DOCUMENTATION FOR PLANS INCORPORATING PERFORMANCE-BASED SOLUTIONS

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<tr><th></th><th>Type of document</th><th>Contents</th></tr>
<tr><td>1.</td><td>Fire Safety Engineering Design Brief</td><td>
i) Project scope
Define scope/extent of fire safety engineering works, eg. involve specific fire protection system components, new construction of a building, additions and alterations to partial building or whole building or renovation of an existing building for a change of use. The scope also serves to document the fire safety engineer’s area of responsibility within the overall project.

ii) Identify relevant performance-based issues to be addressed.

Eg.
<table>
<tr><th>Location affected by PB Solution</th><th>Relevant Prescriptive Clause</th><th>Corresponding Root & Sub-Objectives</th><th>Design Solution</th><th>Acceptance Criteria</th></tr>
<tr><td>Atrium of Building A Commercial Complex

Grid A/Z- 1/8</td><td>Clause 3.3.1
Table 3.3A

Requirement for element of structure to be fire rated to 1-hr</td><td>Root Objectives
- R3.1 and R3.3

Sub-Objectives
- S3.1, S3.3 and S3.9</td><td>Non-provision of the required 1-hr fire resistance rating to elements of structure at atrium through use of CFD fire modelling to demonstrate that atrium element s of structure will not reach critical steel temperatures for anticipated fire loads at the atrium.

Attached sketch showing location of affected elements of structure at the atrium.</td><td>Steel temperatures for elements of structure at the atrium will not reach critical steel temperatures of 550 degrees Celcius for fire occurring at the atrium for anticipated fire loads.</td></tr>
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iii) Building characteristics

Identify critical building characteristics such as

- Building classification and usage
- Building setback from boundary line
- Number of floors, area of each floor and their general layout

iv) Occupant characteristics

Identify dominant occupant characteristics such as

- Number and basis for calculation for occupant load and exit capacity
- Physical attributes eg handicapped, aged
- Fire Safety Manager/ Fire warden

v) Fire hazards / fire scenarios

Assess potential fire hazards in the building including ignition sources and fuel loads. Describe the plausible fire scenarios considered, why they were used and identify the 'worst credible' fire scenario(s). Any assumptions made must be justified. Select parameters for design fires.

vi) Trial designs

Identify trial design(s), ie fire safety measures for analysis and state the assumptions made and the sequence of operations of the proposed fire safety systems.

vii) Method of evaluation

Determine the method of evaluation (i.e. qualitative and/or quantitative). The method chosen must be well-documented (limitations and assumptions), well-validated and suitable for the tasks at hand.

- If quantitative analysis is adopted, state the approach (deterministic or probabilistic) and specify the performance/acceptance criteria, sensitivity studies, uncertainties and safety factors. A comparison table of the generated outputs against the acceptance criteria is to be included.
- If qualitative analysis is adopted, the basis on which engineering judgement is made must be clearly documented and appropriate references provided.

		viii) Design parameters Identify and select design parameters e.g. design occupant groups, design fire, etc. **ix) Notes of discussion / Consultations** Notes of discussion with SCDF are to be attached with the brief for reference. **x) References** Identify relevant reference information. **xi) Credentials and Endorsement of fire safety engineer** Include name, credentials and endorsement of the fire safety engineer who prepared the brief.

2.	**Fire Safety Engineering Report**	**i) FEDB** Include the approved FEDB in the report. (Note : How the performance criteria were developed, including any certainty or safety factors should be discussed. The selection of design fire scenarios and the basis used to select those fires should also be discussed). **ii) Assumptions & Limitations** State assumptions and limitations made during the assessment with regards to the fire safety engineering design. **iii) Evaluation** Show how the final design, that was selected from the trial designs, meet the performance criteria. The evaluation should include a description of the analysis method and the design tools used. Any computational tools used should be discussed along with the input parameters and output results. References should be given for all equations and all calculations should provide sufficient information for the entire design process to be followed clearly and precisely. As far as possible, graphs should be used instead of numerical printouts. Such printouts should only be included as an appendix, not in the main report. **iv) Critical design features** State the critical design features/parameters that must be maintained throughout the life cycle of the building in order for the design to function as intended. **v) Engineering judgement** State the justification in applying of engineering judgement, where it is used. **vi) Conclusions and recommendations** Justify the conclusions drawn from the assessment and associated recommendations. **vii) Summary** Provide a summary of the fire safety measures. **viii) Specifications** State the specifications of the fire protection systems that are derived from the calculations and results within the report, including any particular construction requirements to ensure fire safety system is properly realised.

		E.g. Specification of RTI and activation temperature for sprinkler system. (Note : Simply referencing existing codes might not be adequate. For example, if the fire protection design is based on a particular spacing of sprinklers or sprinkler design density, then such characteristics of that sprinkler system must be clearly indicated.) There should be specific instructions to the QP who will be detailing the design and incorporating into the plans. **ix) Commissioning and maintenance** Identify the commissioning and maintenance needs (e.g. its frequency) for the fire safety systems. **x) Fire safety management** Highlight specific procedures or processes that must be adhered to in order to achieve the desired level of safety. **xi) References and citations** Identify sources of information concerning the project from which data were obtained for purpose of assessment. **xii) Credential and Endorsement of FSE** Include name, credentials and endorsement of the fire safety engineer who prepared the report.

3.	**Operations and Maintenance Manual**	**i) Role & responsibilities of building operator** State the role and responsibilities of the building operator in ensuring that the components of the performance-based design are in place and operating properly. **ii) Identification of sub-systems** Identify and describe the relevant sub-systems for the particular project and their interaction with each other. Eg. • Fire detection • Fire suppression • Emergency warning • Occupant evacuation **iii) Maintenance plan** • Develop maintenance plan for the proper functioning of the design system. • Establish inspection and testing regimes (including testing criteria) and their schedules. Note : Although some systems might be tested and inspected individually, the interconnections between systems should be periodically tested. • Documentation of inspections/testing and their results should be maintained with the building records. **iv) Restrictions** List the restrictions placed on the building operations. These restrictions may include critical fire load, building use and occupancy, and reliability and maintenance of systems. **v) Compensatory actions** Highlight compensatory actions that must be taken if a fire protection system is impaired or removed from service. **xiii) Credentials and Endorsement of FSE** Include name, credentials and endorsement of the FSE who prepared the manual.

4.	**Peer Reviewer's report**	**i) Scope of review** State the documents being reviewed. **ii) Review process** Describe how the review was performed and state the references used. Note : (a) The review should not only address the checking of the calculations for the performance-based solution but also review the appropriateness and adequacy of the methodology used in obtaining the final result. (b) If the reviewer is not familiar with the methodology, or aspect thereof, used by the FSE, the peer reviewer may perform his own checks and determine if the design is acceptable. **iii) Highlight any reservations** Highlight concerns about any part of the documents being reviewed. Recommend additional studies, if any. **iv) Suggestions of areas for improvement** **v) Conclusion** State the conclusion, eg. Either of the following: (i) Documents reviewed are acceptable. (ii) Documents reviewed are acceptable pending further studies. (iii) Documents reviewed are unacceptable. FSE to revise the design. **vi) Credentials and Endorsement of peer reviewer** Include name, credentials and endorsement of the peer reviewer who prepared the report.