

## Section 7 - Fire Safety Assessment Report (FSAR)

### Clause G7.1 Framework of FSAR

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The fire engineering for an Alternative Solution will be assessed based on all information being documented in the FSAR. It provides the basis on which an analysis is conducted to assess the impact of a fire on the occupants under a worst credible scenario and time of ignition for the Alternative Solution. The FSAR should present details of the relevant aspects of the Alternative Solution, which fall into one of the following three categories:

- (a) Active fire safety provisions
- (b) Passive fire safety provisions
- (c) Fire safety management

The FSAR should identify and set out the strategy for the Alternative Solution. The format and content of the FSAR are as follows:

**(a) Introduction:**

- (i) States the nature of the problems identified
- (ii) Sets out the overall objectives of the fire strategy
- (iii) Highlights the key parameters

**(b) Building and Use Classification:**

- (i) Building site – location, boundary distances, access, fire service water supplies
- (ii) Building form – area, height, number of floors, (atria and basements, if any)
- (iii) Use Classification – floor by floor use, connection between buildings, storage, parking
- (iv) Occupancy – type, number, location, characteristics
- (v) Special features and inter-relationship with other properties

**(c) Code Compliance:**

- (i) Deemed-to-Comply provisions that are not complied with
- (ii) Alternative Solutions
- (iii) Relevant Performance Requirements
- (iv) Guidance used

**(d) Technical Justification:**

- (i) Sub-systems to be addressed
- (ii) Acceptance criteria
- (iii) Method of analysis
- (iv) Analysis tools
- (v) Hazard analysis, ignition sources, fire loads
- (vi) Fire scenarios, design fires
- (vii) Interaction of design fires with occupants and building
- (viii) Safety factor, if any

**(e) Trial Design Solution:**

- (i) Sub-systems being analysed
- (ii) Active fire safety provisions – smoke detection, occupant warning, sprinklers etc.
- (iii) Passive fire safety provisions – fire compartments, sealing of penetrations, FRR etc.
- (iv) Fire safety management– maintenance, housekeeping, evacuation planning etc.
- (v) Means of escape strategy
  - Occupant behaviour and reaction
  - Occupant way finding
- (vi) Smoke control
  - Purpose of smoke control system
  - Activation
  - Capacity
  - Zoning
- (vii) Fire spread
  - Combustibility of linings and furnishings
  - FRR of fire barriers
  - Fire compartment size
  - External fire spread
- (viii) Structural Performance
  - Structural response to elevated temperatures
  - Required FRR
- (ix) Sprinkler systems
  - Hazard classification
  - Water supplies
  - Extent of coverage
  - Type of heads
- (x) Occupant Warning / Alarm system
  - Type and extent of the system
  - Coverage and spacing
  - Manual call points / Break glass alarms
  - Interaction with other active systems
  - Position of indicator panels
  - Signal to emergency services

- (xi) First-aid firefighting
  - Hose reels
  - Portable fire extinguishers
- (xii) Facilities for firefighters
  - EVA
  - Fire service water supplies
  - Firefighting and rescue stairway
  - Fireman's lifts
  - Fire control centre / indicator panel
  - Active system controls
  - Inter-floor communication
- (xiii) Emergency lighting and exit signs
- (xiv) Management
- (xv) Maintenance of fire safety provisions
- (xvi) Housekeeping
- (xvii) Fire drills
- (xviii) Staff training

The FSAR should contain calculations, sketches and diagrams to support the conclusions and objectives of the report. Detailed information should include smoke filling, design fire and egress calculations as may be applicable.

To illustrate the design concepts, diagrams and sketches showing fire compartmentation, means of escape and expected smoke control approach should also be included.

#### Clause G7.2 Assessment of Structural Performance

The assessment and analysis of structural elements or frames and the structural response to elevated temperatures should be assessed as appropriate.

Important design aspects to be considered include:

- (a) importance of design fires, utilisation of test data as design fires;
- (b) calculation of FRR, based on full fire compartment burn-out;
- (c) use of the time-equivalence method and its limitations, with regard to application to individual members and fire compartments;
- (d) use of calculation methods for assessing heat transfer to structural members or elements of construction;
- (e) use of test information and the applicability of adapting test information for a specific case;
- (f) development of suitable acceptance criteria;
- (g) role of fire service intervention and accounting for firefighters;
- (h) relevant safety factors and safety margins;

- (i) use of materials such as timber, steel and concrete and their limitations. Use of building materials that are sensitive to flame impingement should be carefully addressed, e.g. structural glazing; and
- (j) methods of protection and their limitations.

### Clause G7.3 Commissioning and Field Testing

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All fire safety provisions must be commissioned and tested.

Testing of passive fire safety provisions must comply with Part E.

Requirements on acceptance testing for FSI are stipulated in the Code of Practice for Inspection, Testing and Maintenance of Installations and Equipment.

#### Hot Smoke Tests

Hot smoke tests may be utilised as part of building commissioning and testing to ascertain if active fire safety provisions are operating effectively and are interacting as they should, i.e. smoke detection activating door closers and sounding an alert in the appropriate zone.

The use of hot smoke tests may not be fully effective in testing fire engineering solutions for smoke control systems. Hot smoke tests are typically carried out in the range of 1 to 1.5MW in order to avoid damage to on-site environment. Since this range is substantially smaller than most design fires, they do not adequately represent the design fires. In this connection, the testing of fire engineering solution for smoke control systems may be assisted by computer modelling and validation.

A hot smoke test can be carried out for special buildings, provided the limitations of the test are understood.

### Clause G7.4 Maintenance and Management

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Authorized persons should be aware of the expected maintenance and management requirements that may result from the Alternative Solution, which should be listed in the fire safety management plan. The requirements on fire safety management plan are stipulated in Part F.