CHAPTER 13

AIRCRAFT HANGARS

Scope

13.1. This chapter details the Defence design requirements for passive and active fire safety measures for New Construction, alterations, additions or Change-in-Use to Aircraft Areas in Hangars and Deployable Hangars. Parts of the building that do not contain aircraft must comply with the general requirements detailed in the BCA and the specific requirements in other chapters of the MFPE as applicable.

Aim

13.2. The overall aim of this chapter is to detail appropriate levels of fire protection for Aircraft Areas to protect high value critical or strategic aircraft from a fire event.

References

13.3. Reference is necessary to the following documents:

a. National Construction Code Volume One – Building Code of Australia (BCA);

b. National Fire Protection Association (NFPA) 11—Standard for Low-, Medium-, and High-Expansion Foam;

c. National Fire Protection Association (NFPA) 409—Standard on aircraft hangars;

d. AS 1319—Safety signs for the occupational environment;

e. AS 1670.1—Fire detection, warning, control and intercom systems—System design, installation and commissioning—Fire;

f. AS 1940—The storage and handling of flammable and combustible liquids;

g. AS 2118.1—Automatic fire sprinkler systems—General requirements;

h. AS 2118.3—Automatic fire sprinkler systems - Deluge systems;

i. AS 2419.1—Fire hydrant installations—System design, installation and Commissioning;

j. AS 2441—Installation of fire hose reels;

k. AS 2444—Portable fire extinguishers and fire blankets—Selection and location; and

l. AS 4806 suite of standards—Closed circuit television (CCTV).
Protection Levels and *Hangar* Assessment Form

13.4. The fire safety measures that are required in *Hangars / Aircraft Areas* are dependent on the strategic value of the aircraft, the number of aircraft in the same fire compartment and whether the aircraft are fuelled or *Defuelled*. The protection requirements are increased in line with the level of importance according to the Contribution Factor (CF). A description of CF categories according to operational capability is provided in table 13-1 below:

<table>
<thead>
<tr>
<th>Hangar / Aircraft Area Contribution Factor (CF)</th>
<th>Description</th>
<th>Fire protection level objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intolerable loss in a fire event</td>
<td>Where the loss or partial loss of aircraft in a fire event would be of high impact to Defence operational capability.</td>
<td>High</td>
</tr>
<tr>
<td>CF1 and CF2</td>
<td>Where the aircraft contribute towards Defence operational capability but the loss in a fire event would be tolerable.</td>
<td>Moderate</td>
</tr>
<tr>
<td>CF3, CF4 and CF5</td>
<td>Where the loss or partial loss of aircraft in a fire event would be of minor or no impact to Defence operational capability.</td>
<td>Low</td>
</tr>
</tbody>
</table>

Table 13–1: Contribution Factor descriptions

13.5. To facilitate the assessment process and to formally record its conclusions, the Building Criticality Assessment Form at annex 2A and Hangar Assessment Form at annex A of this chapter shall be completed by the Project Sponsor. The *Delivery Authority* is responsible for ensuring this process is completed for all new building projects, refurbishments and alterations. The forms must be part of the design documentation for the building and are to be finalised at the design briefing stage. The *Delivery Authority* is also responsible for ensuring the completed forms are attached to the structure in the *Defence Estate Information System* (DEIS) prior to building handover.

13.6. The assessment process described above is also required for existing *Hangars* where the operational capability level of the aircraft is the subject of a *Change-in-Use* or where the assessment has not been done. Where this occurs, the Regional Director is to ensure that the Criticality Assessment Form and *Hangar* Assessment Form is completed. The Regional Director must ensure that the form is saved in DEIS.

13.7. The fire safety requirements for each category are specified below. Annex B provides a table summarising the required fire safety measures.

13.8. Requirements for *Deployable Hangars* are specified later in this chapter.

**CF3, CF4 AND CF5**

13.9. *Hangars / Aircraft Areas* assigned a CF3, CF4 and CF5 are required to comply with the BCA. There are no additional MFPE requirements.

**CF1 and CF2**

13.10. *Hangars / Aircraft Areas* assigned a CF1 or CF2 identified as tolerable loss shall comply with the requirements of the BCA and the additional requirements specified below.
Signage

13.11. **Hangars** that house **Defuelled** aircraft only shall have a regulatory sign in accordance with AS 1319 with appropriate symbol and the following wording ‘THIS HANGAR SHALL HOUSE DEFUELLED AIRCRAFT ONLY’. A minimum of two signs shall be located in clearly visible locations.

Distance between aircraft (multiple aircraft installations)

13.12. Minimum separation distances between aircraft shall be determined by the Project Sponsor following consultation with relevant stakeholders.

13.13. The determination of minimum requirements for aircraft separation distances shall be documented in the design brief and provided to the **Building Certifier** as part of the project requirement.

13.14. A regulatory sign in accordance with AS 1319 with appropriate symbol and the following wording ‘MINIMUM SEPARATION DISTANCE BETWEEN AIRCRAFT IS (specify metres)’. A minimum of two signs shall be located in clearly visible locations.

Floor drainage

13.15. Aircraft Areas shall incorporate floor drainage systems unless the Project Sponsor confirms the area will not be permitted to contain fuelled aircraft when completing the form at annex A. If floor drainage is not proposed in Aircraft Areas with Defuelled aircraft, then this must be documented in the project brief (normally Functional Design Brief) or design reports and shall also be provided to the **Building Certifier** as part of the project requirement.

Notes

(1) The requirement for floor drainage always applies to Aircraft Areas that have or potentially could have fuelled aircraft.

(2) The intent of specifying floor drainage for Aircraft Areas with Defuelled aircraft is to accommodate the potential future use with fuelled aircraft as it is impractical and costly to install floor drainage retrospectively.

13.16. Floor drainage systems shall be of sufficient capacity to ensure that the peak potential fuel spill – and maximum potential foam discharge where foam suppression is provided – is contained and uncontrolled discharge to stormwater or sewerage systems is prevented. The system shall be in accordance with ‘Guidelines for Testing Fixed Aqueous Film Forming Fire Protection System’ located on the Defence Estate Quality Management System (DEQMS) website. A floor drainage system shall incorporate flame traps in the Aircraft Area and be designed such that the Aircraft Area door tracks and Hangar walls remain clear of flammable liquids. The floor gradient shall be not less than 0.5 percent and shall drain away from the Aircraft Area. Consideration should be given to incorporating hydrocarbon detection in the drainage system to provide early warning at a monitored location as required by the users. Any installed hydrocarbon detection system shall not to be connected to the Fire Detection Control and Indicating Equipment (FDCIE).

Hangar fire compartmentation

13.17. In addition to when required by the BCA, Aircraft Areas shall be constructed as a separate fire compartment to any other part of the building unless the Project Sponsor confirms the area will not be permitted to contain fuelled aircraft when completing the form at annex A. If fire compartmentation is not proposed to separate Aircraft Areas with Defuelled aircraft, then this must be documented in the project brief (normally Functional Design Brief) or design reports and shall also be provided to the **Building Certifier** as part of the project requirement.

13.18. Where required, the fire compartmentation shall be in accordance with section C of the BCA for fire walls and the fire resistance levels applicable for the type of construction required for the building.
Fire hydrants

13.19. A hydrant system must be provided regardless of building area. The installation is to be in accordance with clause E1.3 of the BCA and AS 2419.1. Consideration shall be made to providing primary coverage via an external hydrant system that has direct access to the Aircraft Area.

Fire hose reels

13.20. Fire hose reels are to be provided regardless of fire compartment size. The installation is to comply with clause E1.4 of the BCA and AS 2441.

Portable foam equipment

13.21. Hangars that can house fuelled aircraft are to be provided with foam liquid proportioners and/or a foam making branch and foam shall be provided with all fire hose reels. The portable foam equipment must be capable of producing 27 litres/min of foam solution at a minimum of 220 kPa for a period of 30 minutes in accordance with AS 1940.

Sprinklers

13.22. Aircraft Areas that contain CF3 (loss tolerable) capability aircraft should consider the installation of fire sprinklers systems regardless of building or fire compartment floor area. The consideration must be documented in the project brief (normally Functional Design Brief) or design reports and shall also be and provided to the Building Certifier as part of the project requirement. Where sprinklers are provided, the installation shall be in accordance with specification E1.5 of the BCA and AS 2118 as applicable.

Portable fire extinguishers

13.23. Portable fire extinguishers with an ABE classification shall be provided. The fire extinguisher shall be co-located with the fire hose reel. The mounting and signage requirements are to comply with AS 2444.

Smoke detection

13.24. A smoke detection system shall be provided – regardless of fire compartment size. The installation is to be in accordance with clause 4 of specification E2.2a of the BCA and AS 1670.1.

Fire compartmentation of Aircraft Areas

13.25. Aircraft Areas may be designed for individual or multiple aircraft per fire compartment.

13.26. Where the option to house each individual aircraft in separate fire compartments is chosen, then the fire compartmentation between each aircraft shall be in accordance with section C of the BCA for fire walls and the fire resistance levels applicable for the type of construction required for the building. This option allows deletion of the MFPE requirement for smoke exhaust or smoke and heat vents specified below.

Smoke exhaust

13.27. Smoke exhaust shall be provided in Aircraft Areas over 2,000m² or 12,000m³, or where there are multiple aircraft in the same fire compartment and one or more can be fuelled. The installation shall be in accordance with specification E2.2b of the BCA for smoke exhaust. Automatic operation of the smoke exhaust shall be initiated by the fire detection or suppression system.

Notes.

1. Preference shall be given to automatic smoke exhaust systems which can be configured for environmental / temperature control and smoke exhaust mode.
(2) Make-up air systems shall be separate from environmental / temperature control systems.

(3) Mechanical services provided for environmental / temperature control shall be designed such that they do not unduly interfere with the operation of smoke exhaust systems.

INTOLERABLE LOSS

13.28. Incorporate all the requirements for CF1 and CF2 (loss tolerable) Hangars / Aircraft Areas and the additional requirements specified or varied below.

Hangar fire compartmentation

13.29. Aircraft Areas shall be constructed as a separate fire compartment to any other part of the building. The fire compartmentation shall be in accordance with section C of the BCA for fire walls and the fire resistance levels applicable for the type of construction required for the building.

Sprinklers

13.30. Aircraft Areas that contain very high or high operational capability aircraft shall incorporate fire sprinklers systems regardless of building or fire compartment floor area. The installation shall be in accordance with specification E1.5 of the BCA and AS 2118 as applicable.

Fire compartmentation of Aircraft

13.31. Aircraft Areas should be designed such that very high or high operational capability fuelled aircraft are housed individually either in separate Hangars or in separate fire compartments in the same Hangar. This is the Defence preferred option and it allows deletion of the requirements for flame detection and low level foam suppression – refer to paragraphs 13.34 and 13.35.

13.32. Where the option to house individual fuelled aircraft in separate fire compartments is chosen, then the fire compartmentation between each aircraft shall be in accordance with section C of the BCA for fire walls and the fire resistance levels applicable for the type of construction required for the building.

Smoke exhaust

13.33. Smoke exhaust shall be provided for all Aircraft Areas that contain single or multiple very high or high operational fuelled aircraft. The installation shall be in accordance with the requirements specified in paragraph 13.27.

Flame detection

13.34. In addition to the requirement for smoke detection, Aircraft Areas that require a low level foam suppression system shall also be provided with a flame detection installed in accordance with AS 1670.1.

Low level foam suppression system

13.35. Low level fixed foam suppression shall be provided in Aircraft Areas that house multiple fuelled aircraft in the same compartment. The method of installation is to be in accordance with the requirements of NFPA 409 and NFPA 11. This may be achieved by either of the following methods:

a. low level foam systems such as pop-up sprinklers; or
b. oscillating foam monitors.
13.36. If low level foam suppression is specified in lieu of fire compartmentation, consideration of the following points must be demonstrated during the design development stages:
   a. the effects of firefighting foam on aircraft avionics and components;
   b. the down time required for clean up after a discharge;
   c. the increased water storage requirement;
   d. the additional firefighting foam to be contained;
   e. protection of controls and main valves from a fire within the Aircraft Area while at the same time maintaining ready access for operation;
   f. The effectiveness of a sprinkler system must not be unduly affected by the operation of a supplementary low level foam system or vice versa;
   g. disposal requirements after a discharge; and
   h. whole of life costs.

13.37. Low level foam suppression systems shall be provided with a control station that has automatic and manual modes for control and suitable monitoring of the foam suppression system. The control station shall be installed at a suitable location in accordance with the user requirements. Manual actuators are to be located adjacent to the fire hose reels. The manual actuators shall be installed so that they are unobstructed, readily accessible, and located in the normal paths of exit from the area. The following specific requirements must be met:
   a. in automatic mode, the foam system shall only operate on activation from both the smoke and flame detection systems referred to in paragraphs 13.24 and 13.34. The operation of a single detection type shall not cause the activation of the foam suppression system;
   b. manual actuators shall be active in all circumstances;
   c. when the Aircraft Area is occupied, it shall be possible to isolate the automatic operation of the foam suppression system and select manual operation at the control station;
   d. when unoccupied, the automatic mode must always be selected. This sequence, personnel training and the requirements for manual operation of the foam suppression system must be incorporated into the Standard Operating Procedures for the Hangar;
   e. the control station shall be secured in such a manner that prevents unauthorised interference or accidental operation; and
   f. to assist the system from being inadvertently left isolated, the control station shall be provided with suitable indicator light installed in a prominent location to indicate when the system has been isolated.

Water supply for low level foam suppression systems

13.38. The water supply for a foam suppression system shall be grade 1 in accordance with the requirements of AS 2118.1.

13.39. The water supply shall be sufficient to operate the foam zone in alarm and all immediately adjacent foam zones for a minimum of 30 minutes. The full 30 minutes must be at the pressure and flow that meet the requirements of the system design.
Firefighting foam

13.40. The type of firefighting foam to be used in Defence foam suppression systems shall be as follows:


b. the fire suppression foam purchased to operate existing Defence suppression systems shall not contain any perfluorooctanyl sulfonate (PFOS) chemicals. Any new foam purchased shall be compatible with existing installations and shall not adversely affect or diminish the firefighting performance of existing suppression systems; and

c. new Defence suppression systems shall use firefighting foams that do not contain any PFOS chemicals. The suppression systems shall be designed to deliver the required performance using the alternative firefighting foam.

Commissioning and maintenance requirements for low level foam suppression systems

13.41. The commissioning of low level foam suppression systems shall include the physical testing of all possible combinations of detection circuits (smoke and flame) to ensure that only the designed circuits (one smoke and one flame in foam zone of fire source) operate the automatic foam suppression sequence. Care must be taken to ensure that two or more smoke detection circuits or two or more flame detection circuits do not initiate a foam discharge. Detailed commissioning requirements and maintenance tests to confirm system design parameters are provided in Guidelines for Testing Fixed Aqueous Film Forming Fire Protection System’ and NFPA 11.

CCTV systems

13.42. A closed circuit television (CCTV) installation should be considered where the system would enhance a fire service response in Aircraft Area. The preferred option is the system is able to be monitored by the responding Defence fire service. Sponsors will identify when CCTV systems are required. When provided the system shall comply with AS 4806. Consideration of this requirement must be documented during design development.

DEPLOYABLE HANGAR

13.43. A Special Structure classification may be applied to Deployable Hangars. Refer to paragraphs 3.34 to 3.37 for these requirements.

Annex:

A. Hangar Assessment Form
B. Summary of Fire Safety Requirements for Aircraft Areas