildings at risk should not exceed the acceptance criteria for human tenability.

*Table 4.1: Residual RHF Results*

| Face Ref No. | Emitter Type                          | Approx. Distance/s to Receiver (m) | Re-estimated Max RHF (kW/m <sup>2</sup> ) | Comment – Post mitigation                                  |
|--------------|---------------------------------------|------------------------------------|-------------------------------------------|------------------------------------------------------------|
| E1           | CAT A + N/C FACADE                    | 16.3                               | 1.0                                       | <2.5 kW/m <sup>2</sup> Acceptable for single escape routes |
| E2           | CAT A + N/C FACADE + COVERED OPENINGS | 22.3                               | 1.2                                       | <2.5 kW/m <sup>2</sup> Acceptable for single escape routes |

The recommended protection strategy appears to reduce the risk to a level that can be considered acceptable. Table 4.1 gives the residual RHF values assuming the client provides the protection as in Figures 4.3-4.4.

Figure 4.3: Protection System Material Requirements- Ground floor

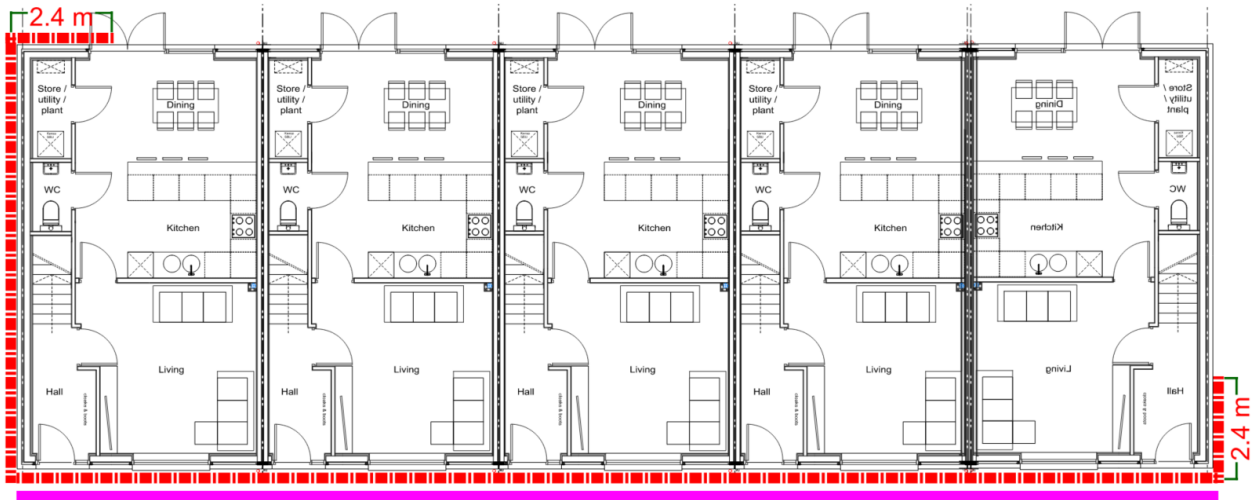
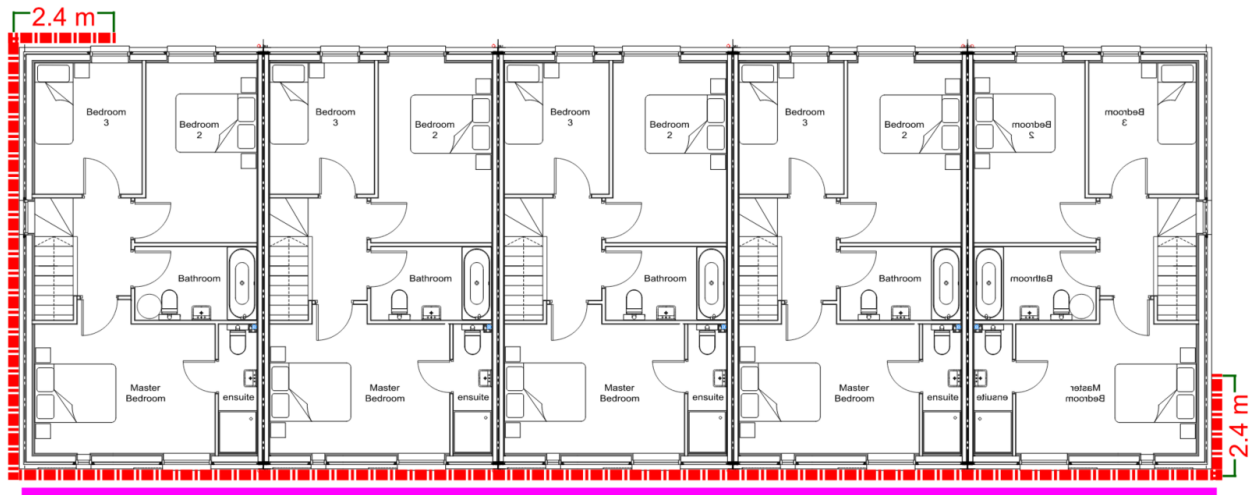
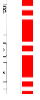
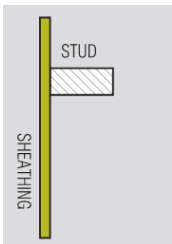
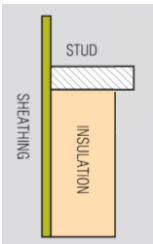


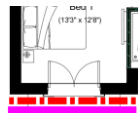
Figure 4.4: Protection System Material Requirements- First floor



| Key to colours on risk mitigation                                                 |                                 |
|-----------------------------------------------------------------------------------|---------------------------------|
|  | External wall –sheathing see D1 |
|  | Covered opening – see D4        |

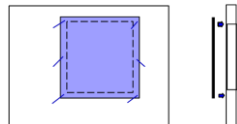
| Key to wall type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>External walls – D1</b> </p> <p><b>(including gable and spandrel panels where appropriate)</b></p> <p><b>External walls to be provided as:</b></p> <p>a. Standard timber frame construction with non-combustible sheathing boards ( 9mm Euro Class A1 or 12mm A2 board) on the external face</p> <div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="text-align: center;">  <p>Typical open-panel external wall</p> </div> <div style="text-align: center;">  <p>pre-insulated wall</p> </div> </div> <p>No exposed timber based boards in this construction</p> |

## External walls – D4 with covered windows

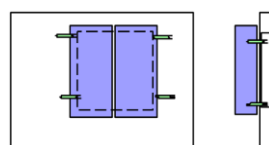


- non-combustible boards needed for boarding as given in D1

board over window or door is non-combustible board



Options to temporarily close window & door openings – internal boards fixed over the opening



or hinged frames with boarding on timber framing- if hinged frames are used a work permit method statement shall be used to open the windows for certain construction activities. The hinged frames are to be secured to the frame so that they are effectively fixed during end of shift work and when not needed to be open. No more than two hinged window is to be open at any one time during the build process.

## 4.4 Conclusions

Assuming the client follows the recommendations issued in this report, those in UKTFA 16 steps and adequate escape routes are provided, we confirm that the proposed development appears acceptable and an appropriate standard of fire safety will have been achieved (as far as is reasonably practicable). That is, if a fire occurs at any time, it will not pose an unacceptable level of risk to persons off-site.