0762P DELTA PANELS IN COOL ROOMS

Branded worksection

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Worksection abstract

This branded worksection *Template* is applicable to refrigerated cool rooms and components with a room operating temperature below 5°C, including those operating below freezing. It is intended for small to medium walk-in cool rooms up to 20m² floor area and includes the construction of the room using DELTA PANELS insulated panels, and its associated refrigeration system and controls.

How to use this worksection

Customise this worksection *Template* for each project. See A guide to NATSPEC worksections (www.natspec.com.au) for information on *Template* structure, word styles and completing a worksection.

Related material located elsewhere in NATSPEC

If a listed worksection is not part of your subscription package and you wish to purchase it, contact NATSPEC.

Related material may be found in other worksections, including:

- *0310 Concrete - combined*.
- *0315 Concrete finishes*.
- *0612 Cementitious toppings*.
- *0631 Ceramic tiling*.
- *0651 Resilient finishes*.
- *0657 Resin based seamless flooring*.

Related branded worksections include:

- *0428p DELTA PANELS insulated roofing systems*.

Material not provided by DELTA PANELS

This branded worksection includes generic material which may not be provided by the Product Partner including:

- Condensers.
- Evaporators.
- Refrigerant plant.

Documenting this and related work

You may document this and related work as follows:

- Coordinate cool room details with the base building. For example, cool rooms with floors at the same level as the adjacent floor require substantial set downs in the slab, typically 200 mm for a cool room operating above 0°C, and 250 mm for a for a cool room operating below 0°C. Depth will depend on insulation thickness, screed thickness and floor finish. Alternatively, if the insulation cannot be located above the slab, insulation below the slab (and possibly heaters) will be required to prevent condensation and conserve energy.
- Likewise, some internal finishes (e.g. floor tiles) may need to be coordinated with building finishes.
- Show the location of refrigeration equipment on the drawings, paying attention to adequate provision of cooling air intakes and discharge.
- The location of luminaires may be shown on the drawings or left to the contractor to determine based on default text.
- Local regulations may apply, notably in relation to Work Health and Safety, health (food storage), laboratory safety and practices.
- Consider access to the space above cool rooms and equipment. Sandwich panels, although rigid, may not be adequate for the applied loads.
- If shelving is to be attached to cool room walls, consider the method of fixing.
- Make sure there is adequate air flow into and away from condensing units, particularly if mounted indoors or if drop-in units are documented.
- Since cool rooms vary in temperature more than the surrounding spaces, make adequate provision to accommodate thermal movement, particularly near doors with anti-condensation heater cables.

- This worksection includes the option of Class 2L (lower flammability) refrigerants to AS/NZS ISO 817 (2016). If used, make sure the relevant provisions of AS/NZS 5149.1 (2016), AS/NZS 5149.2 (2016), AS/NZS 5149.3 (2016) and AS/NZS 5149.4 (2016) are incorporated. Issues to consider include plant location, plant room size, plant room ventilation and refrigerant alarms.
- Refer to AIRAH DA12 (2020), which, in addition to recommendations on energy conservation, contains useful design information relevant to Australia.
- Consider ventilation requirements. This worksection assumes cool rooms are intermittently occupied. If they are continuously occupied at times, conform to AS 1668.2 (2012). The NCC cites AS 1668.2 (2012). The current edition is AS 1668.2 (2024).

This worksection *Template* contains text that may be adapted for use in Design and Construct projects. See NATSPEC TECHreport TR 03 for information on specifying Design and Construct for mechanical services.

The *Normal* style text of this worksection may refer to items as being documented elsewhere in the contract documentation. Make sure they are documented.

For example:

- The location of viewing panels in cool room doors.

Specifying ESD

The following may be specified by retaining default text:

- Measures to minimise condensation to improve equipment life and limit microbial growth risk.
- Prohibition of CFCs and HCFCs as blowing agents.
- Durable components, particularly for corrosion resistance.
- Provisions for reducing vibration.
- Features recommended by AIRAH DA12 (2020) to increase energy efficiency. Refer to AIRAH DA12 (2020) for additional energy saving options.

Refer to NATSPEC TECHreport TR 01 on specifying ESD.

1 GENERAL

DELTA PANELS is a 100% Australian owned and operated manufacturer of insulated panels. Its range of products includes roof, wall and patio systems, plus a wide range of accessories. The range of panels (in various styles and colours) has been engineered for enhanced performance in Australia's harsh environment.

1.1 RESPONSIBILITIES

General

Requirement: Provide refrigerated cool rooms using DELTA PANELS insulated panels, and associated work, as documented.

Documented is defined in *0171 General requirements* as meaning contained in the contract documents.

DESIGN

Cool rooms are provided by specialist subcontractors on essentially a design and construct basis to meet specified performance parameters.

Refer to NATSPEC TECHreport TR 03 on specifying design and construct for mechanical services.

The *Optional* style text in this clause may be changed to *Normal* style text when the contractor is to design and select the cool rooms and associated refrigeration equipment. Use *0701 Mechanical systems* to describe design parameters for mechanical systems, as a whole, including the basis for calculating the cool room capacities.

The SELECTIONS schedules provide a means for the specifier to define basic cool room parameters from which the contractor will complete the design including sizing and selecting the plant, detailing the construction, and so on.

Selection parameters included in the SELECTIONS schedules should not be repeated here**.** The schedules' *Guidance t*ext includes suggestions for modification to suit design and construct projects.

General

Requirement: Design refrigerated cool rooms to **DESIGN** in *0701 Mechanical systems*, and as documented.

Design documentation

This is a partial list of items only. Edit to suit the project. Drawings relating to whole systems should be included in *0701 Mechanical systems*.

General: To **DESIGN DOCUMENTS** in *0171 General requirements*.

Calculations: Provide calculations of refrigeration system and assumptions made.

Drawings: In addition to the drawings documented in **SUBMISSIONS**, **Shop drawings**, provide the following:

- Location of refrigeration equipment.
- Access to space above cool rooms and equipment.
- Details of shelving.
- Details of external and internal finishes and protection.
- Arrangement for adequate air flow into and away from condensing units.
- [complete/delete]

1.2 COMPANY CONTACTS

DELTA PANELS technical contacts
Website: www.deltapanels.com.au/contact

1.3 CROSS REFERENCES

General
Requirement: Conform to the following:

- *0171 General requirements*.

0171 General requirements contains umbrella requirements for all building and services worksections.

List the worksections cross referenced by this worksection. *0171 General requirements* references the *018 Common requirements* subgroup of worksections. It is not necessary to repeat them here. However, you may also wish to direct the contractor to other worksections where there may be work that is closely associated with this work.

NATSPEC uses generic worksection titles, whether or not there are branded equivalents. If you use a branded worksection, change the cross reference here.

- *0701 Mechanical systems*.

0701 Mechanical systems deals with matters common to more than one Mechanical worksection.

- *0771 Automatic controls*.
- *0781 Mechanical electrical*.
- *0791 Mechanical commissioning*.
- *0792 Mechanical maintenance*.

1.4 STANDARDS

General
Refrigeration systems: To AS/NZS 5149.1 (2016), AS/NZS 5149.2 (2016), AS/NZS 5149.3 (2016) and AS/NZS 5149.4 (2016).

AS/NZS 5149.1 (2016), AS/NZS 5149.2 (2016), AS/NZS 5149.3 (2016) and AS/NZS 5149.4 (2016) deal with safety and environmental aspects of refrigeration systems. They are based on the corresponding ISO 5149 series standards but with Australian amendments including a performance option in Appendix ZZ of each part of the standard.

See NATSPEC TECHnote PRO 007 on refrigerant.

Cool rooms for food storage: To AS 4674 (2004).

This standard covers matters including finishes, fixtures, fittings and lighting.

Electrical safety: To AS/NZS 60335.1 (2022) and AS/NZS 60335.2.89 (2020).

Code of practice: IPCA 004.3 (2017).

1.5 MANUFACTURER'S DOCUMENTS

Technical manuals
Website: www.deltapanels.com.au/deltacool

1.6 INTERPRETATION

Abbreviations
General: For the purposes of this worksection, the following abbreviations apply:

- BMS: Building management system.

Similar terms are DDC (direct digital control) and BAC (building automation and control system). Adjust to suit the project terminology.

- EPS: Expanded polystyrene.
- PIR: Polyisocyanurate.

Edit the **Abbreviations** subclause to suit the project or delete if not required. List alphabetically.

Definitions

General: For the purposes of this worksection, the following definitions apply:

- Cool room: A refrigerated space that is designed to maintain a temperature below 5°C and is used primarily for the storage of product.

Product is used generically to refer to the contents stored and so encompasses perishable materials such as food and temperature sensitive materials such as some pharmaceuticals.

To avoid ambiguity, in this worksection the terms cold room and freezer room have not been used and instead requirements are specified in terms of room operating temperature. AS 4674 (2004) uses the terms chiller and freezer without defining them.

Edit the **Definitions** subclause to suit the project or delete if not required. List alphabetically.

1.7 SUBMISSIONS

Certification

Structural and trafficable ceilings: Submit certification of the ceiling from a structural engineer.

Fire performance

Non-combustibility: Submit evidence of conformity to **FIRE PERFORMANCE**, **Non-combustibility**.

If non-combustible materials are documented, consider including this *Optional* style text by changing to *Normal* style text.

Fire hazard properties: Submit evidence of conformity to **FIRE PERFORMANCE**, **Fire hazard properties**.

Operation and maintenance manuals

Requirement: Submit manual to **COMPLETION**, **Operation and maintenance manuals**.

Products and materials

Thermal insulation properties: Submit evidence of conformity to AS/NZS 4859.1 (2018).

Evidence of delivery: Submit delivery docket as evidence of delivery of [complete/delete]

If evidence of delivery to site is required for particular products, consider including this *Optional* style text by changing to *Normal* style.

Type tests: Submit test results for the following:

- Refrigeration equipment: To **REFRIGERATION PLANT GENERALLY**, **Tests**.

0171 General requirements **TESTING - GENERALLY** requires that all testing be done by an Accredited Testing Laboratory except for site tests or test methods that do not have an Accredited Testing Laboratory. Accredited Testing Laboratory is defined in *0171 General requirements*. It includes organisations outside Australia that meet defined criteria.

Type tests are carried out off-site. However, submission of evidence of a successful type test may be called up here for requirements specified in PRODUCTS.

Samples

Requirement: Submit samples to PRODUCTS, **GENERAL**, **Samples**.

Shop drawings

Requirement: In addition to the requirements of *0701 Mechanical systems*, submit drawings showing the following:

- Plan and cross-sections of each cool room.
- Room construction details including vapour barriers and measures to prevent cold bridging. Provide drawings of each type of:
  - . Wall to wall joint.
  - . Wall to ceiling joint.
  - . Wall to floor joint.
  - . Partition wall to external wall joint.
  - . Panel to panel joint.
  - . Door jamb.

. Floor cross-section.
. Ceiling suspension detail.
- Escape provisions.
- Coordination with building elements.
- Provisions for differential thermal movement.
- Condensate drainage.
- Refrigeration system and piping.
- Door and other heaters.
- Lighting including emergency lighting.
- If the cool room is recessed into the floor slab, details of set downs.

Typical details can be found in IPCA 004.3 (2017) Annex A.

Subcontractors
General: Submit names and contact details of proposed installers.

Contact DELTA PANELS for details of DELTA PANELS recommended installers appropriate to construction in your area.

Tests

Detail the tests required in EXECUTION and list the submissions required here.

Requirement: Submit test results for the following:
- Testing to **EVACUATION OF REFRIGERANT GAS SYSTEMS**.

Warranties
Requirement: Submit warranties to **COMPLETION**, **Warranties**.

1.8 INSPECTION

Notice
Inspection: Give notice so that inspection may be made of the following:
- Floor slab: Ready for installation of subbase.
- Heated subbase: Complete and before commencing floor laying.
- Vapour barrier: Installed with locating angle in position ready for wall panel installation.
- Membrane: Installed ready for placing wearing surface.

Edit to suit the project, adding critical stage inspections required.

Hold points, if required, should be inserted here. For critical installations, it may be desirable to make the above witness points into hold points.

2 PRODUCTS

2.1 GENERAL

Product substitution
Other products: Conform to **SUBSTITUTIONS** in *0171 General requirements*.

SUBSTITUTIONS in *0171 General requirements* sets out the submissions required if the contractor proposes alternative products. Refer also to NATSPEC TECHnote GEN 006 for more information on proprietary specification.

Product identification
General: Marked to show the following:
- Manufacturer’s identification.
- Product brand name.
- Product type.
- Quantity.
- Product reference code and batch number.
- Date of manufacture.

Edit the list to suit the project or delete if not required.

Samples
Requirement: Provide a sample, drawing or photograph of each of the following:

- Wall to wall to ceiling corner joint.
- Panel to panel joint.
- Wall to floor joint.
- Door jamb.
- Floor cross-section.

Cutaway sections: For each sample, provide cutaway sections or standard drawings to permit inspection of application details including insulation materials, adhesives, sealants and fixings.

Storage and handling

Requirement: Store and handle materials to the manufacturer's recommendations and the following:

- Protect materials including edges and surfaces from damage.
- Keep dry and unexposed to weather.
- Do not drag metal sheets or panels across each other or over other materials.
- Insulated panels: Store unpacked panels by size in racks and protect from scratching, warping or bending.

Operating conditions

General: Provide equipment that operates within an ambient temperature range of 0°C to 45°C, without excessive head pressure or unstable operation.

Edit upper and lower temperature to suit the actual conditions of the project area, if necessary.

Adhesives and sealants

Requirement: Conform to **ADHESIVES AND SEALANTS** in *0701 Mechanical systems*. Provide only materials that are approved for the application by DELTA PANELS and conform to IPCA 004.3 (2017) *Code of practice*.

0701 Mechanical systems defines sealant as including liquids and mastics.

Corrosion protection

Ferrous metals:

- Inside the cool room or outside but subject to condensation: Stainless steel or hot-dip galvanized steel.
- Outside the cool room and not subject to condensation: Stainless steel, hot-dip galvanized steel or metallic-coated steel.

Fasteners: Stainless steel or non-ferrous only.

Fasteners

Rivets: Expanding solid end type 4.0 mm diameter approved by DELTA PANELS.

Refrigerants

Requirement: Provide refrigerants as follows:

- Listed as Safety Group A1 or A2L in AS/NZS ISO 817 (2016).

Safety Group A1 refrigerants have low toxicity and no flame propagation. Safety Group A2L refrigerants have low toxicity and lower flammability. Refrigerants not listed in AS/NZS ISO 817 (2016) are not covered by AS/NZS 5149.1 (2016), AS/NZS 5149.2 (2016), AS/NZS 5149.3 (2016) or AS/NZS 5149.4 (2016) so should be avoided.

- Ozone Depletion Potential: 0.
- Global Warming Potential: ≤ 700.

A Global Warming Potential of 700 represents moderate requirement. Refrigerants with higher and lower values are available. Lower values tend to be associated with higher flammability.

Safety Group, Ozone Depletion Potential and Global Warming Potential for refrigerants are listed in AS/NZS 5149.1 (2016) Annex B. See NATSPEC TECHnote PRO 007 on refrigerant options.

Insulation blowing agents

Restricted agents: Conform to PRODUCTS AND MATERIALS, **GENERAL**, **Prohibited materials** in *0171 General requirements*.

2.2 FIRE PERFORMANCE

See DELTA PANELS website for fire performance test reports.

Non-combustibility

Insulation materials: Not deemed combustible tested to the NCC cited AS 1530.1 (1994).

The NCC cites AS 1530.1 (1994). The current edition is AS 1530.1 (2024).

The NCC does not prohibit the use of combustible insulation materials provided they meet the other fire hazard properties. If non-combustible insulation is required, consider including this *Optional* style text by changing to *Normal* style text.

Fire hazard properties

See NATSPEC TECHnote DES 003 for more information on the fire hazard properties of insulation materials and NATSPEC TECHnote DES 020 on fire behaviour of building materials and assemblies.

Group number: To AS 5637.1 (2015).

DeltaCool-EPS-FR tested to AS ISO 9705 (2003): Group number 1.

DeltaCool-PIR tested to AS ISO 9705 (2003): Group number 1.

Non-sprinklered buildings: Wall and ceiling linings must either have an average specific extinction area less than 250 m^2/kg or a smoke growth rate index not more than 100 as determined by AS 5637.1 (2015).

Refer to NATSPEC TECHnote DES 020 for information on fire hazard properties.

Materials: Tested to AS/NZS 1530.3 (1999). Fire hazard properties as follows:

- Refrigeration pipe insulation:
  - . Spread-of-Flame Index: 0.
  - . Smoke-Developed Index: ≤ 3.
- Other materials:
  - . Spread-of-Flame Index: ≤ 9.
  - . Smoke-Developed Index: ≤ 8 if Spread-of-Flame Index is more than 5.

Materials with reflective facing: Tested to AS/NZS 1530.3 (1999) and the recommendations of Appendix A6.

The requirements above are consistent with the NCC.

AS/NZS 1530.3 (1999) is a mandatory standard in the NCC. Smoke-Developed Index and Spread-of-Flame Index are determined under AS/NZS 1530.3 (1999). See also BCA (2022) C2D11.

For more stringent fire performance, consider requiring that both insulation material and facing individually meet the fire hazard indices, not just as a composite material.

AS/NZS 1530.3 (1999) Informative Appendix A6, recommends that reflective surfaces of test specimens (which would otherwise generally pass this test) be blackened and diagonally scored in order to simulate soot deposition onto reflective surfaces in a real fire situation. Note also that AS/NZS 1530.3 (1999) clause 4.12.2(c) requires three test specimens of laminated reflective surface materials to incorporate a vertical joint. For flexible ducting see also clause 4.9.2(a).

- DeltaCool-EPS-FR: Spread-of-Flame Index: 0.
- DeltaCool-PIR: Spread-of-Flame Index: 0.

- Smoke-Developed Index: ≤ 8 if Spread-of-Flame Index is more than 5.

- DeltaCool-EPS-FR: Smoke-Developed Index: 2.
- DeltaCool-PIR: Smoke-Developed Index: 3.

2.3 PRE-COMPLETION TESTS

Standards

General: Provide refrigeration equipment that has been subjected to physical tests as follows:

- Pressure tests: To AS/NZS 5149.2 (2016).

2.4 DELTA PANELS INSULATED PANELS

DELTA PANELS DeltaCool insulated panels comprise a roll-formed metal skin on two sides, factory bonded to a choice of core-Expanded Polystyrene Fire Retardant (EPS-FR) or Polyisocyanurate (PIR). Skins are coated with an anti-bacterial paint that inhibits the growth of bacteria. All DeltaCool panels are 1200 mm wide and can be rolled to the required length.

DeltaCool-EPS-FR

Description: Composite panels comprising pre-painted, roll form steel skins, bonded to an insulating core of fire retardant grade expanded polystyrene rigid cellular foam.

DeltaCool-PIR

Description: Composite panels comprising pre-painted, roll form steel skins, bonded to an insulating core of polyisocyanurate rigid cellular foam.

Insulation core

Standard: To AS/NZS 4859.1 (2018).

AS/NZS 4859.1 (2018) categorises insulation as follows: Formed shapes, Formed in situ, Compressible, Loose fill, IR reflective and Vacuum panels.

Internal and external skins

Skin material and thickness: As documented.

The available skin thickness are 0.4 mm and 0.6 mm depending on requirements for structural performance and fire resistance.

Factory pre-coating: Polyester to a dry film thickness of 25 µm. Antibacterial.

Finish: As documented.

Panel profile: As documented.

Dimensions

Panel thickness: As documented or to achieve the documented insulation R-Value.

This may be documented in the **Cool room schedule**.

Walls between cool rooms: Same insulation material and thickness as the walls of the higher temperature room.

Panel width:

- Standard module width: 1200 mm.

Other widths are also available e.g. 1000 mm and 1500 mm. The width should be chosen to minimise joints.

- Minimum width: 600 mm.

Ceiling panels

Thickness: To achieve the documented insulation performance except if the ceiling is trafficable or serves a structural function.

Structural and trafficable ceilings: If the ceiling is trafficable or serves a structural function, provide Professional Engineer's certification that the thickness and construction is adequate for the imposed loads and meets statutory requirements.

Professional engineer is defined in *0171 General requirements* as having the same meaning as the term in the NCC.

2.5 DOORS

Door type

Requirement: Provide DELTA PANELS insulated swing or sliding doors, as documented.

Document in the **Cool room schedule**, on the drawings, or if there is only one type, delete alternatives.

Door assembly

Type: Sliding or hinged panels as documented that close against a door frame. Provide all necessary door hardware, gaskets and accessories to form a complete installation.

Escape provisions: Provide access doors openable from both the inside and outside. If the door is electrically or pneumatically operated provide a means for opening the door manually.

Back-up escape provisions: Provide one of the following:

- A telephone in every room.
- Unlocked insulated safety exit door that can only be opened from the inside.
- A door to **EMERGENCY ACCESS DOORS**.
- A panel removable from the door or adjacent wall from the inside of the room making an opening large enough for a person to pass through easily.

Thermal performance: Provide doors and door sets that, when closed, have thermal insulation properties equal to those of the wall in which they are located.

Seal: Provide face sealing doors.

Sill-less doors: If the door has no sill, provide Fermod 473 adjustable camrise hinges to elevate the door clear of the floor surface during opening and closing.

Door panel

Construction: Provide doors of panel type construction, free of studding with skins bonded to both sides of an insulation core.

Insulation: Conform to **DELTA PANELS INSULATED PANELS**.

Edging: Form door edging from a heavy gauge aluminium extrusion with double web seal to both skins. Mitre corner and firmly secure to panel with stainless steel countersunk head screws.

Viewing panel

Type: Triple glazed, vacuum insulated with thermally broken aluminium frame.

External panes: Toughened safety glass to AS 2208 (2023).

Size and location: As documented.

Include in the **Cool room schedule** or on the drawings.

Door frame

Construction: Form frame stiles and head from 3 mm aluminium or 10 mm PVC-U extrusions incorporating rebates if required for door seating. Mitre corners and fix frame firmly to the inner and outer wall skins. Maintain the vapour seal of the wall panel. Make suitable provision for fixing the specified hardware.

Threshold

Heater cable section below doors: Locate heater cables as follows:

- Freezer door threshold flush with external floor: Locate heater cable in a channel formed in the external floor between two 25 x 25 x 3 mm aluminium angles recessed into the floor. Provide polyurethane packing below the heater cable and removable silicone seal above it.
- Freezer door threshold higher than the external floor: Locate heater cable in a removable section on the external face of the cool room, below the door threshold. Fix section with countersunk stainless steel screws.

Anti-condensation heater cables

Heater cables: Incorporate a thermal break and heater cables to prevent condensation on outside face of door.

Type: 230 V self-temperature regulating heater cable terminating in coiled tails. Provide earth leakage protection.

Installation: Install heater cables, accessible for replacement, under removable aluminium cover in the door frame and threshold.

Gaskets

Construction: Provide naturally resilient, non-hygroscopic neoprene or silicone rubber gaskets with not less than 2 sealing prongs. Fix to the door using a method that allows easy removal and replacement.

Door protection

Requirement: If door protection is documented, provide 2.5 mm thick aluminium checker plate, the width of the door, to both sides of the door and to a height of 1200 mm.

If required, include door protection in SELECTIONS or show on the drawings.

Door energy conservation

Open doors can significantly affect cool room energy use. AIRAH DA12 (2020) claims that plastic strip curtains, automatic door closers or alarm systems and implementing proper door management through staff training can deliver savings of up to 15% of refrigeration energy.

The following may be included individually or in combination by documenting them in the **Cool room schedule**.

Plastic strip curtain: Provide heavy duty, clear plastic curtains with overlapping strips, as documented. Install the full width of the door. Minimise gaps at the top bottom and sides.

Automatic door closer: Provide an automatic closer as documented to close the door tight against its seals when not being held open.

Door open alarm: Provide an audible alarm as documented to signal when the door has been open for a pre-set time period.

2.6 EMERGENCY ACCESS DOORS

General

Requirement: Conform to **DOORS** with the following exception:

- Provide easily accessible internal release mechanisms fitted with luminous identification and instruction plates that do not require power.

2.7 DOOR HARDWARE

Catches

Construction: Provide externally lockable door catches with overriding internal safety release mechanism and internal handles for closing of door.

Hinges

Hinged doors: Hang hinged doors on edge mounted, rising butt type, self-closing hinges capable of holding the door fully open.

Material

Hinges, catches, handles and similar items: Heavy duty brass or gunmetal, chromium-plated to AS 1192 (2004), service condition number 2, satin finish.

Sliding track

Sliding doors: Hang sliding doors on an overhead sliding track mechanism of capacity suitable to the door, comprising an extruded aluminium track section, top carriages with ball bearing nylon wheels, bottom roller guides and a door height adjustment mechanism. Provide heavy duty rubber stops at both ends of the door travel.

Installation

Fixing: Securely bolt hardware to the door and frame. Minimise cold bridging and formation of condensation on the outside of the cool room.

Alarm bell

Bell: Provide a manually operated bell on the door with the operating mechanism on the inside and the bell on the outside. Recess the operating mechanism so that it is flush with the inside face of the door.

2.8 REFRIGERATION PLANT GENERALLY

Construction

Requirement: Provide one or more complete packaged systems per room consisting of condensing and evaporator units, designed and rated by the manufacturer to operate together.

Consider the need for duty-standby or dual systems rather than a single system per room.

Refrigeration system types

Type: Provide refrigeration systems as documented of the following types:

Include refrigeration system type in SELECTIONS or on the drawings.

- Split system: Two piece package system with separate evaporator and air cooled condensing unit.

Preferably show the location of the condensing unit on the drawing.

- Single drop-in unit: Drop-in or slide-in unit, self-contained one piece factory sealed unit, fully wired and complete with all controls.

Selection: Select system components to match the documented capacities and to operate without excessive saturated suction temperature.

Components

Requirement: Provide the following for each system:

- Air cooled condensing unit.
- One or more evaporators with fans.
- Automatic controls.
- Capacity control on systems over 30 kWr.
- Manual reset high pressure and auto reset low pressure cutouts.
- High and low side test points.
- Associated refrigerant and drain piping.
- Refrigeration plant power circuits.
- Vibration isolating mountings.
- Pressure relief to AS/NZS 5149.2 (2016).
- Phase failure protection on motors ≥ 5.5 kW.

- Permanent, weatherproof, wiring diagram fixed on or next to the control panel.

Split systems: Provide in addition:

- Liquid line solenoid valve.
- Liquid-suction heat exchanger.
- Thermostatic or electronic expansion valve.
- Compressor service valves.
- Integral positive temperature coefficient type crankcase heaters if required for safe compressor operation. Energise when the compressor is off.
- Schrader type connections for evacuation and refrigerant charging.
- Test valves.
- Liquid receiver with service valves. Size to hold the full refrigerant charge.
- Suction line vibration eliminator.
- Replaceable filter-dryer.
- Low oil pressure cutout.
- Liquid line sight glass and moisture indicator.
- Cool room temperature ≤ 0°C: Provide also:
  . Crankcase pressure regulator.
  . Liquid line accumulator with liquid heat exchanger.
  . Insulated oil separator.

Consider oil return and separator, particularly with long pipe runs.

Defrosting

Room operating temperature ≤ 2°C: Electric defrost.

Room operating temperature > 2°C: Natural defrost.

Tests

0171 General requirements defines different tests in **INTERPRETATION**, **Definitions**.

Type tests: Factory type test packaged refrigerating plant for capacity and operating performance to the following:

- Condensing units: To EN 13215 (2016).
- Evaporators: To EN 328 (2014).

2.9 EVAPORATORS

Description

General: Provide low-silhouette evaporators that include an extended surface aluminium finned copper cooling coil with externally mounted externally equalised expansion valve, refrigerant distributors, one or more fans and motors, one or more fan and motors, stainless steel or aluminium condensate drain pan and accessories. Locate the expansion valve bulb or sensor to the valve manufacturer's recommendations.

Type: Low profile induced draft or forced draft.

Casing: Stainless steel or heavy gauge aluminium.

Coils

Fins: ≤ 240 fins/m.

Room air to coil temperature difference: ≤ 5 K.

Face velocity: ≤ 2.5 m/s.

Fans

Type: Axial flow, aluminium blade, propeller with an IP54 motor, class E insulation and built-in auto-resetting overload protection.

Noise level in room with all fans operating: ≤ 65 dB(A).

Installation: Provide a corrosion-resistant fan guard and aerodynamic contoured tube housing. Provide easy access to each fan and motor for inspection and maintenance.

Air delivery: Direct to the room with a throw of not less than three quarters of the room length.

Consider EC fan motors as they are more energy efficient. (High voltage permanent magnet DC with built in AC to DC conversion.)

Motors: ≥ 0.37 kW: Three phase only.

Heaters

Room operating temperature ≤ 2°C: Provide coil defrost heaters and drain pan heaters consisting of totally enclosed sheathed heater elements, in banks designed for separate and easy removal in the case of failure. Provide dual heater circuits.

2.10 CONDENSING UNITS

Description

Type: Provide packaged condensing units comprising liquid receiver, compressor, hot gas line, condenser and accessories. Mount the components on a common grid corrosion protected steel base.

Room operating temperature ≤ 0°C: In addition, provide the following:

- Open surge tank suction accumulator.
- Back pressure regulator.
- Oil separator.

Consider EC fan motors as they are more energy efficient. (High voltage permanent magnet DC with built in AC to DC conversion.)

Compressor types

Type: Provide open type compressors as follows and as documented:

- Belt drive.
- Direct drive.
- Semi-hermetic.
- Hermetic.

Include compressor type in SELECTIONS or show on the drawings.

Hermetic and semi-hermetic compressors

Enclosure: Welded or accessible hermetic steel enclosure with minimum 3 mounting feet. Provide the following:

- Mounting: Vibration isolating mountings.
- Service valves: Packed and capped, backseating refrigerant suction valve.
- Charging connections: Schrader type connections for evacuation and refrigerant charging.

Crankcase heaters: Provide integral positive temperature coefficient type crankcase heaters if required for safe compressor operation.

Scroll compressors: Provide reverse rotation protection.

Gauges

Requirement: Provide suction and discharge pressure gauges to nominated condensing units.

If required, include in SELECTIONS or show on the drawings.

Air cooled condensers

Condenser coils:

- Tubes: Copper to AS 1569 (1998), AS 1571 (2020) or AS 1572 (2023) designation C12200.
- Fins: Aluminium alloy plate fins ≥ 0.12 mm thick to AS 2848.1 (1998), designation 3003 or 8011.
- Fin pitch: ≤ 550 fins/m.
- Subcooling: > 5 K.

For some environments e.g. close to the ocean, additional coil treatment may be needed. If so, see **ADDITIONAL COIL CORROSION PROTECTION** in *0733 Air coils*.

Fans: Propeller or axial flow as follows:

- Propeller fan: Direct drive with single thickness fixed pitch aluminium or ultraviolet light protected polypropylene blades.
- Aerofoil axial flow fan: Direct drive with adjustable pitch aerofoil section blades of ultraviolet light protected glass reinforced plastic or polypropylene, or aluminium.

Fan motors:

- Over 0.37 kW: Three phase.
- Speed: < 25 r/s.
- Bearings: Sealed for life ball bearings.
- Minimum degree of protection: IP55.

Head pressure control: Provide head pressure control by fan cycling.

Water cooled condensers

Type: Mechanically cleanable shell and tube condensers with steel end plates and shells and copper or copper alloy extended surface tubes.

Performance rating: Rate to AHRI 450 (2007).

Design pressures:

- Water side: ≤ 1000 kPa.
- Refrigerant side: To AS/NZS 5149.2 (2016).

Drain and vent: Provide valved water side drain and vent connections to each condenser.

Compressor cooling: If the compressor is not refrigerant cooled, provide a compressor cooling fan.

Sacrificial anodes: Provide sacrificial anodes conforming to AS 2129 (2000) and AS 2239 (2003) in the condenser water boxes to protect all ferrous metals.

Head pressure control: Provide a water flow control valve to maintain head pressure.

Condensing unit enclosure

Requirement: Provide an enclosed powder coated casing enclosure rated at IP54 to nominated condensing units. Arrange to be easily removable for service.

If required, include in SELECTIONS or show on the drawings.

2.11 REFRIGERATION PIPE INSULATION

Material

Material R-Value: To BCA (2022) J6D9.

Type: Chemically blown closed cell nitrile rubber or polyethylene in tubular form.

Physical properties:

- Maximum thermal conductivity: 0.04 W/(m.K) at 0°C.
- Moisture absorption: Non-hygroscopic.
- Water vapour resistance factor μ: ≥ 5000 to EN ISO 12629 (2022).

Water vapour resistance factor μ is the ratio of the water vapour diffusion resistance of the material to that of still air. As a ratio, it is unitless. If the water vapour permeability of still air is taken as 0.2 g/MN.s, a μ of 5000 is equivalent to 5000 times 0.2 or 1000 g/MN.s, which is 0.0001 μg/N.s.

2.12 SHELVING

General

Shelving: Provide proprietary adjustable modular shelving as follows:

- Posts: 25 x 25 x 1.2 mm cold-rolled angle section with 25 mm diameter foot with 65 mm height adjustment. Provide slotted holes at regular centres in the posts for shelf height adjustment.
- Shelf frames: 32 x 2.5 mm cold-rolled angle section at front and rear.
- Wire grid shelves: Welded frame with 4 mm wires at 25 mm centres supported on 8 mm centre and edge bars.
- Dunnage shelves: Welded frame with 25 x 25 x 1.6 mm square hollow section tubes at 65 mm centres.

Consider this construction also for shelves that are subject to high loadings and/or greater wear and tear.

Material: Hot-dip galvanized steel or stainless steel as documented.

Include material in SELECTIONS or show on the drawings.

3 EXECUTION

3.1 PANEL INSTALLATION

Manufacturer's instructions

Requirement: Conform to the recommendations of DELTA PANELS, IPCA 004.3 (2017) *Code of practice* and construction drawings.

Completion: Register the project's certificate of compliance to IPCA 004.3 (2017) *Code of practice* Annex D.

Joints

General: Provide each panel as a 1200 mm wide module, tightly drawn and interlocked with the joint system to provide structural integrity, thermal efficiency and a vapour barrier.

Joint finish: Provide aluminium extrusions or steel flashings of the same material as the panel skin, internally and externally as follows:

- At panel junctions, except if DELTA PANELS proprietary panel to panel joint is used.
- Between panels and building structures.

Sealant: Apply a continuous bead of sealant along extrusions to form a vapour seal.

Floor joint: Provide aluminium F extrusion base mould with mitred corners at the base of walls. Fix at 300 mm centres and/or to Professional engineer's recommendations.

See *0171 General requirements* for the definition of Professional engineer.

Panel butt jointing

General: Join using DELTA PANELS proprietary panel to panel joint with sealant applied to inside and outside to DELTA PANELS recommendations.

Cut panels

Position: Locate cut panels at the corners of the room.

Cutting: Use only DELTA PANELS approved blades.

Joint types

External corner joints: 50 x 50 mm folded extruded aluminium angle trim. Fix the external trim with sealed blind rivets.

Internal corner joints: 40 x 40 mm folded extruded aluminium channel or angle. Provide an extruded aluminium cove moulding with more than 25 mm radius to internal joints.

Aluminium cove is optional and can be fixed over the top of the internal angle for hygiene or aesthetic reasons.

Wall to ceiling joints: Form a rebate in the wall panel to receive the ceiling panel. Cut back the internal skin of the panel that is not rebated for the width of the rebate to provide continuous insulation contact.

This is to prevent cold bridging at this point.

Floor insulation to wall joint: Remove the inside skin of the cool room floor wall panels for the height of the floor insulation to form insulation continuity without gaps.

This is to prevent cold bridging at this point.

Joint covers

External wall and ceiling joint cover: Provide 50 x 50 mm extruded aluminium angle or 0.55 mm steel angle of the same material and finish as the panel skin.

Internal wall and ceiling joint cover: Coved aluminium extrusion or 0.55 mm steel angle of the same material and finish as the panel skin.

Delete steel angle if only coved extrusion required.

Internal floor joint cover: Coved aluminium extrusion.

Joint cover fixing: Fix the joint covers to panels with sealed blind rivets.

Panel penetrations

Non fire-rated construction: Provide flanged PVC-U sleeves for service penetrations through wall and ceiling panels. Fill the void between the service and the sleeve with sealant. Vapour seal the panel.

Fire-rated construction:

- Penetrations: Provide steel sleeve fire collar if services penetrate fire-rated wall and ceiling panel. Fill the void between the service and the sleeve with fire-rated foam approved by DELTA PANELS.

- Flashing: Provide a colour coated steel flashing around the penetration fixed with 4 mm diameter stainless steel rivets to the wall, sealed with sealant recommended by DELTA PANELS.

External flashing

Construction: Provide extruded aluminium or colour coated steel channel or angle to the base of walls. If this is exposed to the elements, provide either an apron flashing of colour coated steel to prevent ingress of water into the base joint, or a cove moulding of not less than 25 mm radius, as a flashing between the external wall and the external floor.

This is typical. Edit to suit external floor finish.

Internal wall protection

Requirement: Provide wall protection to internal walls of the cool room.

If required, include in SELECTIONS or show on the drawings.

Cool rooms with no shelving:

- Concrete wearing surface floor: Provide a 50 x 50 x 3 mm hot-dip galvanized rectangular hollow section rail 100 mm from the wall. Support rail 100 mm above the finished floor on 44 x 6 mm hot-dip galvanized brackets at ≤ 1500 mm centres.
- Aluminium checker plate or plywood wearing surface: Provide 4 heavy duty 100 x 25 mm extruded aluminium bump rail sections fixed horizontally to the full width of each wall. Locate at 250 centres vertically with the lowest bump rail 100 mm above the floor.

Cool rooms with shelving: Provide heavy duty 100 x 25 mm extruded aluminium bump rail sections fixed horizontally to the full width of the wall. Provide one per shelf at a height to suit the shelving.

3.2 SEALING

Manufacturer's instructions

Requirement: Conform to the recommendations of DELTA PANELS, IPCA 004.3 (2017) *Code of practice* and construction drawings.

Sealants

Type: Use a mastic sealant for internal mating surfaces and a liquid sealant as a secondary vapour barrier on external joints.

Sealants for fire-rated cool room construction

Type: Use a mastic sealant for internal mating surfaces and an acrylic fire-rated sealant as an intumescent barrier on external joints. If fire-rated sealants are required on internal slip joints, provide breathing gap for 1 m or 10% of the height of the joint, whichever is the greater.

Vapour sealing

Construction: Form a continuous external vapour barrier around the cool room by vapour sealing the external wall and ceiling joints and penetrations, and by sealing the locating section to the base of the wall panels and to the vapour barrier membrane.

Water sealing for internal wash down areas

Construction: Form a waterproof joint between walls and floor wearing surfaces by sealing the internal cove and external flashing mouldings to the respective wall and floor surfaces. Seal all internal butt and corner joints to 1 m above the floor when wash-down required.

3.3 PRESSURE RELIEF

Relief port

Requirement: Provide each room with an operating temperature below 0°C with two relief ports in one wall.

Construction: Square aluminium body in a PVC-U sleeve with internal vertical hinged PVC-U vanes.

Size: To the recommendations of AIRAH DA12 (2020).

Heater: Provide an electric heater in each relief port to prevent malfunction resulting from freezing.

3.4 CEILING SUPPORT

Manufacturer's instructions

Requirement: Conform to the recommendations of DELTA PANELS and construction drawings.

Ceiling joints over internal walls

Overlap: If ceiling panels butt join over internal wall panels, locate the ceiling joint not less than 25 mm from the face of the wall panels.

Ceiling suspension
Requirement: To IPCA 004.3 (2017) *Code of practice*.

3.5 HEATED FLOOR SUBBASE

Heated subbase
Requirement: Provide a heated subbase incorporating a heating mat over the floor slab under cool rooms as follows:

- Under all rooms constructed on suspended floors.
- Under all rooms with an operating temperature below 0°C.

Heating mat
Construction: Provide a heating mat with twin overlapping circuits, each of 100% of the required heating capacity.

Cables: 230 V self-temperature regulating heating cable, factory-assembled into mats each with not more than 500 mm between adjacent coils and terminating in cold tails.

Output of heating mat: 15 W/m^2.

Mat installation
Location: Lay the mats on insulated spacers at centres recommended by the manufacturer to cover the whole floor area to within 200 mm of the walls.

Termination: Terminate the tails in a junction box located on the inside wall of the room.

Alternatively, show location on the drawings.

Screed: Embed the heating mats in a 1:3 cement: sand screed to provide not less than 25 mm minimum cover. Provide a smooth level surface finish, free of loose material and projections, suitable for receiving the vapour barrier membrane.

Testing
Continuity: Test the heating mat cables for electrical continuity:

- Before laying the screed.
- Continuously during the laying process and for the following 24 hours.

Method: Use a continuity warning device temporarily connected to the circuits during this period.

Tanking option
Tanking: Provide bituminous sheeting over the subbase or subfloor and sides of a rebated floor. Lap all joints 150 mm. Install to the manufacturer's recommendations.

If required, include in SELECTIONS or show on the drawings.

3.6 FLOOR VAPOUR BARRIER MEMBRANE

General
Material: Polyethylene film branded continuously:

- AS 2870 (2011) CONCRETE UNDERLAY 0.2 mm HIGH IMPACT RESISTANCE.

Installation
General: Install as follows:

- Lay over the base, lap joints at least 200 mm and seal the laps and penetrations with non-hardening mastic sealant spread in a continuous strip 75 mm wide.
- Tape over joints with polyethylene pressure-sensitive adhesive tape, applied without wrinkles. Face the laps away from the direction of concrete pour.
- Patch or seal punctures or tears before pouring concrete. Cut back excess polyethylene film not required as a vapour barrier after concrete has gained strength and forms have been removed.

Base preparation: Remove projections above the plane surface, and loose material.

Locating section: Fix over the vapour barrier membrane, extruded aluminium angles mitred at the corners to form a locating frame for positioning the walls of the cool room. Fix the locating frame by securing to the subfloor using masonry anchors. Vapour seal the fastener penetration with sealant before inserting the fastener.

Vapour seal: Apply continuous mastic sealant between the locating section and vapour barrier membrane and between the locating section and the wall panels.

3.7 FLOOR INSULATION

Insulation

Insulation thickness: Same as documented for walls and ceilings.

This may be documented in the **Cool room schedule**.

Concrete wearing surface

Floors with a concrete wearing surface: Lay rigid cellular polyurethane sheet insulation to AS 1366.1 (1992) over the whole of the internal floor area tightly fitted without gaps immediately above the vapour barrier membrane. Lay the insulation boards in two equal thickness layers using ship-lapped joints.

Aluminium checker plate or plywood wearing surface

Floors with an aluminium checker plate or plywood wearing surface: Provide floor insulation in the form of prefabricated panels, bonded to the wearing surface. Lay panels immediately above the vapour barrier membrane and tightly fitted without gaps.

Aluminium and plywood are not generally suitable for rooms below freezing.

3.8 RECESSED COOL ROOM FLOORS

General

Grout: If the installation of wall panels within the setdown for a recessed cool room floor results in a space between the vertical face of the setdown and the wall panels, grout the space between the two to finish level with the floor.

3.9 WATERPROOF MEMBRANE

General

Membrane and sealing: Conform to **FLOOR VAPOUR BARRIER MEMBRANE**.

Installation: Lay the membrane over the floor insulation with 150 mm overlaps at the joints. Turn the edges up against the wall inner skin, to the lesser of a height of 50 mm or the top of the cove moulding.

3.10 FLOOR WEARING SURFACE

General

Requirement: Provide a wearing surface:

- To accept the floor in-service loads without damage to the floor insulation.
- With a hard wearing surface finish.

Include the wearing surface type in SELECTIONS or show on the drawings.

Grading: Grade the surface to doorway.

Cool rooms for food storage: To AS 4674 (2004) Section 3.

AS 4674 (2004) Section 3 includes acceptable floor finishes and coving. It prohibits feather edge skirting.

Concrete wearing surface

Construction: Provide a concrete slab reinforced with steel fabric to AS/NZS 4671 (2019) SL72 mesh. Locate the fabric to provide a top cover of 25 mm, by means of reinforcement supports, chairs, blocks or supports resting on metal or plastic chairs, blocks or supports.

Coving: Provide a 75 mm radius cove in the concrete at the junction between the wearing surface and the wall inner skin. Finish the cove under an aluminium coving angle. Seal gaps to **SEALING**.

Concrete strength: 40 MPa.

Entrained air: If the room operating temperature is not more than 0°C, conform to AS 3600 (2018) clause 4.7.

For 10 mm aggregate and concrete subject to freezing, AS 3600 (2018) clause 4.7 limits the percentage of entrained air to between 4% and 8%.

Maximum aggregate size: 10 mm.

Slab thickness: ≥ 75 mm.

This thickness should allow for falls (1:100 in AS 4674 (2004)).

Finish: Provide a finish to the concrete conforming to the following:

- As laid concrete: Finish the concrete surface in a slip-resistant finish by trowelling silicon carbide or aluminium oxide grains into the surface.
- Epoxy coating: Apply a 3 mm thick slip-resistant epoxy coating to the floated concrete surface.
- Steel tiles: Bed and grout steel tiles to the concrete surface.
- Ceramic tiles: Selected slip-resistant, fully vitrified ceramic tiles. Bed and grout to the concrete surface.

Aluminium checker plate wearing surface

Construction: Bond 20 mm thick marine plywood to AS/NZS 2272 (2006), formaldehyde emission class E_1 or lower, over the whole surface area to the floor insulation metal skin. Bond 2.5 mm thick aluminium checker plate to the whole surface area of the plywood with a flexible and durable adhesive recommended by the manufacturer for this application. Extend aluminium plate into the door threshold.

Joints: Locate aluminium plate joints to overlap the joints in the marine plywood by ≥ 50 mm. Fix aluminium plate joints to the marine ply with stainless steel screws and seal with sealant.

Coving: Provide an extruded aluminium cove moulding, ≥ 25 mm radius, at the junction between the wearing surface and the wall inner skin. Seal gaps to **SEALING**.

Consider aluminium checker plate for cool rooms if the floors will be subject to a significant abuse, e.g. kegs being rolled and dropped often. Stainless steel is another option but is far less common because of its significantly greater expense. Aluminium checker plate is an alternative to metal tiles that were previously used for such applications.

Plywood wearing surface

Construction: Provide 20 mm thick marine plywood to AS/NZS 2272 (2006), formaldehyde emission class E_1 or lower, bonded to the floor insulation metal skin. Apply a 3 mm thick slip-resistant epoxy coating to the marine plywood.

Coving: Provide an extruded aluminium cove moulding, not less than 25 mm radius at the junction between the wearing surface and the wall inner skin. Seal gaps to **SEALING**.

Vinyl wearing surface

Requirement: Provide a vinyl wearing surface over concrete or plywood, as documented.

Construction: Install to vinyl manufacturers' recommendations for cool room application.

Coving: Provide a 75 mm radius cove moulding. Run vinyl cove to 100 mm on wall above the floor.

Document floor finish in SELECTIONS or on the drawings.

3.11 REFRIGERANT PLANT

General

Access for maintenance: To **ACCESS FOR MAINTENANCE** in *0171 General requirements*.

Vibration suppression: To **VIBRATION SUPPRESSION** in *0171 General requirements*.

Evaporators

Location: To the recommendations of AIRAH DA12 (2020).

Mounting: Mount the evaporator below the ceiling, with 450 mm between the wall and the rear of the evaporator and at least 2100 mm clearance under.

Support: Suspend the unit from cold-rolled metallic-coated steel bearers mounted above the room. Extend the bearers to the cool room walls and size to suit the load and span.

Hardware: Nylon or stainless steel to suit the load.

Condensing units

Location: To the recommendations of AIRAH DA12 (2020).

Vibration isolation: Mount each condensing unit on 4 vibration isolators.

Support: Support condensing units on either a concrete plinth or hot-dip galvanized steel frame securely fixed to the wall, floor or slab above using anchor bolts.

Arrangement: Provide clearance around units for condenser air flow and maintenance access. Make sure discharge air does not short-circuit to condenser intake.

Alternatively adjust outdoor coil air entering temperature to compensate for elevated air temperature due to recirculation.

Plinths: If located on grassed or similar permeable surfaces, provide concrete plinths under outdoor equipment.

For plinths see *0171 General requirements*. Preferably show plinths on the drawings. Consider security of outdoor equipment.

Refrigerant leak detection

Requirement: Provide refrigerant leak detection to AS/NZS 5149.3 (2016).

Sensors: To **GAS SENSORS**, **Refrigerant sensor** in *0771 Automatic controls*.

3.12 REFRIGERATION PIPING

General

Requirement: Conform to equipment manufacturer's recommendations for the refrigerant used. Provide refrigeration piping designed and installed so that the complete system meets the documented performance and operating conditions.

Design

Suction lines: Size for pressure drop less than 1.0 K saturated suction temperature.

Correct sizing of suction lines is essential to the efficient operation of the system. Normally units are selected with a capacity above that documented. If the suction line is undersized the loss in capacity may be hidden behind the excess plant capacity. For the owner however excess suction line pressure drop means wasted energy. In more extreme situations it can result in the unit failing to meet required latent cooling capacity as the excess suction line pressure drop appears as an elevated evaporator suction temperature and hence coil dew point.

Oil return: Size for oil return to compressor. If velocity for oil return would result in the suction line pressure drop exceeding pressure drop limit, provide double suction risers. Prevent oil draining back during the off cycle.

Liquid lines: Size for pressure drop of less than 1.0 K saturated liquid temperature when handling the manufacturer's unit capacity under the operating temperatures stated in the schedules.

Layout

General: Install pipework in straight lines and uniform grades without sags. Grade horizontal hot gas lines and suction lines at not less than 1 in 200 in the direction of gas flow.

Location: When possible, run suction and liquid lines inside common insulation.

This reduces condensation and the resulting heat transfer increases refrigeration efficiency.

Connections to vibrating equipment. Provide flexibility to resist vibration by way of coiled pipe connections or braided hose.

Pipe support

Requirement: To **SERVICES INSTALLATION**, **Pipe support systems** in *0171 General requirements*.

Stand-off brackets: If pipes are exposed within the cool room or in food preparation areas, support on brackets to provide the clearances from adjacent surfaces to AS 4674 (2004) clause 3.2.9.

Pipes

Piping: Provide copper tubes as follows:

- ≤ DN 15: To AS 1571 (2020)-O.
- > DN 15: To AS 1571 (2020)-1/2H. Use annealed copper only for pulled bends.

O temper = fully softened condition (annealed). 1/2H = intermediate temper (half hard).

Pipe wall thickness:

- Pipes ≤ DN 50: To Type B.
- Pipes > DN 50: ≥ 1.6 mm.

Deemed-to-Satisfy for split systems under 7.5 kW cooling capacity: Split system manufacturer's standard pre-charged piping kit.

Bends

Pulled bends: Form bends without flattening or wrinkling with an inside radius not less than 3 pipe diameters using the correct tool size for the pipe diameter.

Pipe fittings

Copper alloy fittings: To AS 3688 (2016), dezincification resistant, welded, brazed or compression type only.

Preformed fittings: Preformed refrigerant capillary line tees, bushes, couplings and elbows. Wherever possible make reductions at elbows, tees, line devices or equipment connections with reducing fittings, otherwise provide reducing bushes or reducing couplings.

Compression fittings: Flareless twin ferrule, torque free, mechanical grip fittings that can be gauged using a precision ground and hardened metal gap inspection gauge. Provide frost proof flare nuts.

Screwed joints: Use only if equipment items are not available with flare, flanged or brazed capillary connections.

Brazed joints

General: Provide preformed capillary fittings or form capillary unions by expanding one pipe end. Prevent flux and brazing alloy from entering pipes. Use dry nitrogen to purge air from pipes before brazing. During brazing, maintain a flow of dry nitrogen through pipes to prevent oxidation.

Avoid flared screwed or flanged joints wherever possible. In addition to using nitrogen, if possible clean internal accessible joints before proceeding with further assembly work, to provide the maximum possible internal cleanliness.

Brazing alloy: To AS/NZS ISO 17672 (2023) Table 7 alloy CuP 284.

Brazing alloy for jointing dissimilar metals: To AS/NZS ISO 17672 (2023) Table 6 alloy Ag 134.

Sleeves

General: Provide pipe sleeves if pipes pass through building elements. Insulate the space between the pipe and sleeves.

Sleeves are covered in *0171 General requirements*.

Valves

General: Provide valves to AS/NZS 5149.2 (2016). Make provision for charging and withdrawal of refrigerant. If a gauge is not permanently connected (for example commissioning connections), seal the outlet of the isolating valve with a flared seal cap nut.

Valve types

Expansion valves: To maintain correct superheat over the operating range.

Line valves: Packed and capped line globe valves: Back seating valves with renewable nylon or PTFE seats, packed spindle and removable gland cap. Incorporate mounting feet integral with valve body with adequate fixing holes.

Service valves: Backseating type with gasketed cap.

Solenoid line valves: Solenoid coil and valve parts replaceable without disturbing valve body or refrigerant piping.

Piping protection

Extent: Protect refrigeration piping exposed to view, weather or potential damage with piping covers fabricated from 0.6 mm thick prefinished metallic-coated steel.

e.g. Colorbond.

Section: Folded hat sections to suit piping.

Weatherproofing: Weatherproof external joints and fasteners with non-setting mastic sealant.

3.13 CONDENSATE DRAINS

See AS/NZS 3666.1 (2011) clauses 2.8 and 2.9 for drainage requirements and recommendations. See NATSPEC TECHnote DES 022 for more information on requirements for microbial control in buildings.

General

Condensate drains: Provide trapped drain lines with uniform and continuous fall to connect condensate trays to the nearest building drain point.

Preferably show the location of building drain points on the drawings. There may be local statutory restrictions on where condensate can be discharged.

Material:

- Room operating temperature > 0°C: PVC-U.
- Room operating temperature ≤ 0°C:
  - . Inside room: Copper.
  - . Outside room: PVC-U.
- All cool rooms in kitchens: Chromium plated copper.

Size: The greater of unit drain connection size and DN 20.

Pipe support spacing: To AS/NZS 3500.1 (2021) Table 5.7.4.

AS/NZS 3500.1 (2021) Table 5.7.4 includes copper and PVC-U, and other materials.

Sealing: Seal drain pipes if they penetrate casing.

Termination: Terminate drains to allow visual inspection of condensate flow.

Traps: To withstand more than 2 times fan static pressure. Construct from either:

- Transparent, kink resistant hose.
- PVC-U trap with removable caps and a visible air break.

Falls and drains: Check that the condensate tray falls conform to AS/NZS 3666.1 (2011) and in particular that trays and sumps are graded to the outlet to prevent moisture retention. Test drains by pouring a measured quantity of water into upstream end.

Trace heating

Room operating temperature ≤ 2°C: Provide trace heating to condensate drain piping to prevent their contents from freezing.

It may be necessary to insulate drains in high humidity environments (e.g. tropical locations). If the condensate drain discharges into a waste line that has intermittent flows from other sources the waste may also require insulation.

Control: Integrate heater operation with defrost termination and fan delay thermostat.

Insulation

General: If drains run in ceilings above occupied areas or other locations where condensation could cause damage or nuisance provide insulation to **REFRIGERATION PIPE INSULATION**.

Insulation R-Value: ≥ 0.6 m^2.K/W.

Adjust R-Value to suit project conditions.

Consider including this *Optional* style text by changing to *Normal* style text.

3.14 REFRIGERATION PIPE INSULATION

Installation

General: Insulate any refrigerant piping that may sweat. Apply insulation un-slit if possible. If slit, refix slit faces with adhesive applied to full area.

Joining: Use only an adhesive or jointing system supplied by the insulation manufacturer.

Timing: Leak test piping to **EVACUATION OF REFRIGERANT GAS SYSTEMS** before insulating joints, fittings and valves.

Finish: If exposed to sunlight or to view in occupied areas, provide 2 coats of tintable, water-based, rubberised, ultraviolet-resistant, flexible paint finish.

Penetrations through fire rated elements: If insulated pipe penetrates a fire-resistance rated element, provide a section of non-combustible, non-hygroscopic insulation for the thickness of the element and 150 mm each side.

3.15 EVACUATION OF REFRIGERANT GAS SYSTEMS

General

System evacuation: Dehydrate the refrigerant gas system before charging with the refrigerant gas.

Evacuation: Use a high-vacuum pump, capable of reducing the pressure in the system to less than 53 Pa (400 µm) connected to both high and low pressure sides of the system with valves open and controls connected. Measure the pressure with calibrated electronic or similar gauges.

Test time: Maintain vacuum for a period not less than 12 hours to verify the vacuum is stable.

3.16 ELECTRICAL GENERALLY

General

Requirement: Conform to *0781 Mechanical electrical*.

Alternatively, consider *0782 Mechanical electrical - minor* for a stand-alone cool room contract.

Conduits: Box type sealed internally.

Stand-off brackets: If conduits are exposed within the cool room or in food preparation areas, support on brackets to provide the clearances from adjacent surfaces to AS 4674 (2004) clause 3.2.9.

Control panel cabinets

Construction: Provide control panels documented as follows:

- Metallic-coated steel: Construction to *0781 Mechanical electrical*.

- Proprietary: Proprietary IP65 polycarbonate enclosure with removable front cover retained by quarter turn fasteners with front cover fasteners and wall fixing holes located outside the sealed space. In all other respects conform to *0781 Mechanical electrical*.

Include panel type in SELECTIONS or show on the drawings.

3.17 BATTERY SUPPLY

General

Requirement: Provide a mains powered battery charger and battery to serve alarms and emergency lighting, independent of all other emergency power supply within the building.

Batteries

Type: Provide maintenance free, sealed, lead acid type batteries 12 volt.

Battery capacity: 7 amp hour or sufficient to run all emergency lights for 2 hours, whichever is the greater.

Battery charger

Type: Provide a battery charger suitable for continuous float charge use in conformance with the battery manufacturer's recommendations.

Charging current: 2.5 Amps maximum continuous current and a terminal voltage of 13.7 V d.c. Incorporate individual connections for battery and load output with a re-settable current overload protection device, with visual device incorporated in the charger.

Installation

Mounting: Securely mount the charger and battery in a separate enclosure with hinged door, of the same construction as the Control Board, attached to and mounted below the Control Board. Provide a label on the door BATTERY AND CHARGER.

Connection: Polarise the connections from the charger to the battery, and between the battery and load, or clearly mark to prevent reverse connection.

Label

Battery installation/replacement date: Attach a stamped metal tag to the battery indicating the installation date and advised replacement date to the battery manufacturer's recommendations.

3.18 LIGHTING

Service lighting

Cool rooms for food storage: To AS 4674 (2004) clause 2.6.

AS 4674 (2004) clause 2.6 references AS/NZS 1680.1 (2006) and AS/NZS 1680.2.4 (2017).

Service lighting requirement: Provide at least one 9 W LED service light fitting in each cool room.

Luminaires

Cool rooms for food storage: To AS 4674 (2004) clause 2.6.2.

Type: Provide LED luminaires specifically designed for use at both ambient temperature and the cool room operating temperature.

Diffuser: High impact acrylic or UV stabilised polycarbonate.

Protection: IP65 to AS 60529 (2004). Seal all wiring entries.

Switching requirements

Service lights: Provide a labelled ON/OFF control switch on the inside of the cool room adjacent to the door, to control the service light(s). Arrange so that the light cannot be switched off from outside the room.

Pilot light: Provide a pilot light on the outside of the cool room to indicate when the service lights are on.

3.19 EMERGENCY LIGHTING

General

Location: Provide an emergency light within each cool room adjacent to the exit door, positioned to illuminate the emergency door release mechanism, alarm and emergency instructions.

Luminaires

The contractor is responsible for locating the single point luminaires for conformance to AS/NZS 2293.3 (2018).

Type: Prismatic bulkhead type, fitted with a 3 watt 12 volt LED lamp, with non-corrosive body and hinged one piece polycarbonate cover, separated by a neoprene gasket and suitable for use at both the cool room operating temperature and ambient temperature.

Degree of protection: IP65 to AS 60529 (2004).

Switching: Power the emergency light from the emergency lighting battery supply, to operate automatically in the event of mains power supply failure to the cool room lighting circuit.

Visual indicator lights: Provide a red indicator, readily visible when the luminaire is in its operating location, which indicates that the battery is being charged.

Inverter system: Provide protection of the inverter system against damage in the event of failure, removal or replacement of the lamp, while in normal operation.

Local test switches: Provide a momentary action test switch, accessible from below the ceiling, on each luminaire to temporarily disconnect the mains supply and connect the battery to the lamp.

Common test switches: Provide a common test switch on the distribution board to disconnect the main supply to the luminaires to test discharge performance. Configure to automatically revert to normal operating mode on completion of the discharge performance test.

Batteries

Location: Locate batteries outside the cool room.

Type: Lead acid or nickel cadmium batteries capable of operating each lamp at its rated output continuously at least 2 hours during final commissioning, pre-practical completion tests and 1.5 hours during subsequent tests.

Battery life: At least 3 years when operating under normal conditions at an ambient temperature of 25ºC and subjected to charging and discharging at 6 monthly intervals.

5 or 6 years is possible in some circumstances. See AS/NZS 2293.2 (2019) for system checks.

Marking: Indelibly mark each battery with its date of manufacture.

See also AS/NZS 2293.1 (2018) clause 6.4.8.

Power supply

General: Provide an unswitched active supply to each luminaire and exit sign.

3.20 PERSONNEL SAFETY ALARM

Make sure that personnel safety conforms to local Work Health and Safety requirements.

Alarm

Requirement: Provide each cool room with a personnel safety alarm consisting of an emergency pushbutton switch and an audible alarm and indicator light in all cool rooms as follows:

- Emergency switch: Mechanical illuminated latching mushroom type located in cool room adjacent to the exit door and suitable for use at the cool room operating temperature.
- Audible alarm: Bell or siren type located above (outside) the cool room door. Alarm to be silenced by reversing the emergency switch.
- Indicator light: Flashing red, ≥ 50 mm diameter, located outside and above the cool room door.
- Label the light: PERSON TRAPPED IN COOL ROOM.

3.21 CONTROLS GENERALLY

General

Controls: To *0771 Automatic controls* and the following.

Control module

General: Provide a microprocessor-based electronic control module, to monitor and control each cool room and its refrigeration system. Locate each control module outside the cool room it serves. Provide the following functions:

- Control the cool room temperature.
- Adjustable set point and control differential.
- Measure, log (hourly) and display the cool room temperature.
- Display highest and lowest room temperature logs for period.
- Sensor calibration.
- High room temperature alarm.

- Automatic duty/standby change over for cool rooms with duty/standby systems.
- Alarm outputs.
- Phase failure relay.
- Automatic defrost cycle control.
- Defrost cycle sequencing to prevent simultaneous defrost if the cool room has multiple refrigeration systems.
- Separate fuses for each evaporator.
- Manual defrost initiate and termination.
- Display time to next defrost and time from last defrost.
- Anti-short cycle adjustable timer limits compressor starts per hour.
- Self-test function.
- Memory retention in the event of power failure.

Consider location of the control module. Possible arrangements are flush mounted on the fascia of the fixed panel above the door of the control board or surface mounted adjacent to the cool room door.

Evaporator shutdown: Provide a labelled switch to **LIGHTING**, **Switching requirements** matching the light switch for each cool room to shut down the evaporator fans and refrigerant solenoid valves.

Temperature control

Control accuracy: Maintain the required room temperature within ±0.5 K of set point.

Evaporator fans: To run continuously during normal (non-defrost) operation.

Defrost cycle

Room operating temperature > 0°C: Provide a defrost cycle controlled by the electronic control module, with time initiation and evaporator temperature termination. Run evaporative fans continuously during defrost.

Room operating temperature ≤ 0°C: Provide a defrost cycle controlled by the electronic control module, time initiated and evaporator temperature terminated. De-energise the evaporator fan during the defrost cycle and delay it from restarting on termination of the defrost cycle until the evaporator reaches operating temperature.

Door interlock

Requirement: Provide a switch to sense when the door is opened so that:

- Lighting within the cool room is switched and remains on based on motion detection.
- Evaporator fans are switched off while the door remains open.

Installation protection

Requirement: Provide the following:

- Motor thermal overload.
- Manually reset low and high pressure cutouts.
- Separate fuses for multiple evaporator fans.

BMS interface

BMS points: Provide the alarm and monitoring points to interface with the BMS.

Include BMS points in SELECTIONS or show on the drawings. Coordinate the BMS interface with *0773 Building management systems.* Refer to that worksection for interface issues such as interoperability, e.g. via ANSI/ASHRAE 135 (2024) (BACnet) compliance.

DIGITAL SYSTEM CONTROLLER INTERFACE in *0771 Automatic controls* may be used as a basis for specifying the interface in this worksection.

Connection: Provide voltage-free contacts wired to a dedicated terminal strip in the respective cool room switchboard.

Coordinate with *0773 Building management systems*.

Independent operation: Arrange the interface so that failure or fault in the BMS does not render the cool room installation inoperative in any way.

3.22 CONTROLS FOR COOL ROOMS WITH DROP-IN AND SLIDE-IN SINGLE PACKAGED REFRIGERATION UNITS

General

Control: If a drop-in or slide-in packaged refrigeration unit is documented for the cool room, provide the unit fully factory wired and complete with all refrigeration controls, other controls and safety features.

Include refrigeration system type in SELECTIONS or show on the drawings.

Thermometer: Provide a 100 mm dial thermometer to each cool room.

Defrost: Incorporate electric defrost heaters in refrigeration units. Defrost to be time initiated, pressure or temperature terminated, with fail-safe override and evaporator fan delay.

3.23 PAINTING AND LABELLING

General

Requirement: Conform to *0171 General requirements*.

Standards

Refrigeration systems: To AS/NZS 5149.2 (2016).

Safety signs: To AS 1319 (1994).

Emergency instructions

Notice: Provide a notice located within the cool room adjacent to the door indicating the locations of the personnel safety alarm switch and door release mechanism with instructions on how to activate the alarm and operate the door release mechanism.

Construction: Photo luminescent type with lettering at least 15 mm high. Screw fix to the cool room wall panel. Provide a photo luminescent exit sign above the cool room door.

Photo luminescent sign output: ≥ 2 mcd/m^2, 60 minutes after light source is removed.

Labels

General: Provide labels for the following:

- Controls.
- Switches.
- Switchboard components.
- Indicator lights.
- Alarms.
- Each cool room door.

Consider coordination of door labelling with other door labels in the project.

- Control boards.
- Condensing units.

Labelling of insulated panels

Requirement: To IPCA 004.3 (2017) *Code of practice* Annex B.

3.24 COMMISSIONING

For information on the commissioning process refer to NATSPEC TECHnote GEN 010 and NATSPEC TECHnote GEN 020.

Compliance with this clause targets the Commissioning requirement within the Minimum Expectation level of the Verification and Handover credit in Green Star Buildings (2021).

General

Requirement: Conform to *0791 Mechanical commissioning*. Commission to DELTA recommendations.

Standard: To the recommendations of AIRAH DA12 (2020).

3.25 COMPLETION

Reinstatement

Fasteners: If required, adjust for weather tightness without distortion of external panel face.

Extent: Repair or replace damage to the roofing and rainwater system. If the work cannot be repaired satisfactorily, replace the whole area affected.

Touch up: If it is necessary to touch up minor damage to prepainted metal roofing, do not overspray onto undamaged surfaces.

Cleaning

Requirement: Remove excess debris, metal swarf, solder, sealants and unused materials.

Exposed metal surfaces: Clean surfaces of substances that interfere with uniform weathering or oxidisation.

Protection: Remove protective coatings using methods required by the manufacturer after completion.

Protective film will withstand exposure to weather for a limited period of time before losing its peel-off characteristics and causing staining. The gloss coating changes when exposed to plasticisers.

Panels and floors: Clean to manufacturer's recommendations.

Panel finishes may require special cleaning products.

Operation and maintenance manuals

Requirement: Prepare a manual that includes recommendations from DELTA PANELS for annual maintenance of the cladding system, including recommended methods of access, inspection, cleaning, repair and replacement.

Compliance with this subclause targets the Operations and Maintenance requirement within the Minimum Expectation level of the Verification and Handover credit in Green Star Buildings (2021).

Warranties

Requirement: Cover warranties for materials and workmanship from the supplier and the installer.

- Form: Against failure of materials and execution under normal environment and use conditions.
- Warranty for workmanship: 2 years.
- Warranty for materials: 20 years.

Use only if warranties extending beyond the defects liability period are available for the particular system. Insert the required warranty period and terms, which should be negotiated beforehand. If the warranty is in the form of separate material and installation warranties, the signatures of both manufacturer and installer are required.

The form(s) required should be provided as part of the contract documentation.

DELTA PANELS standard warranty is 2 years for workmanship and 20 years for materials.

3.26 MAINTENANCE

General

Requirement: Provide maintenance as documented. Conform to *0792 Mechanical maintenance*.

4 SELECTIONS

Schedules are a tool to specify properties required for products or systems. If the principal permits documentation of the product or system by proprietary name, some of the properties may be unnecessary and can be deleted. Document the product or system's location or application here and/or on the drawings with a matching project code. Refer to NATSPEC TECHnote GEN 024 for guidance on using and editing schedules.

4.1 COOL ROOMS

Cool room schedule

	Cool room 1	Cool room 2	Cool room 3
DELTA panel type			
Room function			
Room internal dimensions: Length (mm)			
Room internal dimensions: Width (mm)			
Room internal dimensions: Height (mm)			
Room operating temperature (°C)			
Air cooled condenser: Air entering temperature (°C)			
Water cooled condenser: Water entering temperature (°C)			

	Cool room 1	**Cool room 2**	**Cool room 3**
Water cooled condenser: Water leaving temperature (°C)			
Refrigeration plant capacity at above conditions (kWr)			
Refrigeration plant operating hours per day			
Panel thickness (mm)			
Panel skin profile			
Panel skin thickness (mm): Internal and external			
Panel skin profile			
Panel finish and colour: External			
Panel finish and colour: Internal			
R-Value (m^2.K/W)			
Panel protection: Internal wall protection			
Panel protection: Door protection			
Floor: Floor wearing surface type			
Floor: Concrete wearing surface finish			
Floor: Tanking option			
Main door: Door type			
Main door: Door clear opening (width x height) (mm)			
Main door: Viewing panel size (width x height) (mm)			
Emergency access doors: Number required			
Emergency access doors: Door action			
Emergency access doors: Door clear opening (width x height) (mm)			
Door plastic strip curtain			
Automatic door closer			
Door open alarm			
Refrigeration plant: Type			
Refrigeration plant: Acceptable refrigerants			
Refrigeration plant: Compressor type			
Refrigeration plant: Compressor drive			
Refrigeration plant: Suction and discharge pressure gauges			
Refrigeration plant: Condensing unit enclosure			
Refrigeration plant: Condenser fan motor			
Refrigeration plant: Evaporator fan motor			
Control panels: Enclosure material			
Service lighting: Number of luminaires			
Control options: Phase failure relay			
Control options: Condensing unit fault			

	Cool room 1	Cool room 2	Cool room 3
indication			
Control options: Lamp test switch			
Remote alarms: Refrigeration plant fault			
Remote alarms: Room over temperature			

The codes in the header row of the schedule designate each application or location of the item scheduled. Edit the codes to match those in other contract documents.

Some items in this schedule may be omitted if the respective clauses are deleted (e.g. Internal wall protection if the **Internal wall protection** subclause is deleted. Alternatively, some or all of the details in this schedule may be shown on the drawings and deleted from the schedule. Similarly, if schedule items are detailed on the drawings they should be deleted from the schedule.

DELTA panel type: Select from the following:

- DeltaCool-EP-FR.
- DeltaCool-PIR.

Room function: e.g. Restaurant service, Pharmaceutical storage, Mortuary.

Air cooled condenser: Air entering temperature (°C): To suit site and plant configuration. If air flow is restricted consider specifying a value higher than design ambient to compensate. Delete if there are no air cooled units.

Water cooled condenser water entering/leaving temperature (°C): Delete if there are no water cooled units.

Refrigeration plant operating hours per day: e.g. 18. This is used to calculate plant capacity allowing for defrost. Omit if the refrigeration plant is fully specified.

Panel thickness: Select from 35 mm, 50 mm, 75 mm, 100 mm, 125 mm, 150 mm, 175 mm, 200 mm, 225 mm and 250 mm.

For the majority of NCC climate zones (2 to 8) DELTA PANELS recommend 75 mm panels for rooms above freezing and 100 mm panels for rooms below freezing. Rooms in zone 1 may require an increased thickness such as 100 mm for rooms above freezing and 150 mm for rooms below freezing.

AIRAH DA12 (2020) recommends R-Values of ≥ 4.5 m².K/W for rooms above freezing and ≥ 6.0 m².K/W for rooms below freezing. Condensation is unlikely to be a problem in any climate zone with these R-Values. If using the AIRAH recommendations, insert panel thickness appropriate to the selected DELTA insulation material. R-Values of DELTA panels are as follows:

Panel thickness	DeltaCool EPS-FR	DeltaCool PIR
50 mm	1.4	2.16
75 mm	2.1	3.23
100 mm	2.7	4.31
125 mm	3.4	5.39
150 mm	4.1	6.47
175 mm	4.8	7.54
200 mm	5.4	8.62

Panel skin thickness: e.g. 0.4 mm, 0.5 mm or 0.6 mm.

Panel skin profile: Select from the following:

- Smooth.
- Ribbed.
- 5V.
- SatinLine.
- Mesa.
- Single V.

Panel finish and colour: External:

- 0.4 mm: Off-white Colorbond Permagard.
- 0.6 mm: Select from standard Colorbond® range.

Panel finish and colour: Internal:

- 0.4 mm: Off-white Colorbond Permagard.
- 0.6 mm: Select from standard Colorbond® range.

R-Value:

- DeltaCool-EPS-FR: R-Values range from 1.40 to 6.1.
- DeltaCool-PIR: R-Values range from 2.16 to 8.62.

Panel protection: Internal wall panel protection: e.g. Required, Not required.

Door panel type: e.g. Swing or horizontal sliding, Full face or Flush, Sill or Sill-less. Consult DELTA PANELS documentation for options.

Door panel protection: e.g. Required, Not required.

Floor:

- Floor wearing surface type: e.g. Concrete, Aluminium checker plate, Plywood.
- Concrete wearing surface finish: e.g. As laid, Epoxy coated, Ceramic tiles.
- Tanking option: e.g. Required, Not required.

Main door:

- Door type: e.g. Hinged, Sliding.
- Door protection option: e.g. Required, Not required.
- Viewing panel size (width x height) (mm): Insert dimensions or Not required.

Door plastic strip curtain: e.g. Required, Not required.

Automatic door closer: e.g. Required, Not required.

Door open alarm: e.g. Required, Not required.

Refrigeration plant:

- Type: e.g. Split system, Single drop-in unit, Single slide-in unit.
- Acceptable refrigerants: This may be omitted if the refrigerants permitted under the respective legislation are acceptable. See NATSPEC TECHnote PRO 007 on refrigerant options.
- Compressor type: e.g. Belt driven open drive, Direct driven open drive, Hermetic, Semi-hermetic.
- Compressor drive: e.g. a.c., inverter, digital.
- Suction and discharge pressure gauges: e.g. Required, Not required.
- Condensing unit enclosure: e.g. Required, Not required (omit for drop-in and slide-in types).
- Condenser fan motor: e.g. a.c., or EC.
- Evaporator fan motor: e.g. a.c. or EC.

Control panels: Enclosure material: e.g. Metallic-coated steel, Polycarbonate.

Control options:

- Phase failure relay: e.g. Required, Not required.
- Condensing unit fault indication: e.g. Required, Not required.
- Lamp test switch: e.g. Required, Not required.

Remote alarms:

- Refrigeration plant fault: e.g. Required, Not required.
- Room over temperature: e.g. Required, Not required.

4.2 BMS INTERFACE

Cool room BMS points schedule

Equipment item and point description	Point type	Scheduled	Trend log	Alarm	Include in graphic

Legend
AI: Analog input (hardware point).
AO: Analog output (hardware point).
DI: Digital input (hardware point).
DO: Digital output (hardware point).

Use this schedule to define interface requirements to the building management system so their values can be transmitted to the BMS.

Other possible inclusions are software points e.g. AV (analog value), BV (binary value).

Points schedules are often restricted to hardware points; however software points may be included so their values can be transmitted to the BMS. Exercise caution if including software points. Failure to include points may give rise to variations.

Key to schedule

Equipment item and point description: e.g. Cool room temperature.

Point type: See **Legend**.

Scheduled: Insert time schedule or No.

Trend log: If logging is required (e.g. Required, Not required).

Alarm: If alarm is required (e.g. Required, Not required).

Include in graphic: If the point is to be included in a BMS graphic (e.g. Yes, No).

Adapting the Cool room BMS points schedule for design by contractor

Insert the information described in the above guidance.

4.3 COOL ROOM ACCESSORIES

Shelving schedule

	Cool room 1	Cool room 2	Cool room 3
Number of shelving modules			
Size of modules (width x depth x height) (mm)			
Number of shelves per module			
Post and frame material			
Shelf material			
Number of dunnage shelves			
Size of dunnage selves (width x depth) (mm)			
Dunnage shelf material			

The codes in the header row of the schedule designate each application or location of the item scheduled. Edit the codes to match those in other contract documents.

Some or all of the details in this schedule may be shown on the drawings and deleted from the schedule.

Post and frame material: e.g. Metallic-coated steel, Stainless steel.

Shelf material: e.g. Metallic-coated steel, Stainless steel.

Dunnage shelf material: e.g. Metallic-coated steel, Stainless steel.

Adapting the Shelving schedule for design by contractor

Insert the information described in the above guidance.

REFERENCED DOCUMENTS

The following documents are incorporated into this worksection by reference:

AS/NZS ISO 817	2016	Refrigerants - Designation and safety classification
AS 1192	2004	Electroplated coatings - Nickel and chromium
AS 1319	1994	Safety signs for the occupational environment
AS 1366		Rigid cellular plastics sheets for thermal insulation
AS 1366.1	1992	Rigid cellular polyurethane (RC/PUR)
AS 1530		Methods for fire tests on building materials, components and structures
AS/NZS 1530.3	1999	Simultaneous determination of ignitability, flame propagation, heat release and smoke release
AS 1569	1998	Copper and copper alloys - Seamless tubes for heat exchangers
AS 1571	2020	Copper - Seamless tubes for air-conditioning and refrigeration
AS 1572	2023	Copper and copper alloys - Seamless tubes for engineering purposes
AS 2129	2000	Flanges for pipes, valves and fittings
AS 2208	2023	Safety glazing materials in buildings
AS 2239	2003	Galvanic (sacrificial) anodes for cathodic protection
AS/NZS 2272	2006	Plywood - Marine
AS 2848		Aluminium and aluminium alloys - Compositions and designations
AS 2848.1	1998	Wrought products
AS 2870	2011	Residential slabs and footings

AS/NZS 3500		Plumbing and drainage
AS/NZS 3500.1	2021	Water services
AS 3600	2018	Concrete structures
AS/NZS 3666		Air-handling and water systems of buildings - Microbial control
AS/NZS 3666.1	2011	Design, installation and commissioning
AS 3688	2016	Water supply and gas systems - Metallic fittings and end connectors
AS/NZS 4671	2019	Steel for the reinforcement of concrete
AS 4674	2004	Design, construction and fit-out of food premises
AS/NZS 4859		Thermal insulation materials for buildings
AS/NZS 4859.1	2018	General criteria and technical provisions
AS/NZS 5149		Refrigerating systems and heat pumps - Safety and environmental requirements
AS/NZS 5149.1	2016	Definitions, classification and selection criteria (ISO 5149-1:2014, MOD)
AS/NZS 5149.2	2016	Design, construction, testing, marking and documentation (ISO 5149-2:2014, MOD)
AS/NZS 5149.3	2016	Installation site (ISO 5149-3:2014, MOD)
AS/NZS 5149.4	2016	Operations, maintenance, repair and recovery (ISO 5149-4:2014, MOD)
AS 5637		Determination of fire hazard properties
AS 5637.1	2015	Wall and ceiling linings
AS/NZS ISO 17672	2023	Brazing - Filler metals
AS/NZS 60335		Household and similar electrical appliances - Safety
AS/NZS 60335.1	2022	General requirements (IEC 60335-1 Ed 6, MOD)
AS/NZS 60335.2.89	2020	Particular requirements for commercial refrigerating appliances and ice-makers with an incorporated or remote refrigerant unit or motor-compressor
AS 60529	2004	Degrees of protection provided by enclosures (IP Code)
BCA J6D9	2022	Energy efficiency - Air-conditioning and ventilation - Pipework insulation
AIRAH DA12	2020	Energy efficiency in cold rooms
IPCA CoP 004.3	2017	Insulated Panel Council Australasia (IPCA) Code of Practice
AHRI 450	2007	Performance rating of water-cooled refrigerant condensers, remote type
EN 328	2014	Heat exchangers - Forced convection unit air coolers for refrigeration - Test procedures for establishing the performance
EN ISO 12629	2022	Thermal insulating products for building equipment and industrial installations - Determination of water vapour transmission properties of preformed pipe insulation
EN 13215	2016	Condensing units for refrigeration - Rating conditions, tolerances and presentation of manufacturer's performance data

The following documents are mentioned only in the *Guidance* text:

AS 1530		Methods for fire tests on building materials, components and structures
AS 1530.1	1994	Combustibility test for materials
AS 1530.1	2024	Combustibility test for materials (ISO 1182:2020, NEQ)
AS 1668		The use of ventilation and air conditioning in buildings
AS 1668.2	2012	Mechanical ventilation in buildings
AS 1668.2	2024	Mechanical ventilation in buildings
AS/NZS 1680		Interior and workplace lighting
AS/NZS 1680.1	2006	General principles and recommendations
AS/NZS 1680.2.4	2017	Industrial tasks and processes
AS/NZS 2293		Emergency lighting and exit signs for buildings
AS/NZS 2293.1	2018	System design, installation and operation
AS/NZS 2293.2	2019	Routine service and maintenance
AS/NZS 2293.3	2018	Emergency luminaires and exit signs
AS ISO 9705	2003	Fire tests - Full-scale room test for surface products
BCA C2D11	2022	Fire resistance - Fire resistance and stability - Fire hazard properties
GBCA Buildings	2021	Green Star Buildings
NATSPEC DES 003		Fire hazard properties of insulation and pliable membranes
NATSPEC DES 020		Fire behaviour of building materials and assemblies
NATSPEC DES 022		Microbial control
NATSPEC GEN 006		Product specifying and substitution
NATSPEC GEN 010		Mechanical commissioning strategies
NATSPEC GEN 020		Building commissioning
NATSPEC GEN 024		Using NATSPEC selections schedules
NATSPEC PRO 007		Refrigerant options
NATSPEC TR 01		Specifying ESD
NATSPEC TR 03		Specifying design and construct for mechanical services
ANSI/ASHRAE 135	2024	BACnet: A data communication protocol for building automation and control networks
ISO 5149		Refrigeration systems and heat pumps - Safety and environmental requirements