



REQUIREMENTS FOR AMMONIA REFRIGERATION SYSTEMS AND COOLROOM CONSTRUCTION

Building Code of Australia (BCA) – 2010 Compliance

ISECO Consulting Services Interpretation

Ammonia (Type B2) Refrigerant, Unrestricted Charge Category III Occupancy

Most refrigerated buildings are classified as “Class 7b” this classification is determined by the purpose for which it is designed, constructed or adapted to be used. A Class 7b building is one used “ for storage, or display of goods or produce for sale by wholesale”. a plant or machinery room must have the same classification as the part of the building in which it is situated.

The BCA requirements read in relation to ammonia refrigeration systems and cool-rooms can be broken into three broad elements:

1. Ammonia Refrigeration Systems:

BCA – Section E, Services and Equipment,
E1.0 Deemed-to-Satisfy Provisions.

(a) Where a Building Solution is proposed to comply with the Deemed-to-Satisfy Provision, Performance Requirements EP1.1 to EP1.6 are satisfied by complying with E1.1 to E1.10.

E1.10 Provision for special hazards.

Stating: -

Suitable additional provision must be made if special problems of fighting fire could arise because of-

(a) *The nature or quantity of materials stored, displayed or used in a building or on the allotment.*

Interpretation:

As ammonia refrigerant can cause special problems when fighting a fire or when attending to a leak, the building surveyor must ensure that this special provision has been adhered to in the design, documentation and ongoing maintenance plans of the plant as part of the sign off procedure.

Recommended Solution:

- As ammonia refrigeration design engineers and qualified persons are not currently included in the current NPER certification system, a register of competent persons could be provided by AIRAH.
- This register would include the names of persons who hold full area membership and can demonstrated their knowledge of AS/NZS1677.2-1998 and their abilities as ammonia refrigeration system designers.
- We would expect the respective building surveyor to call on a representative from this group to sign off the design and plant safety provisions.

2. Refrigerated Cool-rooms:

BCA – Section G, Ancillary Provisions,
G1.0 Deemed-to-Satisfy Provisions.

(b) Where a Building Solution is proposed to comply with the Deemed-to-Satisfy Provision, Performance Requirements GP1.2 to GP1.4 are satisfied by complying with G1.1 to G1.2.

GF1.3 Refrigerated chambers, strong-rooms and vaults

Stating: -

- (a) *A refrigerated or cooling chamber, strongroom or vault or the like that is capable of accommodating a person is to have safety measures to facilitate escape and for alerting people outside such a space in the event of an emergency.*

Performance Requirements.

GP1.3

Any refrigerated or cooling chamber, or the like which is sufficient size for a person to enter must: -

- (a) *Have adequate means of communicating with or alerting other occupants in the building in the case of an emergency; and*
- (b) *Have a door which is: -*
- (i) *Of adequate dimensions to allow occupants to readily escape: and*
 - (ii) *Be openable from inside without a key at all times.*

Interpretation:

- AS/NZS 1677.2:1998,4.2 Safety Provisions for Personnel In Refrigerated Spaces. This section provides an extended list that covers the items related to safety of personnel in refrigerated spaces, this could be used as a guide when designing deemed to comply outcomes.
- The respective building survey is to sign off the room safety provisions, after the designer has confirmed compliance.

BCA 2010 - Prescriptive Approach

G1.2 – Refrigerated chambers, strong-rooms and vaults

- (a) *A refrigerated or cooling chamber, strongroom or vault which is of sufficient size for a person to enter must have-*
- (i) *a door which is capable of being opened by hand from inside without a key; and*
 - (ii) *internal lighting controlled only by a switch which is located adjacent to the entrance doorway inside the chamber, strongroom or vault; and*
 - (iii) *an indicator lamp positioned outside the chamber, strongroom or vault which is illuminated when the interior lights required by (a) (ii) are switched on; and*
 - (iv) *an alarm that is-*
 - a. *located outside but controllable only from within the chamber, strongroom or vault; and*
 - b. *able to achieve a sound pressure level outside the chamber, strongroom or vault of 90dB(A) when measured 3m from the sounding device.*

- (c) *A door required by (a) (i) in a refrigerated or cooling chamber must have a doorway with a clear width of not less than 600mm and a clear height not less than 1.5m*

Interpretation:

- AS/NZS 1677.2:1998,4.2 Safety Provisions for Personnel In Refrigerated Spaces. This section provides an extended list that covers the items as shown above.
- The respective building survey/ designer is to sign off these room safety provisions.

3. Insulated Panels for Cool-room Construction:

BCA – Section C, Fire Resistance,

C1.10 Deemed-to-Satisfy Provisions.

1. Scope

This Specification sets out requirements in relation to the *fire hazard properties* of -

- (a) *floor materials and floor coverings; and*
- (b) *wall and ceiling linings.*

2. Class 2 to 9 buildings: General requirements

(d) *In the case of a composite member or assembly, be constructed so that when assembled as proposed in a building-*

- (i) *Any material which does not comply with (a) or (b) (Clause 1 BCA) is protected on all sides and edges from exposure to air: and*
- (ii) *The member or assembly, when tested in accordance with Specification A2.4, has a Smoke-Developed Index and Spread-of – Flame Index not exceeding those prescribed in (b): and*
- (iii) *The member or assembly retains the protection in position so that it prevents ignition of the material and continues to screen it from access to free air for a period of not less than 10 minutes.*

C1.10a Deemed-to-Satisfy Provisions.

3. Walls and Ceilings

(b) *The group number of a material is as follows when tested or predicted in accordance with sub-clause (a)*

- (i) *A Group 1 material is one that does not reach flashover when exposed to 100kW for 600 seconds followed by exposure to 300 kW for 600 seconds.*
- (ii) *A Group 2 material is one that reaches flashover when exposed to 300kW for 600 seconds after not reaching flashover when exposure to 100 kW for 600 seconds*
- (iii) *A Group 3 material is one that reaches flashover in more than 120 seconds but within 600 seconds when exposure to 100 kW.*

(c) *A material used as a finish, surface lining or attachment to a wall or ceiling lining must be a Group 1, Group 2 or Group 3 material used in accordance with Table 2 and for buildings not fitted with a sprinkler system complying with Specification E1.5, have –*

- (i) *A smoke growth rate index not more than 100, or*
- (ii) *An average specific extinction area less than 250m²/kg.*

Interpretation:

Test Standard AS ISO 9705

Fire Test Certification: -

Class of building 7, Wall and Ceiling Lining Materials (Material Groups Permitted)

- Expanded Polystyrene (EPS) sandwich panel. This material complies with Groups 1, 2 and 3 providing the relevant construction panel thickness limits and installation fixings parameters are followed. The smoke growth index identified in BCA Specification C1.10a, clause 3c is not more than 100 m²/s² *1000, and the product may be used in buildings with or without a sprinkler system complying with specification E1.5.
- Polyisocyanurate (PIR) foam core sandwich panel. This material complies with BCA Group 2 and 3, providing the relevant construction panel thickness limits and installation fixings parameters are followed. The smoke growth index identified in BCA Specification C1.10a, clause 3c is not more than 100 m²/s²-1000, and the product may be used in buildings with or without a sprinkler system complying with specification E1.5.

- Polystyrene/Phenolic composite foam (PPCS) sandwich panel. This material complies with BCA Group 1, 2 & 3, providing the relevant construction panel thickness limits and installation fixing parameters are followed. The smoke growth index identified in BCA Specification C1.10a, clause 3b (i) Group 1 and 3c (i) is not more than $100 \text{ m}^2/\text{s}^2 * 1000$, and the product may be used in buildings with or without a sprinkler system complying with specification E1.5.

Comparison Table.

Simultaneous Determination of Ignitability, Flame Propagation, Heat Release and Smoke Release to AS/NZS 1530.3:1999, (Data from test certificates) Zero is the best result.

| Panel Type | Ignitability Index (0-20) | Spread of Flame Index (0-10) | Heat Evolved Index (0-10) | Smoke Developed Index (0-10) |
|--|---------------------------|------------------------------|---------------------------|------------------------------|
| EPS-Enclosed Panel ¹ | 0 | 0 | 0 | 0 to 1 |
| PIR – Steel Faced Sandwich Panel ² | 0 | 0 | 0 | 2 |
| PPCS – Steel Faced Sandwich panel ³ | 0 | 0 | 0 | 2.2 |

Conclusion: -

- **Based on this review all panel types are in compliance with the BCA regulations,**
- **EPS** complies with all of the three BCA group ratings; it is strongly recommended for large commercial and industrial installations to specify Group 1, as this will provide improved fire hazard properties.
- **PIR** complies with two or three BCA group ratings. Recommendations are to specify Group 2 installations, as this will provide improved fire hazard properties. Note group two is excluded for Fire-isolated exits which is a group 1 application.
- **PPCS** complies with all three BCA group ratings. Recommendations are to specify Group 1 installations for large commercial and industrial applications, as this will provide the optimum fire rating performance.
- **Insurance companies** Insurers have expressed support for either PIR or PPCS panel materials.
- **To obtain approvals on new projects** Approvals for new projects may require input of the local fire authority. In some cases the local fire authority will override BCA requirements.
- **It can be seen that all three-panel types** in common use have similar fire hazard properties.

¹ BRANZ Report FAR 2489, 28th September 2005, Assessment of the Performance of Metal Clad Expanded Polystyrene Sandwich Panels in the AS ISO 9705 Room Fire Test. Test of Bondor – Insulated panel results to AS1530.4:1990

² CSIRO Report FNE8218, 20th July 2003. Kingspan, Insulated panel results to AS1530

³ BRANZ Report FAR 2548, 20th July 2005. Fire Test on XFLAM Polystyrene Insulated Panel to ISO 9705-1993 Austral Insulation, results to AS1530:4

- **The respective building surveyor**, The building surveyor would sign off the BCA construction group as part of the development application permit.
- **This interpretation** is intended to be used as a guide only it is not a substitute for not following the correct compliance and approvals procedures.
- **Purchasers** of insulated panel products should request copies of the suppliers fire test data reports to verify the quality of products being offered. These reports should be passed onto the building surveyor or relevant authority.

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