

Managing Fire Risks Associated with Use of External Wall Systems

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Additional assistance with paragraphs 1 to 17 and Commentary on Development of
Guidance Tool.
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The opinions expressed in this report are those of the authors.

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Executive Summary

Purpose, Aims, and Objectives

Following the tragic events at the Grenfell Tower fire, London on 14 June 2017, the Building and Fire Safety Ministerial Working Group (MWG) was set up to oversee a review of building and fire safety regulatory frameworks and any other relevant matters, to help ensure that people are safe in Scotland's buildings.

The aim of this project is to develop guidance for consideration by the Building Standards Division (BSD) of the Scottish Government to assist local authority verifiers manage the fire risk associated with external wall systems (EWS). The research includes qualitative analysis of the design, verification, installation, inspection, and certification of external wall systems. The outcome of the research will be used to develop guidance that may be included in the Compliant Handbook that will be developed to support the Compliance Plan Approach work stream of the Futures Board.

The research focused on compliance issues, both physical and procedural. The developed guidance is intended to assist local authority verifiers to manage the fire risk associated with external wall systems through the design and construction phase of a project and as a result improve compliance with building regulations.

The objectives of the project were to:

- Undertake a transparent, rigorous, and systematic analysis of a sample of domestic high rise (above 18m) building warrant applications dated from 1 May 2005 and a sample of building warrant applications above 11m (domestic or non-domestic) dated from 1 October 2019 in a mix of local authorities. The brief was to sample four applications of each of the above (total of eight) from six local authorities; six local authorities were initially approached as per the brief, three local authorities responded to this request. As a result, the actual number of case studies was subsequently reduced to five, from three cities. The authors are indebted to the cooperation from the three cities that participated. The review involved records for each project, including all available pre and post building warrant documentation made available by the local authorities.
- Provide quantitative as well as qualitative analysis and identify any recurring themes in the verification process, and suggest possible solutions to provide appropriate, effective, and robust verification and compliance processes to ensuring safe external wall system design and construction. Local authority verifiers advised during the interview process that a record is not kept on time spent on each aspect of the Building Standards guidance in the Technical Handbook (including external wall systems), therefore a quantitative analysis was not possible.
- Draft guidance should be targeted at assisting relevant persons (see Section 1) which may be included in or cross-referenced by the Compliance Handbook (Note: this guidance should also be helpful to local authority verifiers, designers, installers, fire risk assessors, fire engineers, and external wall system appraisal experts).

Methodology

The authors created a Guidance Tool (see Section 4) based on their external wall experience. The Guidance Tool was then applied to the design information, correspondence, and site inspection records provided by the relevant local authority for each of the five case studies included in this research; this was intended to identify any gaps in the Guidance Tool. Interviews were held with the local authority case officers for these five building warrant applications which were intended to understand how the local authority verifier arrived at the decisions taken specific to that case study in their own words.

The Guidance Tool (see Section 4) includes a methodology for carrying out site inspections.

In order to inform the research and encourage open feedback, the project addresses and local authorities have been anonymised. Data Protection legislation and copyright will be adhered to at all times.

Conclusions and Recommendations

The Guidance Tool has a place in the Building Warrant process. The outcome of this research is that the most useful aspect will be as a formalised checklist/process for Building Warrant applicants to follow, and act as an aide memoir to local authority verifiers.

Local authority verifiers often rely on their experience with products' fire performance and decide on the suitability of non-standard external wall designs with limited recording of the decision making process. Advice received externally from experts/manufacturers is saved on file. It is the authors' opinion that better record keeping is important for external wall designs as products' fire performance is tied closely to the tested configuration, and reference material should be consulted to prevent inappropriate or untested arrangements from being approved/constructed.

Local authority verifiers carry out spot checks of construction quality of external wall systems on site. This is in theory satisfactory as the responsibility for construction quality sits with the "relevant person", however as construction quality is constantly in question (in the experience of the authors) additional oversight is advisable.

Additional oversight could come in the form of additional site inspections by local authority verifiers or a qualified independent third party acting for the "relevant person" (such as a Clerk of Works). Such site inspections would still be subject to review by local authority verifiers. Input would be needed from the BSD to achieve this, including guidance for all and a suitable accreditation scheme.

There is no strong evidence that a separate stage for external wall systems should automatically be introduced for every project, although this is done routinely for large projects.

As local authority verifiers were unable to estimate the percentage of time devoted to reviewing external wall systems, quantitative analysis has not been possible.

To address construction quality issues, clear guidance should be given to local authority verifiers and Building Warrant applicants on how to most efficiently obtain the services

of a qualified independent third party acting for the applicant to carry out suitable site inspections (suitable is explained by the Guidance Tool). See Section 1 of this report for the role of the relevant person.

Where decisions are made regarding the suitability of external wall systems, local authority verifiers should be encouraged to record the decision making process to reach the conclusion, particularly where the conclusion is to accept the proposal.

1. Introduction and Background

Introduction

1. This project was commissioned by the Building Standards Division (BSD) of the Scottish Government to assist local authority verifiers manage the fire risk associated with external wall systems (EWS). The research includes qualitative analysis of the design, verification, installation, inspection and certification of external wall systems.
2. The outcome of the research will be used to develop guidance that may be included in the Compliance Handbook that will be developed to support the Compliance Plan Approach work stream of the Futures Board.

Background to Scottish Building Warrant Process

3. The Building Standards system in Scotland is established by The Building (Scotland) Act 2003 and associated Regulations. The system is pre-emptive and is designed to check that proposals meet building regulations. The purpose of the system is to protect life and the public interest. It is not intended to provide protection to a client in a contract with a builder.
4. The main principles of the system are:
 - that a building warrant must be obtained before work starts on site, and
 - prior to a building being occupied, a completion certificate must be accepted by a verifier if, after undertaking reasonable inquiry, they are satisfied with the declaration by the “relevant person” that the work meets the building regulations.
5. The system applies to the design, construction or demolition of a building; the provisions of services, fittings or equipment in, or in connection with, a building; and the conversion of a building. It is intended to ensure that work on both new and existing buildings results in buildings that meet reasonable standards, which are set out in building regulations.
6. The regulations do not generally apply to existing buildings unless the owner intends to carry out a type of work that must meet building regulations, including significant alterations. In general terms, work must be carried out in a technically proper and workmanlike manner, and the materials used must be durable and fit for their intended purpose.
7. In Scotland, the 32 local authorities are appointed by Scottish Ministers as verifiers to administer the Building Standards system for their own geographic area and are responsible for the interpretation of Building Standards legislation. Guidance on the Building Standards system is published in the Procedural Handbook.
8. The Building Standards Technical Handbooks provide guidance on achieving the standards set in the Building (Scotland) Regulations 2004. A building warrant application will be granted by a local authority verifier where it is shown that the building

complies with the building regulations at the time of the assessment and may include relevant fire test evidence and product certification.

9. Once the building warrant has been granted it is the responsibility of the “relevant person” to ensure that the construction work meets the building regulations and is built in accordance with the building warrant. The “relevant person” is the building owner or developer in most cases. Where changes are made on site to the approved specification e.g. product substitution, an amendment to the building warrant should be submitted to the verifier detailing the changes.

10. The “relevant person” can appoint an agent to act on their behalf if they are unsure of their responsibilities. It is recommended that this person is a suitably qualified and experienced building professional, for example an architect, building surveyor or structural engineer. Similarly, it is the responsibility of the “relevant person” to make sure that design or construction work is carried out by qualified and experienced building professional, ideally registered with a reputable trade or professional body.

11. Once the work has been completed the “relevant person” must submit a completion certificate to the local authority. The “relevant person” signs the certificate which confirms that the work has been completed in accordance with both the building regulations and the granted building warrant. A local authority must accept a completion certificate if, after reasonable inquiry, it is satisfied as to the matters certified in the certificate. Acceptance of a completion certificate cannot be, nor is it intended to be, a guarantee that all workmanship and materials are suitable. Such a guarantee would require a constant supervisory presence on site and this is a matter for the developer/owner to put in place.

2. Aims, Objectives, and Scope

Scottish Government Aim and Objectives

12. The aim of this project was to develop guidance for consideration by BSD that may be included or cross-referred to in the Compliance Handbook that will be developed to support the Compliance Plan.

13. The research focuses on compliance issues, both physical and procedural. The developed guidance will assist local authority verifiers to manage the fire risk associated with external wall systems through the design and construction phases of a project and as a result improve compliance with building regulations.

14. The objectives of the project were to:

- Undertake a transparent, rigorous, and systematic analysis of a sample of domestic high rise (above 18m) building warrant applications dated from 1 May 2005 and a sample of building warrant applications above 11m (domestic or non-domestic) dated from 1 October 2019 in a mix of local authorities. The brief was to sample four applications of each of the above (total of eight) from six local authorities; six local authorities were initially approached as per the brief, three local authorities responded to this requested. As a result, the actual number of case studies was subsequently reduced to five, from three cities. The authors are indebted to the cooperation from the three cities that participated. The review involved records for each project, including all available pre and post building warrant documentation made available by the local authorities.
- Provide quantitative as well as qualitative analysis and identify any recurring themes in the verification process, and suggest possible solutions to provide appropriate, effective, and robust verification and compliance processes to ensuring safe external wall system design and construction. Local authority verifiers advised during the interview process that a record is not kept on time spent on each aspect of the Building Standards guidance in the Technical Handbook (including external wall systems), therefore a quantitative analysis was not possible.
- Draft guidance should be targeted at assisting relevant persons (see Section 1) which may be included in or cross-referenced by the Compliance Handbook (Note: this guidance should also be helpful to local authority verifiers, designers, installers, fire risk assessors, fire engineers, and external wall system appraisal experts).

Scope of Research

15. The scope of the research is limited to managing the fire risk associated with external wall systems and does not extend to other aspects of the building regulations.

16. For the purposes of this research, an external wall system is a non-loadbearing façade system e.g. rainscreen cladding (and any insulation material behind the cladding or rendered external thermally insulated cladding systems (ETICS)), balconies, solar

shading or other attachment that could promote rapid vertical fire growth. Whilst residential buildings present the greatest risk to life and should be targeted, the author may use evidence from non-residential buildings.

17. BSD provided verifier contact details and helped to facilitate access to records whilst accepting that COVID restrictions may still be in place. This has meant the project timetable has been extended until August 2023. In order to inform the research and identify any areas for improvement, the project addresses and local authorities have been anonymized. Data Protection legislation and copyright will be adhered to at all times.

3. Methodology

18. To meet the aims and objectives outlined above, Building Warrant applications were reviewed with regards external wall systems to identify the assessment approach in the current process. The brief was to review eight Building Warrant applications from six local authority verifiers where the guidance in the technical handbooks recommended non-combustible external wall systems or the system has been tested in accordance with BS 8414 and met the performance criteria in BR 135. As the Building Regulations guidance changed on 1 October 2019, the intention was to review four building warrant applications with a top storey height over 18m between 1 May 2005 and 30 September 2019, and four building warrant applications with a top storey height over 11m from 1 October 2019 onwards. Six local authorities were initially approached as per the brief, three local authorities responded with suitable case study candidates. The actual number of case studies reviewed was reduced to three building warrant applications with a top storey height over 18m between 1 May 2005 and 30 September 2019, and two building warrant applications with a top storey height over 11m from 1 October 2019 onwards. It transpired during the course of reviewing one of the post-October 2019 case studies that the building top storey height is actually 9m.

19. Since 1 May 2005 the basis of compliance would expect to have been via the use of non-combustible materials, or systems compliant with BS8414 / BR135 or a fire engineered solution for over 18 m domestic buildings. Since 1 October 2019 this would extend to any building over 11 m. Any other route other than via non-combustible materials or BS8414 / BR135 would need to be fully justified.

20. The authors used their external wall systems experience to create a Guidance Tool (see Section 4) that was applied to the five case studies reviewed as part of this research to identify where there were gaps in the Guidance Tool for each case study. The outcomes of this were analysed to provide recommendations to Scottish Government/BSD.

21. The reviews of the Case Studies were intended to gain a better understanding of the existing verification process to inform any potential solutions to provide appropriate, effective, and robust verification and compliance processes with regards to the design and construction of external wall systems. The observations in Section 5 therefore focus on identifying potential gaps in the verification processes applied to the Case Studies to improve future verification and compliance processes.

22. Interviews were held with the local authority case officers for these five building warrant applications. The intention was to understand how the local authority verifier arrived at the decisions taken specific to that case study in their own words. To obtain a broad range of responses, the same questions were put to all of the case officers for the case studies undertaken. The questions were derived from common themes in multiple case studies and/or to describe any processes that are routinely undertaken but perhaps not recorded, specifically relating to scrutinising the design of the external wall systems at both the design and construction stages. The findings of the interviews were analysed to provide recommendations to Scottish Government/BSD. In order to inform the research and encourage open feedback, the project address and local authority have been anonymised. Data Protection legislation and copyright will be adhered to at all times.

4. Guidance Tool

23. The Guidance Tool was developed primarily based on the authors' experience of carrying out desktop studies and site inspections for external wall systems, for example as part of work relating to EWS1 forms. Typical observations based on the authors' experience have fed into the preparation of the Guidance Tool, some examples of these are presented in the Appendix.

24. There are three key stages to carrying out a thorough review of external wall systems:

- Stage A: Gather and review technical datasheets and product specifications.
- Stage B: Gather and review proposed external wall detail drawings
- Stage C: Inspect the standard of workmanship

25. Stages A and B are used during the Building Warrant application stage and Stage C is used during the construction stage when carrying out independent site inspection verification.

26. This Guidance Tool is intended to be compatible with the current Building Warrant application process.

27. The Guidance Tool in the Appendix was developed based on the authors' experience and was then tested against the five case studies as part of this research.

5. Case Studies 1-5

28. The reviews of the Case Studies were intended to gain a better understanding of the existing verification process to inform any potential solutions to provide appropriate, effective, and robust verification and compliance processes with regards to the design and construction of external wall systems. The observations below therefore focus on identifying potential gaps in the verification processes applied to the Case Studies to improve future verification and compliance processes.

Case Study 1

Building Profile:

- **Number of storeys: 4**
- **Building type: private residential**
- **Top storey height: 9m (initially assumed to be more than 11m)**
- **Building Warrant application submission date: post October 2019**

29. Drawing information was provided for the building's external wall systems, as well as correspondence between the local authority verifier and the design team.

30. Three external wall types were identified by the applicant design team: facing brick external leaf (general), zinc cladding, and facing brick external leaf (closes). These walls were specified to contain a combination of PIR insulation and glass mineral wool insulation.

31. The buildings are largely constructed of timber structure.

32. The top storey heights are less than 11m and the external walls are more than 1m to the relevant boundary for external fire spread. The external walls can be constructed from combustible products more than 1mm thick which is European Classification B, C, D or E to meet the Domestic Technical Handbook guidance applicable to this building.

33. The approved fire strategy and the external fire spread calculations relied on the external walls not forming the windows to achieve 60 minutes fire resistance from inside.

34. To demonstrate that the external walls achieve at least 60 minutes fire resistance from inside, BS476: Part 21: 1987 fire testing had been provided for part of the external wall system, i.e. the inner face fire rated plasterboards, PIR insulation, an air/vapour control layer, another layer of plasterboards, glass mineral wool insulation, sheathing board and breather membrane with timber battens in between. The outer part of the external wall construction such as brick and zinc were not tested as part of the fire test.

35. It was noted that there were some component differences in product selection and manufacturer between the tested construction and the outline specification document produced by the applicant design team for the proposed external wall systems.

36. Fire performance data sheets for the replacement products were not available in the information provided.

37. No data sheets related to fire performance were contained in the information provided for the cavity barrier products proposed. The cavity barrier products were proposed in line with 60 minute separating walls and floors. The specification provided by the applicant design team did not specify the fire rating of the cavity barriers.

38. No data sheets related to fire performance were contained in the information provided for the intumescent cavity barrier products proposed. The intumescent cavity barrier products were proposed in line with 60 minute separating floors. The specification provided by the applicant design team did not specify the fire rating of the intumescent cavity barriers.

39. The outline specification did not identify the location of the HPL cladding.

40. Parts of the external wall system need to achieve 60 minutes fire resistance from the inside, and there are boiler flue and ventilation penetrations through the 60 minute external wall. This does not appear to be provided with 60 minute fire stopping, and no evidence is provided to support this proposal from the test house to confirm that the construction achieves 60 minutes fire resistance from the inside.

41. The record provided showed the local authority verifier carried out one site inspection for the project.

Case Study 2

Building Profile:

- **Number of storeys: 6**
- **Building type: student residential**
- **Top storey height: 15.45m**
- **Building Warrant application submission date: post October 2019**

42. Drawing information was provided for only one external wall type, although others were noted, such as curtain walling and other unidentified materials. The external wall type provided was “External Wall (Typical)” and comprises:

- 102.5mm facing brick Dunbar bond
- 50mm cavity zone
- 100mm non combustible insulation Knauf Earthwool

- 12mm external grade sheathing board (non combustible)
- 100mm Stud Framing System to specialist design at 600mm centres
- 100mm Full fill multipurpose quilt insulation
- 2 layers of 15mm Gyproc SoundBloc (60 mins FR)

43. No correspondence was provided to the authors for review between the local authority verifier and the design team, although the authors assume that some dialogue must have taken place.

44. Data sheets related to fire performance for products were not provided for any of the products shown on the external wall system detail drawings.

45. Notes on the drawings suggest that the external wall type 1 build up will achieve 60 minutes fire resistance, but no evidence to support this was provided.

46. No data sheets related to fire performance were provided for the cavity/fire barrier products proposed, although drawings referred to 30 minutes fire resistance.

47. The fire strategy elevations show 30 minute fire barriers, even at junctions with 60 minute fire rated walls (to compartment walls and protected zone enclosures) and 60 minute compartment floors. There was no documentation provided for this research to accompany the local authority's decision to accept this, although the authors note that the internal wall arrangement achieves 60 minutes fire resistance from the inside.

48. No detail drawings were provided for vertical fire barriers at the junctions between external walls and 60 minute fire rated walls/walls enclosing protected zones.

49. The fire strategy elevation drawings omitted ductwork penetrations, and this is noted on the drawing.

50. No site inspection reports were provided as part of this research.

Case Study 3

Building Profile:

- **Number of storeys: 8**
- **Building type: private residential**
- **Top storey height: 18.9m**
- **Building Warrant application submission date: pre-October 2019 (pre-June 2017)**

51. Drawing information was provided for the building's external wall systems, as well as contractor's construction specification and correspondence between the local authority verifier and the project architect.

52. Please note that the building warrant application has two stage amendments. Given the age of the applications, they are predominantly paper based where the drawings and supporting information were held separately with outgoing communications being in electronic format. During the warrant process, the local authority changed IT providers. Whilst every effort was made to capture all data during the change, there may be some gaps in the data provided for this research due to the search process for data.

53. Three external wall types each with two different types of internal masonry walls of at least 100mm thick were noted on the drawings and contractor's construction specification document: 18mm thick render on 100mm concrete outer block; 90mm granite stonework and Rockpanel achieving Class A2-s1,d0. These external wall systems are designed with combustible materials within their cavities, such as timber framing and combustible insulation.

54. To meet the Technical Handbook applicable to the Building Warrant application submission date, combustible materials are permitted within the cavity of 2 leaves of masonry or concrete construction that are at least 75mm thick and provided with 30 minute cavity barriers around all openings and at the top of the wall-head.

55. The local authority verifier provided 36 comments in one of the building warrant stages that is applicable to the external wall design. Out of these, there were 2 comments related to Section 2.4, 2.6 and 2.7 of the Domestic Technical Handbook guidance. These comments were in relation to the detailing of cavity barriers and the requirement of the cladding to be non-combustible. These comments were subsequently addressed by the design team applicant by changing the initially proposed combustible cladding to Rockpanel cladding and by providing large scale detailed drawings showing the external wall details with junctions between wall finishes and window jamb detail, door jamb detail, and eaves detail.

56. With the exception of Rockpanel cladding, no other datasheets related to the build up of the external walls were provided in this research.

57. The contractor's construction specification document did not mention the product specification for cavity barriers/fire barriers.

58. Cavity closers were noted on various drawings, but without reference to product/fire rating performance.

59. On one of the drawings, it is not clear whether cavity barriers/closers are provided to window jambs. It wasn't clear how the cavity barrier requirement is met.

60. It appears that the Rockpanels on the external walls span between floors. To meet the Technical Handbook guidance, fire barriers achieving at least 120 minutes fire resistance should be provided on every floor. There are no drawings detailing this provided as part of this research. The only reference to this is the design team applicant's response to the local authority verifier's comments with the following statement "We would also confirm that cavity barriers will be fitted at all floor level lines as well as required horizontal centres throughout."

61. It appears that flues penetrate the external walls. To meet the Technical Handbook guidance, cavity barriers around the flue penetrations should be provided to

these penetrations. There are no drawings detailing this provided as part of this research.

62. No elevation drawings noting the cavity/fire barrier provision were provided as part of this research.

63. No site inspection reports were provided as part of this research.

Case Study 4

Building Profile:

- **Number of storeys: 9**
- **Building type: private residential**
- **Top storey height: 22.2m**
- **Building Warrant application submission date: pre-October 2019 (pre-June 2017)**

64. Drawing information was provided for the building's external wall systems, as well as the architect's and manufacturer's specification and correspondence from the project architect to the local authority verifier.

65. Three external wall types were noted on the drawings, details were provided for two external wall systems.

66. The project architect's responses to the local authority verifier's comments included 28 responses in total relating to the building warrant stage that is applicable to the external wall design. Out of these, there were 9 comments related to Section 2.4, 2.6, and 2.7 of the Domestic Technical Handbook guidance.

67. Datasheets related to fire performance were provided for most key external wall systems products. The BBA certificate provided for one of the external wall systems did not match the trading name of the product, so the applicability of the BBA certificate is not clear.

68. It is not clear from the drawing information how the edges of the SFS systems at windows/doors are closed. Where fire rated separating walls meet the external system, a fire barrier is shown in the cavity between the SFS system and the external cladding panel; however cavities within the SFS and the external cladding panel were not also provided with fire barriers. No record was observed showing how the local authority verifier decided that this arrangement meets the Technical Handbook's guidance.

69. The datasheets related to fire performance for the fire barriers noted that it could be applied in Timber Frame or Masonry/Concrete construction types. As the external wall systems on the building are not timber frame or masonry/concrete, the proposed products do not appear to be appropriate in these locations. No record is provided of a decision making process, for example including liaison with the fire barrier manufacturer.

70. Cavity barriers do not appear to be shown around vent penetrations. The information provided for review for this research was a hard copy greyscale, and it is possible that these were shown on the drawings but not visible from the information provided.

71. A fire barrier has been missed on the elevation drawing in line with a separating wall between two flats.

72. Timber decking is proposed on external terraces serving some of the flats. It is not clear the basis for this being considered appropriate.

73. A rigid insulation board is present as part of the external wall systems, on the inside of the SFS zone. No datasheet related to fire performance is provided for the rigid insulation board and there has been no record made of the decision making process for approving this.

74. No site inspection reports were provided as part of this research.

Case Study 5

Building Profile:

- **Number of storeys: Multiple blocks, 4, 6, and 8 storeys**
- **Building type: private residential**
- **Top storey height: 8.1m, 13.5m, and 18.9m tall blocks**
- **Building Warrant application submission date: pre-October 2019 (pre-June 2017)**

75. Typical detail drawings were provided for the building's external wall systems. Local authority verifier reports were provided and one response from the project architect to the local authority verifier.

76. Three external wall types with different cladding/render materials on the outside were noted on the drawings, details were provided for one external wall system.

77. The local authority verifier's comments regarding external wall systems comprised a request for manufacturer's information for one product and requesting typical detail drawings including external wall details, window head details, and cill details.

78. Two of the cladding materials were untreated timber cladding on treated softwood framing. The outline specification provided by the project architect referred to the BRE Fire Note 9 (BRE 1999). It is not clear how the local authority verifier decided that the proposed untreated timber cladding met the information in the BRE fire note.

79. Datasheets related to fire performance were not provided for any external wall systems products.

80. Cavity closers are not noted on the typical drawing information, including penetrations through the external wall systems by windows, doors, and services. A typical detail drawing shows blockwork that appears to return to close the cavity but a gap was left on the drawing.
81. The elevation drawings do not show any fire barriers or cavity barriers.
82. No site inspection reports were provided as part of this research.

6. Interviews with Local Authority Verifiers

83. Following the review of the case studies, the authors conducted interviews with local authorities to clarify the steps they took and decisions they made. The questions put to the local authorities and their responses are summarised below. Lessons that can be learned, and knowledge and/or scope gaps are summarised in the discussion that follows.

Questionnaire

1. What percentage of time reviewing a Building Warrant application is given to external wall systems, including materials and fire barriers.
 2. What was the internal process if there is a variation between tested construction contained in the fire testing documentation supplied by the Building Warrant applicant and the proposed external wall design?
 3. How was the internal process and discussions leading to the conclusion for Question 2 recorded?
 4. What was the decision making process for Building Warrant approval without the Building Warrant applicant submitting product datasheets and/or specifications as part of the application?
 5. In your view, would the Building Warrant application process benefit from a separate building warrant stage* focusing on the detailed design of external wall systems (including fire/cavity barriers on external wall system)?
 6. What is the procedure for requesting and reviewing product datasheets/specification documents for the external wall systems? Would the guidance tool flow chart in Appendix A assist the verifier in this process?
 7. What would be the anticipated % increase in workload to allow the process mentioned in Question 6 to be integrated in the Building Warrant process?
 8. For the case reviewed, what was the focus of the inspection work?
 9. We think it would be useful to state the focus and intention for any inspection work carried out by the verifier for clarity on what has been covered by the inspection. Do you see any issue in noting this limitation in any inspection report?
 10. Does your department have verifiers who are competent to inspect the external wall build up, including cavity/fire barriers on the external wall system*?
- *Please note that the purpose of the inspection is not to solve the workmanship issues, but merely to spot the workmanship issues to allow the contractor the opportunity to remediate the issue to meet the approved Building Warrant design information and to reflect the manufacturer's product literature.
11. If yes, what would be the anticipated % increase in workload to allow the process of inspecting external wall systems to be integrated in the Building Warrant process?

12. Please note that Questions 8-11 are not meant to put the responsibility of checking the workmanship on the verifier. Quality of workmanship is a key consideration in external wall systems. If your department do not have verifiers who are competent to inspect the external wall build up, would you be open to accepting reports of inspections carried out by others (employed by the building warrant applicant) and what qualifications would you expect them to hold?

13. As part of the completion certification submission, we are of the view it would be useful for the Building Warrant applicant to submit final external wall design datasheets/specifications/drawings (including fire/cavity barriers), any external wall inspection reports, and how these meet or differ from the performance criteria of the approved Building Warrant submission. This is to avoid any ambiguity on the final design. What issues, if any, do you foresee with this additional requirement from a verifier perspective?

14. Do you have any suggestions which you feel would help in developing this guidance? This could for example include steps/information that you feel is missing or that need particular focus, or any problems you foresee with this guidance, or problems which may exist currently?

Case Study 1 Interview

84. The local authority verifier working on the project is no longer with the department. The interview below was conducted with a different local authority verifier to understand the approval process/procedures related to external wall system.

85. Response to Question 1. It is not possible to allocate the percentage of time. The local authority verifier didn't take a record of this. The time spent is dependent on the complexity of the external wall. More time is normally spent when the external wall comprises combustible elements of structure or materials.

86. Response to Question 2. Where variations are present, the local authority verifier will follow up with questions to the building warrant applicant. Specification is crucial in the Building Warrant application process. The European Regulation, which came into force a few years ago, does not allow product placement during the tendering process. Therefore, contractors cannot specify products in their tender. This complicates the process where products specified in the Building Warrant application process differs from the as built design.

87. Response to Question 3. Within the department, there are lots of internal discussions between officers for the local authority verifier to share ideas and experience to determine the suitability of specified products in the Building Warrant application process. However, these are not recorded. For experienced local authority verifiers, the decision is obtained from experience on past products that they reviewed/looked at in detailed before. For less experienced local authority verifiers, they are encouraged to do their own research and seek guidance from more experienced local authority verifier. The department have a digital record of major building case studies. This only records any consultants reports for any major buildings so that any local authority verifiers can refer to them.

88. Response to Question 4. If the product noted on the drawings is new or not familiar to the local authority verifier, the local authority verifier will ask for the product specification to be provided as part of the Building Warrant application process. However, if the product was previously researched in detail by the local authority verifier

in his/her previous applications, the local authority verifier may not ask for the product specification if he/she has strong confidence in determining their suitability based on past experience.

89. Follow on response to Question 4 (post interview). The project was dealt with by a local authority verifier with many years' experience and who had familiarity with similar projects. Therefore, when it comes to matters such as the request or retention of data sheets for particular named products, that is not always requested where it is apparent or already known by knowledge and experience that the product can be suitable in common timber kit situations such as this project. Internet checking and cross referencing is often done by staff on this too in these situations. Whilst local authority verifiers can't unfortunately cross reference with the now retired local authority verifier, that experience will also have been used in the context of this case being a low rise flatted development, where for instance the lowest class of Reaction to Fire is permissible. There is clearly some query over the use of HPL products and local authority verifier have not been able to fully go through all drawings and documents to bottom out where it was being used or not, but in the context of Class E, a basic check on the named product can be seen that it is not untested and can achieve performance above E.

90. Follow on response to Question 4 (post interview). On the matter of the drawings not specifying the rating of cavity barriers, the local authority verifier does understand the comment, however at the same time when looking at the specified Tenmat product, it can achieve up to 120 minutes and is in common use. Similarly for the Rockwool barrier product, its use is common in timber kit situations and therefore known to an experienced officer.

91. Response to Question 5. Yes. The preference is for staged warrant applications for large projects. This includes the potential for external wall systems to form part of the staged warrant that deals specifically with façade design. This will allow a local authority verifier to focus on the task at hand.

92. Response to Question 6. Yes, the guidance tool will create consistency in the design team submitting the right information at the right time across different councils in Scotland. The current problem is the lack of consistency in the information submitted by building warrant applicants. Building warrant applicants sometimes resist when more information is requested by local authority verifiers. They use the basis of the information being requested was not mentioned in their past projects with other local authorities.

93. Response to Question 7. There would be no % increase in workload as the local authority verifiers will have to go through the same process in reviewing the drawings and specifications. The guidance tool will benefit the building warrant applicants for the following reasons:

- Submission of the correct information
- If done correctly and truthfully by the Building Warrant applicant, there will be less questioning by the local authority verifier.

94. Response to Question 8. This depends on the skills and knowledge of the local authority verifier. For more experienced local authority verifiers, there will be fewer comments unless they spot issues on site. This may be followed up by further visits. The department adopt the Construction Compliance Notification Plan (CCNP) when setting out the key stages of inspections during the construction stage. For high

rise/complex projects, there will be more inspections than small or medium size projects. There is currently no inspection dedicated for external wall systems. Depending on the construction sequence, the inspection of this may be included as part of the inspection of other passive fire protection systems.

95. Response to Question 9. Any inspection record is kept internally in the department's digital archive. The lack of inspection reporting for the case study concerned may be due to the COVID-19 pandemic and the department stepping back on-site inspections. Evidence/photos may be relied upon instead. Any issues identified during the inspections are communicated with the design team and the design team sometimes send photos as evidence on how things were resolved.

96. Follow on response to Question 9 (post interview). Specific inspections might occur simply because of the point in the construction process, such as drain tests or foundation inspections, but as work progresses there can be a multitude of matters looked at during a given inspection. Local authority verifiers' role under reasonable inquiry is to highlight contraventions of the Building Regulations where the local authority verifier sees them and so the inspection logs generally report on the progress of work. If contraventions are noted by the local authority verifier, then they should be specific as to the areas of construction involved. Ultimately, if the local authority verifier does not observe contraventions, there are no further comments. It is not local authority verifiers' role to log compliance by having specified areas or checklists completed as to what was seen. That role remains as the legal duty of the owner/developer/relevant person and it is these parties who should have detailed logs of inspections of all construction to prove compliance where required.

97. Response to Question 10. Yes. The department has a project size/experience matrix that tabulates the size of projects and the level of experience required of a local authority verifier to work on the project. For less experienced local authority verifiers, they will work on smaller projects and build up their experience towards larger projects.

98. Response to Question 11. As covered in the answer to Question 8, this is already part of the process. However, if it is proposed to have inspections dedicated to external wall systems, this will require more resources. Response to Question 12. The department would take any report on board. However, this wouldn't change anything or the current process as the department cannot rely on the inspection reports prepared by others.

99. Response to Question 12 (post interview). The report states: "the applicant may wish to appoint a qualified third party acting for the applicant (such as a Clerk of Works) to carry out site inspections on the behalf of the local authorities." No such provision exists in the current regulatory system for this approach. A more accurate reflection may well be to read: that the relevant person could appoint a qualified third party who could present their findings/records to the verifier under "reasonable enquiry" for consideration by the verifier"? The Compliance Manager?

100. Response to Question 13. In 2005, the responsibility of signing the completion certificate was moved from the verifier to agent/developer/contractors. Any variation to the Building Warrant approved specification and design should go through the amendment to warrant process. Therefore, there should be no issue with this process in theory. However, the issue is on whether the sub-contractors or contractors would view their own installation/work as a variation that would trigger the need for amendment to warrant. There is currently no independent body to keep check on this.

101. Response to Question 14. No response provided.

102. Response to Question 14 (post interview). The report makes statements that are designed to make the approvals process more robust and reliable. However, comments made are also going to add to the burden on agents and time on assessments and processing of building warrant applications. For examples, details being approved at the Building Warrant stage without products being specified e.g. “mineral wool insulation by others”, leading to a lack of oversight. The ask by a verifier on an agent to specify a particular product becomes too prescriptive and has been resisted by many agents in the past. The performance specifications route avoids restrictions on applicants. The proposed system would lead to greater need for amendments of warrant purely for a change in a product used on site that achieves the same levels of fire safety.

Case Study 2

103. The interview below was conducted with the original local authority verifier working on the project to understand the approval process/procedures related to external wall system.

104. Response to Question 1. Section 2: Fire has more time than other sections devoted to it, perhaps half the overall BW time spent on fire, of that the prominent sections are 2.7, 2.9, and 2.14. So maybe 10% overall, but this is difficult to quantify and will be different for each project.

105. Response to Question 2. Put it back to the applicant to change the design or change the product. If the manufacturer says they are comfortable with the proposal, the department would have an internal discussion to gather colleagues' experience with this/similar products and its use in this system.

106. Response to Question 3. No formal record made, the only record would be that the comment is removed from the next iteration of the Building Warrant report.

107. Response to Question 4. Based on performance criteria stated on detail drawings. If it's a product the case officer is familiar with they probably wouldn't request a data sheet. For unfamiliar materials they would do an internet search then request data sheets from applicant.

108. Response to Question 5. A separate stage would result in external wall systems having more time spent on it, which is a good thing. More time would be available to scrutinise the materials/design. It would result in an extended Building Warrant process (additional 20 days) which may not be as good for the applicant.

109. Response to Question 6. Request details from applicant or find data sheets online for materials noted on detail drawings. The flow chart would make it clearer for case officers and for training junior case officers, and applicants will know what will be asked of them. Step-by-step guide will help to prevent things from being missed. Appendix B would help the local authority verifier to decide how they deal with designs that don't comply and when they need a fire engineer to assist via 3rd Party check.

110. Response to Question 7. Probably not a lot of additional work because the Appendix A and B flow charts reflect what case officers will be doing anyway, even if only in their heads. As above, formalising the process will prevent things being missed.

111. Response to Question 8. Generally speaking they would do a walk-around from ground to confirm that fire barriers are being installed in line with the fire strategy elevation plans. For this project, they did the walk around but spent most time internally looking at stair locations, for this project the fire stopping company had installed the stopping with a tag on site and a report with photos. The focus for this project was stair locations and lobby protection, and protection to structure. Most of the time the inspections are focussed on keeping an eye out for anything obviously not right. Time constraints is the most difficult challenge, as case officers don't have the time to look at everything (not that it is their responsibility).

112. Response to Question 9. Inspections are general look-around, there isn't a specific focus. Stating a specific focus might suggest that the inspection covered more than actually happened. It's a say-what-you-see approach. The record would say "walkaround of Block A, Stair1, Flat 2, Floor 4, etc".

113. Response to Question 10. Yes.

114. Response to Question 11. Difficult to quantify. Would expect at least 1 full day on site additional per project, which the department don't have time for. If there are issues the case officer would need to come back too, so the increase would be significant.

115. Response to Questions 8 to 11 (post interview). Our site inspections records are concise notes that (primarily) focus on highlighting faults identified on site. There is currently no expectation on staff to provide a detailed record of what was inspected where matters are satisfactory. In some cases, photographs of the construction or other records are checked/sampled on site to achieve reasonable inquiry.

116. Response to Question 12. The case officer would be open to this, subject to the qualification level of the third party, and if completely independent. Either an approved certification scheme like SER structural engineers register or Gas Safe register would be a suitable approach. Alternatively, Chartered Engineer or Chartered Surveyor would be fine. This would have to be a photographic record with comments, and the case officer would still want to do a spot-check inspection on site to confirm the report aligns with what they can see on site.

117. Response to Question 13. Not many issues as long as the information is targeted. Some of those items might be picked up on site anyway e.g. insulation that has branding all over it. The case officer would see this idea as a positive to increase confidence in the design and reassure the case officer that the changes are suitable.

118. Response to Question 14. Perhaps a more simplified version of the information required at application stage will help the applicants and make life easier for the local authority verifiers. The guidance should include links to the publicly available information regarding the information that each local authority requires at the Building Warrant stage.

Case Study 3

119. The local authority verifier working on the project is no longer with the department. The interview below was conducted with a different local authority verifier to understand the approval process/procedures related to external wall system.

120. Response to Question 1. This is not possible to quantify. For traditional construction such as brick/masonry walls, there will not be much enquiry or time spent on these. However, for new construction such as panel construction, a local authority verifier would look more closely to key elements such as separating walls/floors interface with the panel construction. There is a need to strike a balance in time spent reviewing/requesting information for the Building Warrant to be approved.

121. Response to Question 2. The first step is to review how closely the design aligns with the product tested. If there is a big variation, a local authority verifier would request the product to be replaced with a different product which the test matches closely to the design. Any variation that is beyond the expertise of the department, the department would approach the technical team of the product manufacturer or a 3rd party experts with the decision making process.

122. Response to Question 3. Any input from 3rd party experts is recorded in email correspondence. For input from the product manufacturer, this is recorded by short notes. These record of email correspondence or short notes are for the department internal use and focus on the decision making process for Building Regulations purposes.

123. Response to Question 4. For common products, a local authority verifier would not ask for any datasheets or specifications e.g. tried and tested products which have received approval previously and are known to comply. However, the decision of what is a common product is dependent on the experience of the individual officer. The challenge is for the individual officer to keep up to date to the technology/development of the product.

124. Follow on response to Question 4 (post interview). When common materials have been specified with a known performance, product data sheets may not always be requested. All local authority verifiers have completed a competency assessment, where they are members of a professional organisation, they are required to complete and record their continuous professional development, this includes keeping up to date with current construction practices. Local authority verifier provide each officer with access to online Construction Indexes allowing them to research and review products.

125. Response to Question 5. For large buildings, it is normally the case that there will be a separate staged warrant dealing with façade design/external envelope. There is no need to prescriptively require a separate stage for external wall systems. The concern is that focusing only on particular elements may result in other elements of the design being overlooked. The preference is to have a single stage warrant so that everything is looked at holistically prior construction. With staged warrants, it is often the case that work progresses beyond the staged approval which increases the risk of non-compliance.

126. Follow on response to Question 5 (post interview). A holistic approach must be taken when designing and verifying compliance with the fire regulations. The construction of separating floors and walls, particularly the junction details with the external walls are equally important to the overall fire performance of the design. These should not be considered separately. Most large-scale developments include staged applications, a stage specifically for fire only could be beneficial.

127. Response to Question 6. Yes, the guidance tool will create consistency in the design team submitting the right information at the right time across different councils in Scotland.

128. Response to Question 7. The flow chart is hard to follow and a local authority verifier would spend lots of time to understand the flow chart. In order for the verifier not to spend more time dealing with the flow chart, there should be simple template/tick box at the front before the flow chart to summarise the conclusion and information submitted by the building warrant applicant for the verifier to focus on. The flow chart is to aid the building warrant applicant.

129. Response to Question 8. The record keeping for inspection work is not consistent as the 2003 act puts the onus on completion certificate applicants. The inspection responsibility for local authorities was reduced since then up until 2012 when the Oxfords school case happened followed by the Grenfell Tower fire incident. The department is waiting for guidance from the Scottish Government on the extent of reasonable enquiries for inspection work, as this will dictate the extend of workload/focus of the inspections.

130. Response to Question 9. No issue with this proposal.

131. Response to Question 10. Yes.

132. Response to Question 11. This is dependent on Scottish Government clarification on what extent the reasonable enquiry would cover for site inspections and the scope of responsibility with forthcoming Compliance Plan Managers for high risk buildings.

133. Response to Question 12. The department is in favour of reports from Clerks of Works acting for the applicant with early engagement with local authority verifiers. This will provide confidence on supervision and inspections in addition to local authority verifiers' own inspections.

134. Response to Question 13. The issue of the final/as built external wall design/specifications/drawings not necessarily matching up with the approved Building Warrant information could be originated from Building Warrant detailed specifications being reviewed at a stage that is too early in the construction stage. Where material shortages arise (as with recent years), product substitutions happen without necessarily being made aware to the department. The suggested solution for this would be:

135.

- **Step 1** - Approve the performance criteria during the Building Warrant approval stage as opposed to detailed specifications.
- **Step 2** – Work with the Compliance Plan Manager through the Construction Compliance Notification Plan to submit the proposed as built design/specification/drawings that meet the performance criteria several weeks before the construction work starts.
- **Step 3** – Provide formal approval by the local authority verifier if the proposed design/specification/drawings meet the approved performance criteria.

This should minimise any inconsistency for the final as built external wall design and as built information by reducing the risk of product substitution going unnoticed.

136. Response to Question 14. The guidance tool is difficult to follow. It may suit the design team as an aid for them to package the correct information for Building Warrant submission. The suggestion is to have a template (tick box) to summarise the conclusion and information submitted by the building warrant applicant at the front

before the flow chart. The verifier then focuses on the tick box and information submitted.

Case Study 4

137. The interview below was conducted with the original local authority verifier working on the project to understand the approval process/procedures related to external wall system.

138. Response to Question 1. Depends on how familiar the case officer is with the proposed systems, could maybe range from 5% for familiar systems to 15% for unfamiliar systems. Traditional masonry build wouldn't have much time spent on it, the focus would be that cavity barriers are provided in line with walls. Rainscreen cladding systems would have more time spent on them by the department. Current code guidance requires non-combustible materials which simplifies the department's work in assessing materials.

139. Response to Question 2. In the first instance they would refuse the proposals if they were caught, but the officer is not confident they would catch the differences every time. For example, fire barriers installed in configurations different to the tested arrangement noted on the data sheets might not be caught for fire barrier products the base officer feels familiar with, but this might be caught with unfamiliar products they are seeing for the first time as they would read the data sheet fresh. Where the manufacturer confirms that the proposed use of their product is suitable, they would accept this for lower rise (low risk) buildings but for higher rise (and therefore higher risk) buildings they would expect the team to specify a different product. From experience, materials on site observed to be different to the approved process have been the first notification the department receive about material substitutions. The department would request data sheets for these materials if observed and this hasn't (from immediate memory) lead to materials being removed.

140. Response to Question 3. Emails from suppliers would be saved electronically, but this may not always happen. If it isn't a high risk building and the change is not viewed as a high risk change the emails probably wouldn't get recorded. The process for saving information has improved recently due to an improved IT system (previously an email could take 5 minutes to save and the current system is a simple drag-and-drop system that saves information in seconds). Data sheets and electronic submissions in the electronic file are stored now, previous hard copy system is no longer used.

141. Response to Question 4. Previously, data sheets for common materials would not have been saved but would have been reviewed. Current applications have all information saved except those the case officer feels comfortable with e.g. mineral wool. More experienced case officers would likely request fewer data sheets as they feel they are familiar with them.

142. Response to Question 5. Don't see how this would be helpful, as there is already a specific package for external wall systems.

143. Response to Question 6. The flow chart is a good idea, although more experienced staff would likely feel they don't need it. The best use would be to prevent things being missed and achieve consistency in the queries asked. This would be most useful for the applicant so that they cover all of the required information and design details. For case officers this would be useful as an aide memoir that they've requested all of the appropriate information and as an educational tool for junior surveyors.

144. Response to Question 7. This information should be checked anyway, so don't anticipate extra workload. If each wall type were to be reviewed as suggested this would add time. The review by the department would include less scrutiny for traditional construction so this would be project specific.

145. Response to Question 8. Inspections were once a fortnight for a year, but not recorded. Items were discussed with the contractor on site to reduce time spent with paper trail. Fire stopping and structural fire protection were the main focus of site inspections. External wall systems inspections were limited to from-ground observations that cavity barriers were being installed.

146. Response to Question 9. No issue with this, the department have been asked to specifically state what they have and haven't seen. The recorded information is still high level though, e.g. "inspected fire collars in Block A". Not all dialogue on site is recorded. It could be that contractors are advised to mitigate an observed issue and no record is made if this is resolved by the next site inspection. This is considered reasonable by the department as the responsibility for construction quality sits with the site agent. CCNP for high rise buildings would state the specific items they want to see, such as fire/cavity barriers and the timing for these.

147. Response to Question 10. Yes, the case officer would like to get to site early to pick up any obvious issues at the start.

148. Response to Question 11. Impossible to put a % on it, would be case specific and higher for rainscreen cladding than blockwork/masonry. Clearly 100% inspection is not achievable.

149. Response to Questions 8 to 11 (post interview). Our site inspections records are concise notes that (primarily) focus on highlighting faults identified on site. There is currently no expectation on staff to provide a detailed record of what was inspected where matters are satisfactory. In some cases, photographs of the construction or other records are checked/sampled on site to achieve reasonable inquiry.

150. Response to Question 12. Yes they'd be open to this, as long as the third party are independent from the contractor. In the past they've accepted independent contractors fixing already-constructed details and correcting new issues they identify.

151. Response to Question 13. Currently this would be an amendment to warrant, comparable perhaps to engineers form Q system. This process would be useful as a catch-all.

152. Response to Question 14. The 20-day turnaround for applications would be difficult to achieve if there are lots of data sheets to be reviewed. The Compliance Plan Manager might smooth the whole process and improve certainty by considering the external wall systems design earlier.

Case Study 5

153. The local authority verifier working on the project is no longer with the department. The interview below was conducted with a different local authority verifier to understand the approval process/procedures related to external wall system.

154. Response to Question 1. Can't quantify as it depends on complexity of the external wall systems and whether they include known products. Also consideration is given to building height and building risk (LABSS risk assessment document) i.e. lower risk buildings and known products would have less time spent on them, and more time would be spent on high rise projects' external wall systems due to higher risk. Time spent will also depend on quality of submission, well laid out concise information would require less time.

155. Response to Question 2. The proposal would be refused and put back to the applicant team to be amended appropriately. Any deviations from tested arrangement would need to be raised with the test body for comment. It would not be sufficient to rely on the manufacturer's opinion as they have a conflict of interest in terms of selling their product.

156. Response to Question 3. The deviation would remain in the objections list in the report from local authority verifier, and significant emails would be saved in file e.g. comments from manufacturers and test houses. Previously the recording electronically has not been perfect due to the system being slow, but recent IT system upgrade has improved speed which improve the department's electronic recording. Where discussions internally are required, these are recorded on an internal document with 3-4 team members including the conclusions. The conclusions of the internal discussions are communicated to the applicant team in the local authority verifier's report, when closed out the next iteration of the report would have that objection/comment removed.

157. Response to Question 4. This is down to individual case officer's experience and familiarity with the products. Often the data sheets have dozens of pages and it isn't made clear where the relevant fire classification information can be found. Common data sheets aren't always saved so the information provided for this research project might be inaccurately leading to the conclusion that information is missing.

158. Response to Question 5. This would result in better scrutiny of the information provided. The drawback is the additional administrative steps, but overall would improve quality so on balance this would be positive.

159. Response to Question 6. The guidance would assist with quality of submissions if provided to agents. The department would request that specific reference to the place on each data sheet where the fire classification can be found e.g. "see page 21 for fire classification". Appendix A and Appendix B will help the Compliance Plan Manager with their role, and it would also serve as a checklist for local authority verifiers.

160. Response to Question 7. As with all new processes, there will be an initial increase in time/work. Eventually, agents will know what information will be requested by the department which will assist with the process. It should be noted that information needs to be targeted too, not a 100 page product sales literature.

161. Response to Question 8. Can't be certain as the case officer no longer works with the department, but there are inspection notes on file (not provided to officer for case study review). The notes appear to refer to open drain testing, little if any inspections done with cladding, probably focussing on handrails, glass and windows, fire doors, fire stopping/collars, wind and water tightness. Any inspections of external wall systems are therefore likely to have been a from-ground observation that fire/cavity barriers are being installed.

162. Response to Question 8 (post interview). There are blank site inspection records in our files that I cannot explain. However, our records tended to focus on faults noted on site rather than what has been built correctly. In recent years, as part of our reporting and recording process and to speed up the reviews of information being submitted as part of a BW application, we ask agents to provide a written response to the matters that we have raised in our reports. This also helps track why a matter has been accepted.

163. Response to Question 9. Department are wary of recording large amounts of inspection information, as the impression could be that the department are covering more during their inspections than is the case. The responsibility for construction quality is the site agent's and not the department's so any notes are intended to be spot-checks with limited scope and breadth.

164. Response to Question 10. Yes.

165. Response to Question 11. This would be a large % increase and couldn't give a precise number. However, the number of locations given for Appendix C is significantly more than is currently looked at by the department on their inspections.

166. Response to Question 12. Yes the department would be comfortable with this approach. They would expect an accreditation scheme or insurance led scheme regarding suppliers. The qualifications would need to be Chartered Surveyor or Chartered Engineer or similar. The supplier would need appropriate PI cover and the department would still want to visit site for a spot-check inspection to corroborate the findings of the third party inspector.

167. Response to Question 13. Yes, but the industry needs to be accountable. This proposal would introduce greater scrutiny, and the Building Warrant application fee structure would need to be appropriate and updated. In the short term there would be increased timescales but this would be an improvement in the longer term as all involved in the process become better educated and there would be a more formal record.

168. Response to Question 14. The 20-day turnaround for applications would be difficult to achieve if there are lots of data sheets to be reviewed. The Compliance Plan Manager might smooth the whole process by considering the external wall systems design earlier. There would be improved certainty that the approved designs are reflected on site. The guidance on number/location of inspection points to those carrying out site inspections will assist with clarifying to all (including those outside of the Building Warrant process) the extent of site inspections being carried out, at present the feeling is that the public and senior officers within government/the department do not have a good grasp of this.

169. Response to Question 14 (post interview). Stages A and B of the 'Guidance Tool' appear to be an alternative way of presenting the manner in which verifiers carry out their function therefore, I am not sure of the value adopting this approach would add. However, I am sure prior to the adoption of any such proposals discussion would be held with a broader group of verifiers to determine whether it would deliver the outcomes intended. The introduction of the Compliance Plan, whilst adding additional burdens, will help raise the consistency in the checking process both pre and post granting of a building warrant.

170. Response to Question 14 (post interview). It appears from comments made throughout the report that a more forensic record of assessments/decisions prior to granting of building warrants and on-site inspections are expected to be kept. This has not been the case previously in my opinion. The local authority verifier's Building Standards service works within the requirements of the performance framework and operating framework, has been audited as part of the BSD improvement plan and internally as part of our BSI registration. At no time before now have our site inspection records been questioned to this extent and there are no records of non-conformities in our audit reports. If this is the expectation going forward there will be a dramatic increase in the time needed to assess applications and keep such detailed records during the construction process.

Summary of Responses

171. Interviewees were not able to give an estimation of time spent on reviewing external wall systems as this is not recorded. Less time would need to be spent on systems the case officer feels familiar with than unfamiliar systems. Less time would be spent reviewing traditional masonry systems, on these systems the focus would be fire barrier locations.

172. External wall system designs that differ from the tested construction are rejected in the first instance and the applicant is asked to resubmit with appropriate evidence/design. For low rise buildings (i.e. lower risk) the manufacturer's view may be considered for a minor deviation from the tested configuration.

173. Internal discussions where there are deviations from the tested construction and proposed arrangement are not recorded in any formal way. Advice/information from expert 3rd parties is saved electronically.

174. The decision to approve materials without data sheets related to fire performance is up to the experience of the case officer. If the proposed product is one they have dealt with many times in the past they may not insist on a data sheet being provided. Less experienced case officers are more likely to request data sheets.

175. A separate Building Warrant stage tends to be made for external wall systems on large projects, opinion was split on whether this should be the case for all projects. It was acknowledged that more time spent on a specific Building Warrant stage for external wall systems would introduce more administration and overall time for the building warrant process.

176. The guidance tool would assist with quality of building warrant submissions, as the applicant will be aware of the information that will be requested of them. The tool will also be useful in the development of junior case officers and as an aide-memoir to more experienced case officers.

177. It was felt that there would be an initial increase in workload for local authorities to understand the Guidance Tool, but that the Guidance Tool is a formalised version of local authorities' intrinsic process.

178. The focus of site inspections was different for each case study, but there was no specific site visit noted specifically to deal with external wall systems.

179. Some respondents were concerned that stating the focus of the site inspection will give a false impression of a full inspection, whereas their role is to carry out spot checks. The responsibility for construction quality is the site agent's and verifiers are wary of unintentionally taking on responsibility.

180. All interviewees felt that their department has verifiers who are competent to inspect the external wall build-ups, including cavity/fire barriers in the external wall system.

181. The interviewees felt that there would be a significant increase in workload if the site inspections were to be integrated into the building warrant process, but were not able to give a specific time. The time spent would naturally vary from project to project based on differences in size, and number and design of different wall types.

182. Interviewees were mostly comfortable to accept the checking of quality of workmanship to be carried out by others, provided they were appropriately certified/experienced. This may require an accreditation scheme to be created by the Scottish Government. Interviewees noted that this would not completely replace site inspections by local authority verifiers, who would still carry out spot-check style inspections. One interviewee also pointed out that there is no mechanism in the current regulatory framework for others to carry out site inspections on behalf of local authorities; and that this process would need to involve the third party presenting their findings to the local authority verifier to fit within the current regulatory framework instead of directly replacing inspections by local authority verifiers.

183. The introduction of a final external wall design compared to the Building Warrant design would introduce additional time to the Building Warrant process, the current way of dealing with this would be an amendment to warrant.

184. The Guidance Tool is useful but difficult to understand, requests for a simplified version and/or tick-box to confirm that the design team have followed the steps.

7. Discussion

185. The reviews of the Case Studies were intended to gain a better understanding of the existing verification process to inform any potential solutions to provide appropriate, effective, and robust verification and compliance processes with regards to the design and construction of external wall systems. The observations in Section 5 therefore focus on identifying potential gaps in the verification processes applied to the Case Studies to improve future verification and compliance processes.

186. It is clear from the interviews that local authority verifiers in all case studies engaged in dialogue with Building Warrant applicants regarding external wall systems. There is evidence of this within the material provided for this research, but this was limited in quantity.

187. Differences were observed between the fire testing provided for the external wall systems components and/or materials in Case Studies 1 and 2, and there is no record of the local verifiers having contacted the manufacturer or testing house to confirm the validity of the proposed replacement products. During the interviews for all case studies it was noted that often decisions are made by experienced local authority verifiers where it is clear to them that minor changes will not impact the intended fire performance. Whilst this may be appropriate, it is the authors' opinion that it would have been useful for a record to have been kept on file to allow the local authority verifiers to consider any future building changes against the basis of the original Building Warrant approval. Interviewees advised that if they contact manufacturers or testing houses for comments this will be saved to the project file, but this is not standard practice for decisions reached internally. The proposed Guidance Tool would assist here by identifying the differences in materials used and establishing the fire performance.

188. Data sheets that contain fire performance classification in accordance with the relevant British or European Standards were not available for all products in Case Studies 1, 2, 3, 4, and 5. During the interviews, it was noted for all five Case Studies that data sheets are not routinely requested where the local authority verifier has knowledge of the proposed products. Whilst this is valid, it is the authors' opinion that since products are constantly evolving it would be prudent to keep a record of data sheets for the proposed materials, particularly as external wall cladding fire performance is specific to the materials used and therefore sensitive to any changes. During the interviews, local authority verifiers in all Case Studies noted that the list in the Guidance Tool would make clear to applicants what is expected of them, which should assist in avoiding instances of data sheets not being provided in the future.

189. Fire barrier products are specific to the materials and cavities they are installed in. Fire barriers and external wall types detail drawings were not provided for Case Studies 2, 3, and 4. It is the authors' expectation that these details would have been provided to the local authority verifier as part of the Building Warrant application process for their review, but have not been made available to the authors for this research.

190. Fire barriers were shown with a lower fire resistance period than the internal walls that they are installed in line with in Case Study 2. The decision to approve these fire barriers is not recorded in the literature provided to the authors to review for this

research, and such decisions should be recorded so that any fire safety features that the arrangement relies on are clearly understood. For example, the authors note that the internal wall construction achieves 60 minutes fire resistance from the inside; it is possible that this was a factor in the local authority verifier's decision to approve this arrangement and this would have been useful to have been recorded and communicated with the design team so that building owners are aware of this prior to making future decisions of building changes.

191. In Case Study 4, the fire barrier product data sheet provided noted that they are applicable to timber frame or masonry/concrete construction types, which doesn't reflect the building construction materials. The decision to approve these fire barriers is not recorded in the literature provided to the authors to review for this research, and such decisions would have been useful to have been recorded so that any fire safety features that the arrangement relies on are clearly understood.

192. In Case Study 4, a rigid insulation board is present as part of the external wall systems, and timber decking is noted on the external terraces of Case Study 4. The decision to approve these is not recorded in the literature provided to the authors to review for this research. Such decisions would have been useful to have been recorded so that any fire safety features that the arrangement relies on are clearly understood.

193. Fire barriers were not shown on the elevation drawings around services, doors, and window penetrations through the external wall systems for Case Studies 2, 3, and 4, and at the edges of the SFS systems at windows/doors for Case Study 4. The Case Study 5 elevation drawings do not show any fire/cavity barriers. There is no evidence in the literature provided for review that drawings showing barriers in the warrant plans were requested by the local authority verifiers, but the authors infer from the interview responses that this would have been captured on site by the local authority verifier team. However, it is the authors' opinion that this should have been captured at the Building Warrant stage to ensure that the site agent allowed for cavity barriers in their costing and ordering.

194. A fire barrier was missed on the elevation drawing between two flats in Case Study 4. There is no evidence in the literature provided for review that this was captured by the local authority verifiers, but based on the responses in the interviews, the authors infer that this would have been captured on site by the local authority verifier. However, it is the authors' opinion that this should have been captured at the Building Warrant stage.

195. In Case Study 5, the cladding materials included untreated timber cladding on treated softwood framing. The outline specification provided by the project architect referred to the BRE Fire Note 9 (BRE 1999). It is not clear how the local authority decided that this arrangement met the BRE fire note, and the decision to approve this is not recorded in the literature provided to the authors to review for this research. The authors infer from the interview that the local authority verifier used their experience of similar arrangements, but the specifics of the decision would have been useful to have been recorded so that any fire safety features that the arrangement relies on are clearly understood.

196. In the literature review, there was little information on the site inspections carried out by the local authority verifiers for Case Studies 1, 2, 3, 4, and 5 regarding external wall systems. At first glance this may seem as though limited inspections have been

carried out by the local authority verifier, but the interviewees advised that in reality the local authority verifiers are regularly on site for an extended period during the construction process. Therefore, the limited information is due to the fluid nature of construction sites requiring immediate resolution of issues. During the interviews, local authority verifiers advised that issues they observed on site are communicated verbally with the expectation that the site agent will resolve the issues prior to the next site visit by the local authority verifier. This is sometimes accompanied by photos as evidence of issues being resolved if they are closed up prior to the next site inspection, although this was not provided for review for this research. The interviewees also advised that there is no specific site visits exclusively for external wall systems, and that indeed all site visits are intended to be a general walk-around to raise any issues identified on the day. This aligns with the responsibility for construction quality sitting with the site agent, who should as a matter of good practice be recording completed installations (including photos) to prove compliance where required. However, the authors' experience is that construction quality is frequently below the level expected, particularly regarding cavity/fire barrier installations even when photographic records are provided by site agents; the issues may be visible in the photographic records (e.g. gaps around closed-state barriers) or may only be apparent during the site inspection (e.g. missing brackets which would not be observed via photos only). Therefore, the authors' view is that a more robust site inspection process is needed, which is presented in the Guidance Tool. Based on the feedback in the interviews, asking local authority verifiers to carry out this function would result in a significant uplift in their workload and would not be consistent with their responsibilities. It is therefore most appropriate for the responsibility for site inspections to lie with a suitably qualified third party acting on behalf of the site agent. In order to align with the current Building Warrant process, the third party inspector would need to prepare a site inspection report to present to the local authority verifier for their approval and records. This may assist in identifying specific items that the local authority verifier may wish to check on site as part of a spot-check approach under "reasonable inquiries".

197. It is the authors' view that applying the Guidance Tool would have addressed most of the items discussed above. From the interviews conducted, the local authority verifiers for all Case Studies were supportive of the Guidance Tool, on the basis that it would serve to both improve the quality of Building Warrant submissions pertaining to external wall systems and be a useful aide memoir to local authority verifiers. It was also identified that there may be improved consistency in terms of information requested by local authority verifiers on a project to project basis and throughout Scotland.

198. In the interviews, local authority verifier case officers for Case Studies 2 and 3 requested a tick-box style form to accompany the Guidance Tool to expedite the process of checking through the information for each wall type. As that is outside the scope of this research project, this should be reviewed as part of a separate exercise by the BSD.

199. In the interview with the local authority verifier in Case Studies 2, 4, and 5 the initial impression of the Guidance Tool is that it seems complex, however it was recognised that the Guidance Tool formalises the process that case officers must carry out intrinsically. On this basis, the Guidance Tool will serve as an aide memoir to limit the potential for items being overlooked or missed. It is anticipated that with time and usage the Guidance Tool will be fully understood.

200. For the items that would have been addressed by more thorough recording of the decision making process by the local authority verifiers; there is no specific process suggested here. Each local authority will have their own range of experience and internal processes. The recently published guidance in PAS 9980 was reviewed for insight into a risk-based approach, however as PAS 9980 is not aligned with Building Regulations benchmarks its use in Scotland would be limited to potentially using its principles as part of the technical justification to support any non-standard external wall designs. However, this would need to be approved by the local authority verifier and would be subject to the verifier being comfortable with using PAS 9980 as a method of justifying departures from the Technical Handbook's recommendations.

201. The interviewees felt that the local authority verifier case officers within their department are suitably skilled to carry out site inspections of external wall systems. However, most would be willing to rely on an appropriately accredited third party for the majority of the site inspection work for external wall systems. The local authority verifier case officer would still carry out at least one site visit as a spot-check for their own piece of mind. A means of establishing an accreditation scheme for this will need to be reviewed as part of a separate research project.

8. Conclusions

202. The Guidance Tool has a place in the Building Warrant process. The outcome of this research is that the most useful aspect will be as a formalised checklist/process for Building Warrant applicants to follow, and as an aide memoir to local authority verifiers.

203. Local authority verifiers often rely on their experience with products' fire performance and decide on the suitability of non-standard external wall designs with limited recording of the decision making process. Advice received externally from experts/manufacturers is saved on file. It is the authors' opinion that better record keeping is important for external wall designs as products' fire performance is tied closely to the tested configuration, and reference material should be consulted to prevent inappropriate or untested arrangements from being approved/constructed.

204. Local authority verifiers carry out spot checks of construction quality of external wall systems on site. This is in theory satisfactory as the responsibility for construction quality sits with the "relevant person", however as construction quality is constantly in question (in the experience of the authors) additional oversight is advisable.

205. Additional oversight could come in the form of additional site inspections by local authority verifiers or a qualified independent third party acting for the "relevant person" (such as a Clerk of Works). Such site inspections would still be subject to review by local authority verifiers. Input would be needed from the BSD to achieve this, including guidance for all and a suitable accreditation scheme.

206. There is no strong evidence that a separate stage for external wall systems should automatically be introduced for every project, although this is done routinely for large projects.

207. As local authority verifiers were unable to estimate the percentage of time devoted to reviewing external wall systems, quantitative analysis has not been possible.

208. To address construction quality issues, clear guidance should be given to local authority verifiers and Building Warrant applicants on how to most efficiently obtain the services of a qualified independent third party acting for the applicant to carry out suitable site inspections (suitable is explained by the Guidance Tool).

209. Where decisions are made regarding the suitability of external wall systems, local authority verifiers should be encouraged to record the decision making process to reach the conclusion, particularly where the conclusion is to accept the proposal.

9. Recommendations

210. To address construction quality issues, it is the authors' opinion that clear guidance should be given by the BSD to local authority verifiers and Building Warrant applicants on how to most efficiently obtain the services of a qualified independent third party acting for the applicant to carry out suitable site inspections (suitable is explained by the Guidance Tool).

211. Where decisions are made regarding the suitability of external wall systems, local authority verifiers should be encouraged to record the decision making process to reach the conclusion, particularly where the conclusion is to accept the proposal.

212. The BSD should create a simplified checklist so that Building Warrant applicants can quickly inform the local authority verifiers that all materials and fire barrier locations and configurations have been presented and included in the submission.

213. The Guidance Tool should be made available to local authority verifiers and Building Warrant applicants to assist with the Building Warrant process relating to external wall systems.

10. Appendix

STAGE A: MATERIALS / DATASHEETS

Start

A1. Have material datasheets/test data been provided for all components of all wall types? (See Checklist 1) Yes – Go to A2; No – Stop assessment. Request all information listed in Checklist 1

A2. For the material assessed, is it a fire barrier in line with a compartment/separating wall or floor? Yes – Go to A3; No – Go to A4

A3 Does the fire resistance period in the manufacturer's literature match the fire rating of the compartment/separating wall or floor? Yes – Go to A8; No – Go to A.i

A4. For the material assessed, is it a cavity barrier around openings? Yes – Go to A5; No - Go to A7

A5. Does the cavity barrier meet List a-d from note 3 of Table 2.19 of NDTH or Table 2.7 of DTH? Yes – Go to A8; No – Go to A6

A6. Is there evidence in the manufacturer's literature to show that the cavity barrier tested to achieves at least 30 minutes fire resistance? Yes – Go to A8; No – Go to A.i

A7. For each material, is the material exempted as outlined in Annex 2.E.2 of the Non-Domestic Technical Handbook or Annex 2.B.2 of the Domestic Technical Handbook or by EC 96/603/EC? Yes – Go to A8; No – Go to A.i

A8. The material is acceptable.

A.i Are datasheets/test data for the material assessed up to date and appropriate for the proposed build-up? Yes – Go to A.ii; No – Stop assessment. Request appropriate data sheets/test data

A.ii Does the performance on the datasheet confirm European Classification A1 or A2? Yes – Go to Aiii; No – Go to A.iv or B.i

A.iii The material is acceptable.

A.iv The material is not appropriate. Reject the proposal and state the reason for rejection.

End

The STAGE A decision process is represented visually in Figure X below.

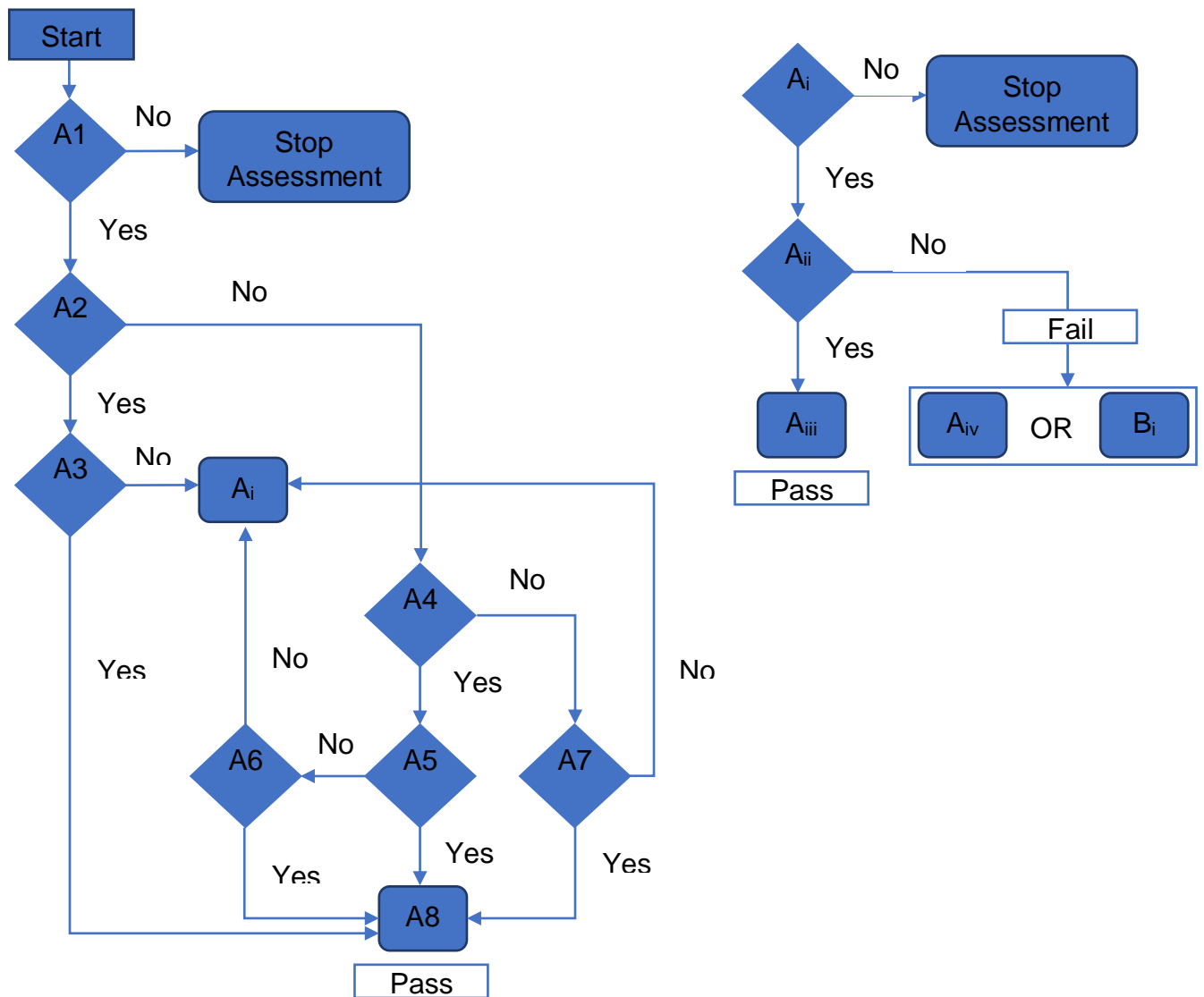


FIGURE X – FLOW CHART TO ACCOMPANY STAGE A

Notes on Stage A:

- A1. Without all of the information available, it is possible to arrive at incorrect conclusions. Therefore, the local authority verifier should first request all of the information in Checklist 1 before proceeding with their assessment. If upon commencing the assessment the local authority verifier discovers that information on Checklist 1 is missing, they should cease their assessment and request the information from the design team.
- A2. This step is to direct the verifier to the correct assessment method. The process should be repeated for each material assessed. In this Guidance Tool, a fire barrier is a material in line with a compartment/separating wall or floor.

- A3. Fire barriers in line with compartment/separating walls and floors should achieve at least the same fire resistance period as the compartment/separating wall or floor.
- A4. No notes provided
- A5. No notes provided
- A6. No notes provided
- A7. No notes provided
- A8. No notes provided
- Ai. No notes provided
- Aii. European Classification A1/A2 is defined in the Technical Handbooks
- Aiii. No notes provided
- Aiv. No notes provided

STAGE B: DESIGN DRAWINGS

Start

B1. Have all drawings been provided for review? (See Checklist 2) Yes – Go to B2; No – Stop assessment. Request all information listed in Checklist 2

B2. Are fire barriers shown in line with:

B2.1 Compartment Walls?

B2.2 Compartment Floors?

B2.3 Separating Walls?

B2.4 Separating Floors?

Yes to all – Go to B3; No to any – Go to B.i

B3. Do the fire rating of the fire barriers match the fire rating of the:

B3.1 Compartment Walls?

B3.2 Compartment Floors?

B3.3 Separating Walls?

B3.4 Separating Floors?

Yes to all – Go to B4; No to any – Go to B.i

B4. Do the fire barriers in line with compartment/separating walls/floors extend through to the outermost component of the external wall systems? Yes – Go to B5; No – Go to B.i

B5. Do the proposed uses of the fire barriers in line with compartment/separating walls/floors align with the manufacturer's literature in A3? Yes – Go to B6; No – Go to B.i

B6. Are cavity barriers shown around the following:

B6.1 Window openings?

B6.2 Door openings?

B6.3 Service penetrations?

Yes to all – Go to B7; No to any – Go to B.i

B7. Do these cavity barriers meet List a-d from note 3 of Table 2.19 of NDTH or Table 2.7 of DTH? Yes – Go to B9; No – Go to B8

B8. Do the proposed uses of the cavity barriers around façade openings align with the manufacturer's literature in A6? Yes – Go to B9; No – Go to B.i

B9. The design drawings is acceptable

B.i Have any fire engineering assessments been proposed to support this arrangement? Yes – Go to B.ii; No – Go to B.vi

B.ii Is the local authority verifier suitably competent to pass judgement on fire engineering proposals? Yes – Go to B.iii; No – Go to B.iv

B.iii Is the proposal reasonable, i.e. does it meet the Technical Handbook's functional standard (s)? Yes – Go to B.v; No – Go to B.vi

B.iv Seek guidance from a competent colleague or suitably qualified third party e.g. Fire Engineer with CEng status through IFE with sufficient external wall fire testing experience. Go to B.iii

B.v The design is acceptable

B.vi The design is not appropriate. Reject the proposal and state the reason for rejection.

End

The STAGE B decision process is represented visually in Figure Y below.

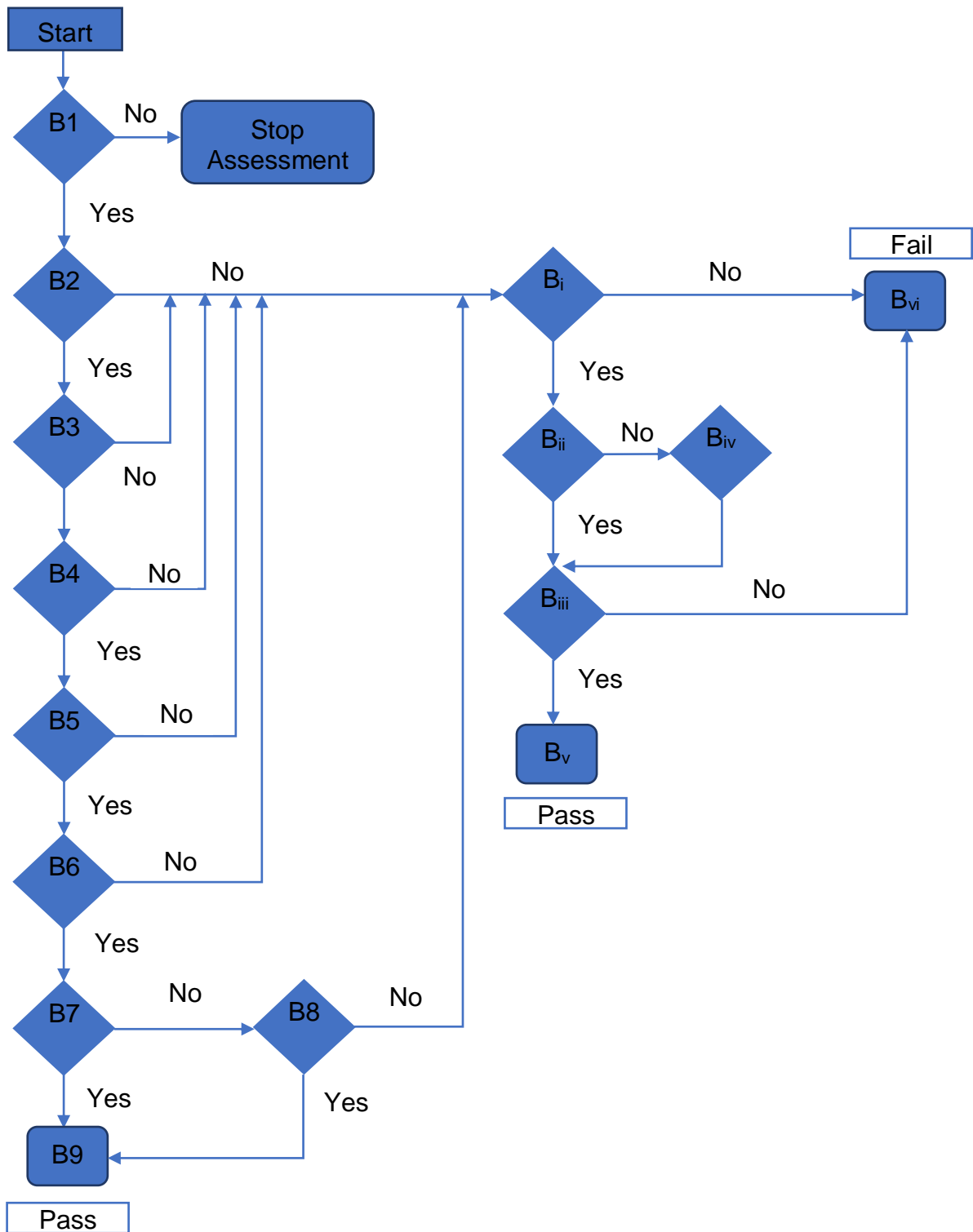


FIGURE Y – FLOW CHART TO ACCOMPANY STAGE B

Notes on Stage B:

- B1. Without all of the information available, it is possible to arrive at incorrect conclusions. Therefore, the local authority verifier should first request all of the information in Checklist 2 before proceeding with their assessment. If upon commencing the assessment the local authority verifier discovers that information

on Checklist 2 is missing, they should cease their assessment and request the information from the design team.

- B2. Fire barriers should be provided in the external wall system in line with compartment/separating walls and floors to continue the fire resistance of the compartment/separating wall/floor through to the outside of the external wall system.
- B3. See note to B2.
- B4. See note to B2.
- B5. Fire barriers need to be fire rated, and the fire resistance should be based on test data provided on a datasheet.
- B6. If the answer is no to any, the impact of cavity barriers not being provided needs to be considered holistically. This applies regardless of the extent/quantity of the omitted cavity barriers, fire engineering justification would need to be provided in order for the local authority verifier to consider the impact of the cavity barrier omission on the whole external wall system.
- B7. No notes provided
- B8. Cavity barriers need to be fire rated, and the fire resistance should be based on test data provided on a datasheet (with the exception of the items noted in B7).
- B9. No notes provided
- Bi. Appropriate fire engineering justification would need to be provided to justify a “no” answer to B2, B3, B4, B5, B6, or B8.
- Bii. It is important to acknowledge where the local authority verifier is not suitably trained or qualified to assess a fire engineering design. The authors’ view is that a suitable demonstration of competence could include Incorporated Engineer and Chartered Engineer level with the Institution of Fire Engineers. These qualifications require the holder to demonstrate the experience in the field and analytical thinking required to assess fire engineering proposals.
- Biii. The requirement is to meet the functional standards in the I as the minimum acceptable performance criteria.
- Biv. No notes provided
- Bv. No notes provided
- Bvi. No notes provided

STAGE C: SITE INSPECTIONS

Materials

Start

C1. Is there a record on purchase order for the components of the external wall system on site? Yes – Go to C3; No – Go to C2

C2. Is there onsite photographic evidence clearly showing the brand and references of all the components of the external wall system? Yes – Go to C3; No – Request further evidence for C1.

C3. Does the evidence in C1 and C2 match the technical datasheets reviewed in A? Yes – Go to C4; No – Please note the variations and re-start Section A.

C4. Do the observations made on site (see Checklist 3 for sampling points) match the wall build up drawings reviewed in Section B? Yes – Go to C5; No – Please note the variations and re-start Section B.

C5. The materials installed on site and external wall built up matches design drawings design information. Go to C6.

End

Cavity/Fire Barriers

Start

C6. Have the cavity/fire barrier inspections been carried out by an independent third party company accredited/endorsed by the cavity/fire barriers manufacturer? Yes – Go to C8; No – Go to C7

C7. Local authority to carry out a site inspection. Do the observations made on site (see Checklist 3 for sampling points and Checklist 4 for cavity/fire barrier measurement) match with the manufacturers' product literature for the installation of cavity/fire barriers? Yes – Go to C10; No – Go to C11

C8. Did the independent third party company inspect all the items in Checklist 4 i.e.: junctions with compartment/separating walls, junctions with compartment/separating floors; cavity barriers around windows, doors, and service openings; cavity barriers at wall heads? Yes – Go to C9; No – Go to C7 to inspect areas not covered by the independent third party.

C9. Did the independent third party company confirm their suitability in writing? Yes – Go to C10; No – Please ask for the confirmation in writing.

C10. As built cavity/fire barriers installation is acceptable.

C11. As built cavity/fire barrier installation is not appropriate. Reject the proposal and state the reason for rejection.

The STAGE C decision process is represented visually in Figure Z below.

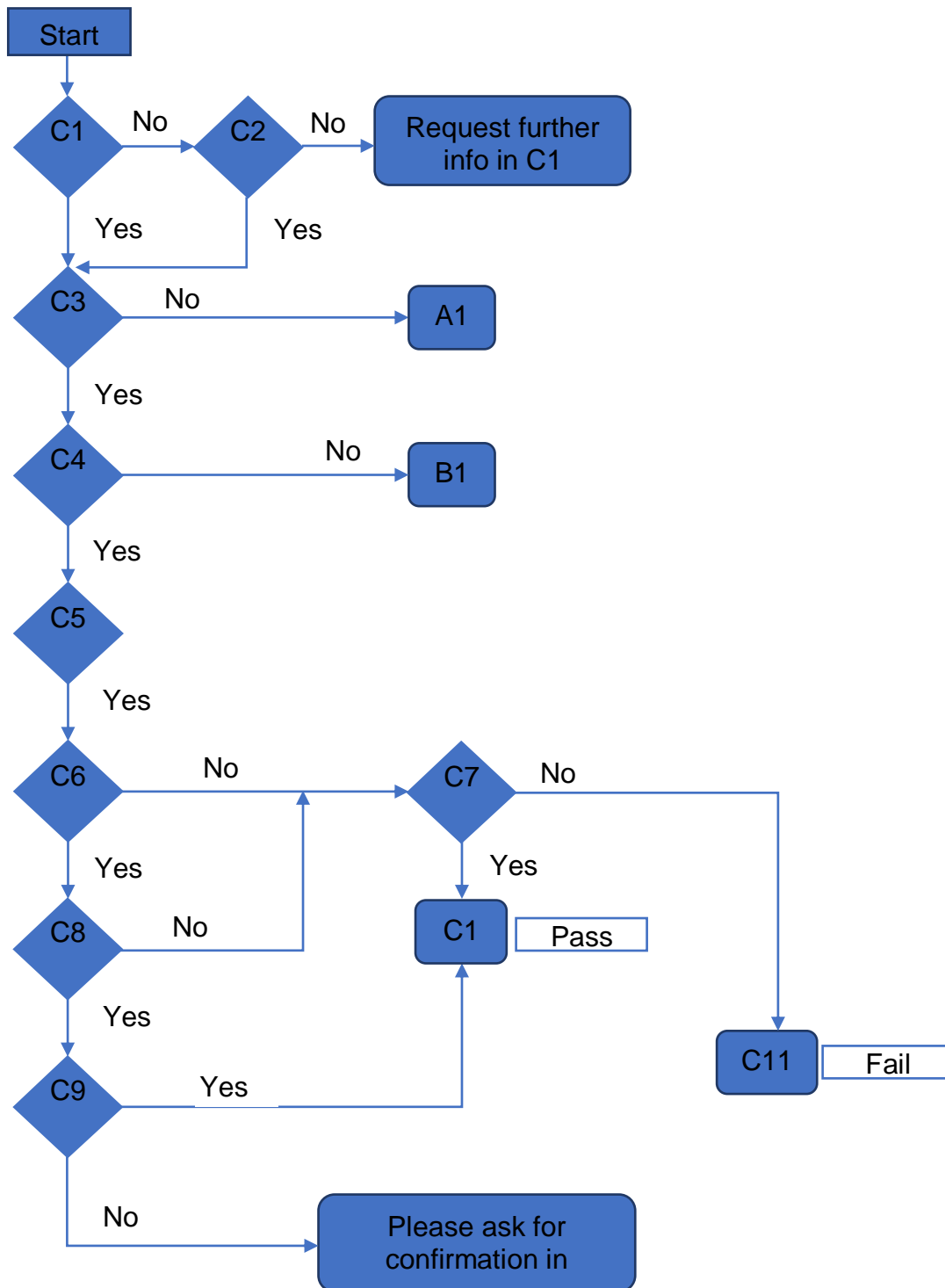


FIGURE Z – FLOW CHART TO ACCOMPANY STAGE C

Notes on Stage C:

- C1. Purchase orders for components in the external wall systems will allow the local authority verifier to confirm that the same materials assessed in Stages A and B are likely to have been installed on site. This will also allow the local authority verifier to identify any new materials/components that were not assessed in Stages A and B.

- C2. Photographic evidence should be recorded by the installer to evidence that the construction materials are those assessed in Stages A and B. The photographic evidence should clearly identify where the photograph was taken e.g. with a drawing reference key.
- C3. Any discrepancies between the assessment carried out by the local authority verifier in Stages A and B and the on-site evidence could compromise the conclusions of the Stages A and B assessment. Therefore, the assessment should be undertaken anew.
- C4. Any discrepancies between the assessment carried out by the local authority verifier in Stages A and B and the on-site evidence could compromise the conclusions of the Stages A and B assessment. Therefore, the assessment should be undertaken anew.
- C5. No notes provided
- C6. The following are not considered to be suitably independent
 - a. Interviews with installers (no self-certification permitted)
 - b. The contractor's/sub-contractor's own QA
 - c. The contractor's QA of their sub-contractor
 - d. Photos only
- C7. The local authority verifier's site inspection should take into consideration the recommendations in Checklist 4.
- C8. No notes provided
- C9. No notes provided
- C10. No notes provided
- C11. No notes provided

CHECKLIST 1 – EXPECTED COMPONENTS OF EXTERNAL WALL SYSTEMS

Please refer to PAS 9980 Annex L “Element” column for common external wall system materials/components.

External wall systems are defined in 2.7.1 of the Technical Handbook as: “non load-bearing components attached to the buildings structure, for example, composite panels, clay or concrete tiles, slates, pre-cast concrete panels, stone panels, masonry, profiled metal sheeting including sandwich panels, rendered external thermally insulated cladding systems, glazing systems, timber panels, weather boarding and ventilated cladding systems. For the purposes of compliance with the building regulations and associated standards, external wall cladding systems also include spandrel panels and infill panels. Many systems incorporate support rails, fixings, thermal insulation, fire barriers and cavity barriers located behind the outer cladding.” For clarity, it is the view of the authors that timber supports are also part of the external wall systems, including in timber frame buildings; in these buildings the elements of structure could be timber (where permitted by building regulations) however any other construction supporting the external wall system that are not elements of structure would need to be non-combustible.

Elements of structure are defined in 2.3.1 of the Technical Handbook.

CHECKLIST 2 – DRAWING AND DESIGN INFORMATION

- Fire Strategy Plans
- Fire Strategy Elevations
- Drawings showing the build up of all the “as built” external wall types
- Plan and section drawings showing cavity/fire barrier details including:
 - Cavity barriers installed around doors
 - Cavity barriers installed around windows
 - Cavity barriers installed at the wall head
 - Cavity barriers installed around ventilation ductwork that penetrates through external walls
 - Fire barriers in line with compartment walls
 - Fire barriers in line with compartment floors
 - Fire barriers in line with separating walls
 - Fire barriers in line with separating floors
 - Fixing details
- Is a ventilated cavity system proposed?
- Qualifications and experience of person(s) certifying any changes from the tested assembly
- Qualifications and experience of person(s) certifying the application of the system to the proposed configuration
- Drawings showing the build up of all the “as built” external balcony/terrace details
- Any local authority verifiers’ agreement on designs that deviate from the Technical Handbooks standard cavity barrier requirements.

CHECKLIST 3 – SITE INSPECTIONS SAMPLING POINTS

At least 2 instances of each wall type to confirm composition reflects Section B design review

At least 2 instances of each of the following critical locations for each wall type:

- Compartment walls (vertical fire barriers)
- Compartment floors (horizontal fire barriers)
- Window head
- Window jamb
- Window cill
- Service penetration
- Wall head

CHECKLIST 4 – SITE INSPECTION MEASUREMENT (CAVITY/FIRE BARRIERS)

Check the following against the manufacturer's product literature:

- Thickness of cavity/fire barriers and their associated fire rating
- Depth of the cavity/fire barriers against the depth of the cavity
- The requirement for brackets/fixings on cavity/fire barriers against the depth of the cavity barriers
- Number of brackets/fixings per cavity/fire barrier
- Distance between brackets/fixings
- The method of fixing the brackets compared to the product literature recommendations
- For closed state cavity/fire barriers – the extent of compression required
- For open state cavity/fire barriers – the maximum air gap permitted by the manufacturer
- Any other information on the manufacturer's product literature

COMMENTARY ON DEVELOPMENT OF GUIDANCE TOOL

After Grenfell, the Royal Institution of Chartered Surveyors (RICS) in conjunction with the Building Societies Association and UK Finance produced the EWS1 form. This was created as a means for valuers and lenders to have it confirmed to them that an external wall system or attachments, such as balconies, on buildings containing flats has been assessed by a suitable expert.

As fire engineers, the author's primary expertise is with proposals that do not achieve straightforward compliance. After the creation of the EWS1 form, the authors were faced with reviewing external wall systems with unusual configurations and/or unknown fire performance.

Although the Grenfell tragedy occurred in an area governed by The Building Act 1984 and 2000 Building Regulations in force in England and Wales, the EWS1 form is currently being demanded by valuers and lenders/funders for tall domestic buildings and any domestic buildings with cladding throughout the UK. In the authors' experience, many developers were also seeking to obtain an EWS1 form even for low rise domestic buildings with conventional brick external wall systems primarily to meet their funders' requirements for having an EWS1 form. Therefore, the demand for EWS1 forms increased from addressing buildings with, for example, small sections of combustible materials to most buildings containing flats.

The below are typical problems that the authors have identified on buildings where they have carried out EWS1 form desktop studies and site inspections:

- Lack of design information being available
- Substitutions of products/materials being made by the contractor team after the Building Warrant has been approved
- Fire barriers not completing the line of separating/compartiment walls/floors all the way through the external wall system
- Details being approved at the Building Warrant stage without products being specified e.g. "mineral wool insulation by others", leading to a lack of oversight
- Cavity/fire barriers not being installed on site not in line with the manufacturer's literature e.g. not deep enough to fill the cavity, missing brackets, distances between brackets being too large
- Cavity/fire barriers being missed completely
- Materials on site not reflecting the approved design information
- Systems being installed on site that don't reflect the manufacturer's literature
- A lack of justification/reasoning as to why certain products with a lower standard of classification than permitted by the Building Regulations are installed on the cladding system. This includes:
 - Timber cladding
 - High Pressure Laminate (HPL) cladding panels

- Metal Composite Materials (MCM) panels
- A lack of consideration of the fire spread potential of constructing balconies from combustible materials.

Some of these items can be resolved with fire engineering assessments by a competent person, others require mitigation/replacement on site.



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