

0762P KINGSPAN INSULATED PANELS IN COOL ROOMS

Branded worksection

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Worksection abstract

This worksection *Template* is applicable to refrigerated cool rooms using KINGSPAN insulated panels. It is applicable to rooms operating temperature below 5°C including those operating below freezing. It includes the construction of the room and its associated refrigeration system and controls.

Guidance text

All text within these boxes is provided as guidance for developing this worksection and should not form part of the final specification. This *Guidance* text may be hidden or deleted from the document using the hidden text *Hide* and *Delete* functions of your word processing system. For additional information visit FAQs at www.natspec.com.au.

Optional style text

Text in this font (blue with a grey background) covers items specified less frequently. It is provided for incorporation into *Normal* style text where it is applicable to a project.

Related material located elsewhere in NATSPEC

Related material may be found in other worksections. See for example:

- 0310 Concrete – combined.
- 0315 Concrete finishes.
- 0423p KINGSPAN insulated panel roofing systems.
- 0437p KINGSPAN insulated panel cladding systems.
- 0471p KINGSPAN in thermal insulation and pliable membranes.
- 0612 Cementitious toppings.
- 0631 Ceramic tiling.
- 0651 Resilient finishes.
- 0657 Resin based seamless flooring.

Material not provided by KINGSPAN

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

- Refrigeration plant.
- Shelving.

Material not included in NATSPEC

Some projects may include items not covered by NATSPEC. For these you may need to create new text or modify this text or a suitable worksection. For example:

- Cool rooms using glycol or ammonia as refrigerant.
- Temperature controlled rooms using sandwich panels similar to cool rooms but operating at above ambient temperature.
- Cool rooms exposed to weather.

Design and Construct Specifications

This worksection can be used to document the contractor's design and documentation responsibilities. If the design, or completion of the design, is not the responsibility of the contractor, delete this clause and associated requirements.

Refer to NATSPEC TECHreport TR 03 on specifying design and construct for mechanical services. It discusses some of the issues and presents a range of approaches for preparing design and construct specifications that can be applied more generally.

Material relating to the contractor's design responsibilities should be located in **SELECTIONS**. *Guidance* text with **SELECTIONS** includes some material that must be edited to suit the project requirements and intended contractor's responsibilities.

The sample material provided in **SELECTIONS** assumes that the location, overall size, doors, room operating temperatures and the like are documented and that the contractor will undertake the remaining design including sizing and selecting the plant detailing the construction and so on.

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 cool room operating below 0°C. Depth will depend on insulation thickness, screed thickness and floor finish.
- 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.
- Local regulations may apply, notably in relation to Work Health and Safety, health (food storage), laboratory safety and practices.
- Access to the space above cool rooms and equipment. Sandwich panels, although rigid, may not be adequate for the applied loads.
- If shelving and the like are to be attached to cool room walls consider the method of fixing.
- Ensure 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, ensure that adequate provision is made 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. If used, make sure the relevant provisions of AS/NZS 5149.1, AS/NZS 5149.2, AS/NZS 5149.3 and AS/NZS 5149.4 are incorporated. Issues to consider include plant location, plant room size, plant room ventilation and refrigerant alarms.
- This worksection contains text, including *Optional* style text, which may be changed to *Normal* style text 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.

Specifying ESD

KINGSPAN Insulated Panels have the following sustainable product attributes:

- Green tag certification.
- EPD reports.
- Excellent thermal performance.
- Low air leakage values.
- Minimal thermal bridging.
- Panels are easily dismantled for reusing or recycling.
- No interstitial condensation.

The following may be specified by retaining default text:

- Measures to minimise condensation to improve equipment life and limit microbial growth risk.
- Durable components, particularly for corrosion resistance.
- Provisions for reducing vibration.

Refer to the NATSPEC TECHreport TR 01 on specifying ESD.

1 GENERAL

Kingspan Insulated Panels is the global leader in the design, development and delivery of advanced building envelopes. Its wide range of products include insulated wall panels, BENCHMARK high end facade systems and standing seam systems. Kingspan Insulated Panels is widely recognised in the industry for the high quality and performance of its products as well as its commitment to excellent customer services and technical support.

1.1 RESPONSIBILITIES**General**

Requirement: Provide refrigerated cool rooms using KINGSPAN Insulated Panels, 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.

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.

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

General

Requirement: Design refrigerated cool rooms, as documented.

Cool room design, application and calculations

Standards: Conform to the recommendations of one or more of the following:

- AIRAH Design Application Manuals.
- ASHRAE Handbooks.
- CIBSE Guides.

Methods of calculation: Manual or software that employs the data and methods in the applicable standard.

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*.

Drawings: Show the following on the drawings:

- Cool room construction details including vapour barriers and means for preventing cold bridging.
- Coordination with building elements.
- Provisions for differential thermal movement.
- Location of refrigeration equipment.
- Access to space above cool rooms and equipment.
- Location of refrigeration equipment.
- Condensate drainage.
- 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**KINGSPAN technical contacts**

Website: www.kingspan.com/au/en-au/products-brands/insulated-panel-systems/contact-en.

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*.
- *0771 Automatic controls*.
- *0781 Mechanical electrical*.

1.4 STANDARDS

General

Refrigeration systems: To AS/NZS 5149.1, AS/NZS 5149.2, AS/NZS 5149.3 and AS/NZS 5149.4.

AS/NZS 5149.1, AS/NZS 5149.2, AS/NZS 5149.3 and AS/NZS 5149.4 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 NATSPEC TECHnote PRO 007 on refrigerant.

Cool rooms for food storage: To AS 4674.

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

1.5 MANUFACTURER'S DOCUMENTS

Technical manuals

Brochures and technical information:

- Downloads: www.kingspan.com/au/en-au/products-brands/controlled-environments/coldstore-systems.
- Technical support: www.kingspan.com/au/en-au/products-brands/insulated-panel-systems/contact-en.

1.6 INTERPRETATION

Abbreviations

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

- CS: KINGSPAN Controlled Environments Panel.
- KIP: KINGSPAN Insulated Panels.
- 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:

- BMS: Building management system.

Building management system is the term used in AS 2896 and this is a common abbreviation for it. Similar terms are DDC (direct digital control) and BAC (building automation and control system). Adjust to suit the project terminology.

- Cool room: A refrigerated space which 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 uses the terms chiller and freezer without defining them.

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

1.7 SUBMISSIONS

Certification

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

Fire performance

Combustibility: Submit evidence of conformity to PRODUCTS, **FIRE PERFORMANCE**, **Combustibility**.

If non-combustible materials are documented convert this *Optional* style text to *Normal* style text.

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

Fire-resistance level: Submit evidence of conformity to PRODUCTS, **FIRE PERFORMANCE**, **Fire-resistance of building elements**.

Products and materials

Thermal insulation properties: Submit evidence of conformance to AS/NZS 4859.1 and AS/NZS 4859.2.

This is primarily to verify claimed insulation R-Value for NCC compliance.

See NATSPEC TECHnote DES 031 for information on specifying R-Values.

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

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

Type tests: Submit results, as follows:

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 **SELECTIONS** or **PRODUCTS** if there are no **SELECTIONS**.

- Cyclone performance: KS1100 CS wall panel.
- Refrigeration equipment.

Samples

General: Submit a sample of each of the following:

- Wall to wall to ceiling corner joint.
- Panel to panel joint.

List other samples to suit the project., e.g. Wall to floor joint, Door jamb.

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

Subcontractors

Approved installers: Submit the name and contact details of the proposed KINGSPAN approved installer.

KINGSPAN recommend that the appointed cladding sub-contractor attend the appropriate product installation training course.

Tests

Pre-completion tests: Submit test results for the following:

- Pressure testing of refrigeration equipment.

Warranties

Materials: Submit KINGSPAN product warranty with corresponding inspection and maintenance document.

Workmanship: Submit a warranty on the installation of the wall and/or ceiling system.

1.8 INSPECTION

Notice

General: 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.

Amend 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 **PRODUCTS, GENERAL, Substitutions** in 0171 General requirements.

The 0171 General requirements clause 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.

Storage and handling

Requirement: Store and handle materials to the KINGSPAN recommendations and the following:

- Provide a safe and trade free area for the storage of KINGSPAN materials.
- Remove KINGSPAN protective film within the time stipulated on the face of each insulated panel.
- Protect materials including edges and surfaces from damage.
- Keep dry and unexposed to weather including protection from direct sunlight.
- Do not drag metal sheets or panels across each other or over other materials.
- Composite panels: Store unpacked panels by size in racks on a slight slope to prevent ponding on panel surfaces. 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.

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

Sealants

Materials: One-component compounds with a neutral curing mechanism, vulcanising at room temperature. Provide sealants that:

- Do not foster microbial growth.

The requirement that sealants not foster microbial growth is consistent with AS/NZS 3666.1. Sealants that support mould growth (e.g. some grades of silicone) and are unsuitable for use in food preparation areas, laboratories, health facilities and the like.

- Maintain their sealing performance for the life of the cool room.
- Bond to the surface of application without primers.
- Are resistant to oils, food acids and water after curing.
- Are non-toxic.
- After curing retain their elastomeric properties over the range of room operating temperatures.
- Are suitable for application by gun or hand tools.

Corrosion protection

Ferrous metals: Either stainless steel or protected from corrosion by hot-dip galvanizing or metallic coating.

Fasteners: Stainless steel or non-ferrous only.

Fasteners

Primary fasteners: Provide high threaded self-drilling, self-tapping screws with bonded washers, as follows:

- Types, sizes and drilling capacity: As recommended by fastener manufacturer to suit type and thickness of supports, and thickness of cladding panels.
- Screw material: Type 316 austenitic stainless steel.
- Washer material: Non-ferrous.
- Washer size: 16 mm diameter.
- Heads: Plastic moulded or lacquered.

Secondary fasteners: Provide fasteners for internal flashing installation at 300 mm centres, as follows:

- Screw/washer material: As primary fasteners.
- Heads: Low profile, painted to match colour of the flashing.

Mushroom bolts: Provide mushroom bolts with threaded rod, lock nut and plastic cover.

Rivets: Expanding solid end type 4.8 mm diameter.

Screws: Self-tapping, self-drilling.

Number, type and location of fasteners: To suit project to KIP Technical Services recommendations.

Refrigerants

Requirement: Provide refrigerants as follows:

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

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 are not covered by AS/NZS 5149.1, AS/NZS 5149.2, AS/NZS 5149.3 or AS/NZS 5149.4 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 Annex B. See NATSPEC TECHnote PRO 007 on refrigerant options.

Factory Mutual (FM) panel system approval

KINGSPAN controlled environment panel systems: Approved to FM 4880 and FM 4881.

The certification branch of FM Global (FM Approvals) offers worldwide certification and testing services of industrial and commercial loss prevention products. Recognised and respected across the globe, FM Approvals certification assures customers that a product or service has been objectively tested and confirms to the highest national and international standards.

2.2 FIRE PERFORMANCE**Combustibility**

Firemaster panels: Not deemed combustible tested to AS 1530.1.

Firemaster panels are deemed non-combustible to AS 1530.1.

Fire hazard properties

Group number: To AS 5637.1.

Non-sprinklered buildings: Wall and ceiling linings must either have an average specific extinction area less than 250 m²/kg or a smoke growth rate index not more than 100 as determined to AS 5637.1.

Wall and ceiling panels: Tested to AS/NZS 1530.3. Fire hazard properties as follows:

- Ignitability Index: 0.
- Heat evolved Index: 0.
- Spread-of-Flame Index: 0.
- Smoke-Developed Index: 2.

Materials with reflective facing: Test to AS/NZS 1530.3 and the recommendations of Appendix A6.

See NATSPEC TECHnote DES 003 for more information on fire hazard properties of insulation and pliable membranes.

The requirements above are consistent with the NCC.

AS/NZS 1530.3 is a mandatory standard in the NCC. Smoke-Developed Index and Spread-of-Flame Index are determined under AS/NZS 1530.3. See also BCA C1.10.

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 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 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).

This above list does not include combustibility. That is, in keeping with the NCC this clause does not prohibit the use of combustible insulation materials provided they meet the other fire properties.

Fire-resistance of building elements

Fire-resistance level: Tested to AS 1530.4.

Refer to NATSPEC TECHnote DES 020 for information on fire-resistance levels.

2.3 PRE-COMPLETION TESTS**Standards**

General: Provide refrigeration equipment that has been subjected to a physical test in conformance to the following:

- Pressure tests: To AS/NZS 5149.2.
- Type tests: Factory type test packaged refrigerating plant for capacity and operating performance.

2.4 KINGSPAN KS1100 CS CONTROLLED ENVIRONMENTS PANEL CONSTRUCTION

This clause covers wall, partition and ceiling construction of a cold store, chill or ambient food production or storage area.

Panels

Requirement: Provide KINGSPAN KS1100 CS insulated wall and ceiling panels.

Construction: Prefinished metal skins continuously laminated over a polyisocyanurate (PIR) core.

Panel to panel joints: KINGSPAN proprietary jointing system except for cut panels. Make sure the visible facing joint engages with a gap of less than 3 mm so the foam faces form a butt joint and maintain an effective seal.

Insulation: Polyisocyanurate (PIR) in continuous form without voids and free of line faults through or across the sheet.

Thermal conductivity: $\leq 0.020 \text{ W/(m.K)}$.

The value is important since this worksection specifies insulation using panel thickness.

Blowing agents: Do not provide materials:

- Which use CFC or HCFC as blowing agents in the manufacturing process.
- Which use a blowing agent with a global warming potential ≥ 140 .

This follows BRANZ recommendations. Some blowing agents have extremely high global warming potential.

Internal and external skins

Material: 0.5 mm zinc-coated steel sheet to AS 1397, coating class Z275 Zincform G300S, factory pre-coated on the exposed surface.

Factory pre-coating: Antibacterial, 25 micron thick

Other colours and coatings are available. Contact KINGSPAN for details.

Colour: White.

Panel profile: Flat or ribbed as documented.

Flashings

Prefabricated flashings: Minimum 0.5 mm metallic-coated steel to AS 1397 manufactured to suit the selected coating.

Document in **SELECTIONS** Cool room schedule.

Dimensions

KINGSPAN KS1100 CS panels are available in 50, 75, 100, 125, 150 and 200 mm thicknesses.

Panel thickness: To suit the temperature difference across the panel and to KIP Technical Services recommendations.

i.e. contractor to select. Alternatively show thicknesses on the drawings or in **SELECTIONS** to KINGSPAN recommendations and delete the above sentence.

Panel width:

- Standard module cover width: 1100 mm.
- Non-standard module cover width: 1200 mm.

Ceiling panels

Thickness: To **Dimensions** except where the ceiling is trafficable or serves a structural function.

KINGSPAN panels are designed as a cladding system rather than as a structural element. Designers should take this into consideration when designing the supporting structure.

Structural and trafficable ceilings: If the ceiling is trafficable or serves a structural function, provide certification from a professional engineer 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.

Tests

Cyclone performance of KS1100 CS wall panels: Tested to 15 kPa wind loading to AS 4040.3.

The KS1100 CS wall panel has been tested to 15 kPa wind loading in accordance with the AS 4040.3 test standard corresponding to a wind speed of 365 km/hr. Contact KIP Technical Services for further information.

2.5 EUROBOND FIREMASTER PANEL CONSTRUCTION

KINGSPAN Trapezoidal wall panels can be installed vertically or horizontally depending on the desired aesthetics. Firemaster offers a total internal wall and ceiling solution that is ideally suited for non-load bearing internal partition walls and ceilings. It provides a tested fire-resistance to match the internal firewalls, protected zones, ceilings and compartmentation walls.

General

Requirement: Provide Eurobond Firemaster insulated wall and ceiling panels, as documented.

FM panel system approval: Certified for installation without a height restriction to FM 4880 Class 1 Fire Rating of Building Panels.

Construction: Prefinished metal skins continuously laminated over a mineral wool core.

Panel to panel joints: Firemaster proprietary jointing system except for cut panels.

Insulation: Non-combustible mineral wool in continuous form without voids and free of line faults through or across the sheet.

Blowing agents: Do not provide materials:

- Which use CFC or HCFC as blowing agents in the manufacturing process.
- Which use a blowing agent with a global warming potential ≥ 140 .

This follows BRANZ recommendations. Some blowing agents have extremely high global warming potential.

Panel thickness: To suit the temperature difference across the panel and to KIP Technical Services recommendations.

i.e. contractor to select. Alternatively show thicknesses on the drawings or in SELECTIONS to KINGSPAN recommendations and delete the above sentence. Firemaster panels are available in 100, 120, 150, 170, 200 and 240 mm thicknesses.

Panel width:

- Standard module cover width: 1100 mm.

Accessories: Flashings, trims, drips, cappings to match/contrast as required (available via Eurobond Doors).

Firemaster Wall Lite system

Description: This system gives the optimum balance between fire performance, cost and weight and has been designed specifically as a practical, contractor-friendly solution. There's no better choice when fire resistance is specified and speed, flexibility and cost effectiveness is demanded and can provide up to 90 minutes fire resistance.

External facing material:

- Flat (non-ribbed) 0.5 mm white foodsafe laminate or white polyester.
- Substrate: ZA275 hot-dip zinc coated steel.
- Metal thickness: 0.5 mm total coated thickness.
- Finish: PE25 white polyester.
- Colour RAL9010.

Internal facing material:

- 0.5 mm steel pre-coated galvanised steel finish.
- Finish: PE25 white polyester.
- Colour: RAL9010.

Panel thickness available: 100 to 240 mm as documented.

Thermal conductivity: ≤ 0.042 W/(m.K).

Sound transmittance of cladding/covering system: Minimum weighted sound reduction index (Rw) within 100 to 3150 Hz frequency range.

- 100 mm: 31 Rw dB.
- 125 mm: 32 Rw dB.
- 150 mm: 32 Rw dB.
- 175 mm: 33 Rw dB.
- 200 mm: 34 Rw dB.

- 240 mm: 34 Rw dB.

Accessories: Provide the following:

- Primary fasteners: Self-drilling and tapping stainless steel screws.
- Number and location of fasteners: Minimum of three fasteners at each end of panel.

Fixing guns: Use fixing guns with depth gauges provide correct compression of the fixings and no distortion of the panel face.

Firemaster Wall Extra

Description: Firemaster Wall Extra is the product of choice when the demand is for a 2 hour fire resistance internal wall panel. Fully tested and independently certified durability, structural integrity and fire performance is at the heart of Firemaster Wall Extra.

External facing material:

- Flat (non-ribbed) 0.5 mm white foodsafe laminate or white polyester.
- Substrate: ZA275 hot-dip zinc coated steel.
- Metal thickness: 0.5 mm total coated thickness.
- Finish: PE25 white polyester.
- Colour RAL9010.

Internal facing material:

- 0.5 mm steel pre-coated galvanised steel finish.
- Finish: PE25 white polyester.
- Colour: RAL9010.

Panel thickness available: 75 to 240 mm as documented.

Thermal conductivity: $\leq 0.044 \text{ W/(m.K)}$.

Sound transmittance of cladding/covering system: Minimum weighted sound reduction index (Rw) within 100 to 3150 Hz frequency range.

- 75 mm: 31 Rw dB.
- 100 mm: 31 Rw dB.
- 125 mm: 33 Rw dB.
- 150 mm: 34 Rw dB.
- 175 mm: 35 Rw dB.
- 200 mm: 36 Rw dB.
- 240 mm: 36 Rw dB.

Accessories: Provide the following:

- Primary fasteners: Self-drilling and tapping stainless steel screws.
- Number and location of fasteners: Minimum of three fasteners at each end of panel.

Fixing guns: Use fixing guns with depth gauges provide correct compression of the fixings and no distortion of the panel face.

Firemaster Wall Ultima

Description: Firemaster Ultima provides the demanding solution for fire walls and compartmentation in high risk areas where up to 4 hours' fire resistance is required. Business continuity and life safety are dramatically increased thanks to the integrity and insulation of this unique system making it ideal for use in high risk buildings such as Data Centres.

External facing material:

- Flat (non-ribbed) 0.7 mm white foodsafe laminate or white polyester.
- Substrate: ZA275 hot-dip zinc coated steel.
- Finish: PE25 white polyester.
- Colour RAL9010.

Internal facing material:

- 0.7 mm steel pre-coated galvanised steel finish.
- Finish: PE25 white polyester.
- Colour: RAL9010.

Panel thickness available: 150 to 240 mm as documented.

Thermal conductivity: $\leq 0.044 \text{ W/(m.K)}$.

Sound transmittance of cladding/covering system: Minimum weighted sound reduction index (Rw) within 100 to 3150 Hz frequency range.

- 150 mm: 34 Rw dB.
- 175 mm: 35 Rw dB.
- 200 mm: 36 Rw dB.
- 240 mm: 36 Rw dB.

Accessories: Provide the following:

- Primary fasteners: Self-drilling and tapping stainless steel screws.
- Number and location of fasteners: Minimum of three fasteners at each end of panel.

Fixing guns: Use fixing guns with depth gauges provide correct compression of the fixings and no distortion of the panel face.

Eurobond Ceiling Panel System

Description: Fire rated non-combustible ceiling panels for use in internal applications. Designed for use in food processing areas, temperature controlled rooms, clean rooms and high risk environments.

Ceiling profiles: Minibead (top), architecturally flat or minibead (bottom), as documented.

Sizes are available to order within the following limits:

- Available Length: 1800 mm – 11000 mm Module
- Width : 1100 mm as standard
- Thickness available: 75 mm-240 mm

External facing material:

- Flat (non-ribbed) 0.5 mm white foodsafe laminate or white polyester.
- Substrate: ZA275 hot-dip zinc coated steel.
- Metal thickness: 0.5 mm total coated thickness.
- Finish: PE25 white polyester.
- Colour RAL9010.

Internal facing material:

- 0.5 mm steel pre-coated galvanised steel finish.
- Finish: PE25 white polyester.
- Colour: RAL9010.

Sound transmittance of cladding/covering system: Minimum weighted sound reduction index (Rw) within 100 to 3150 Hz frequency range.

- 75 mm: 31 Rw dB.
- 100 mm: 33 Rw dB.
- 125 mm: 33 Rw dB.
- 150 mm: 34 Rw dB.
- 175 mm: 35 Rw dB.
- 200 mm: 36 Rw dB
- 240 mm: 36 Rw dB

Thickness: To suit the required FRL and span.

KINGSPAN panels are designed as a cladding system rather than as a structural element. Designers should take this into consideration when designing the supporting structure.

Joints: Provide panels with interlocking steel joint detail.

Structural and trafficable ceilings: If the ceiling is trafficable or serves a structural function, provide certification from a professional engineer 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.

Accessories: Provide the following:

- Ceiling Suspension System: Eurobond Proprietary System

- Support location: To be advised based on spanning capabilities and FRL requirements. Please contact KIP Technical Services for project specific advice.

2.6 DOORS

Door assembly

Type: Sliding or hinged panels as documented that close against a door frame. Provide all necessary door hardware, gaskets and the like.

Escape provisions: Provide the following:

- 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.
- One of the following:
 - . A telephone in every room.
 - . Unlocked insulated safety exit door which can only be opened from the inside.
 - . 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 which, 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 a mechanism 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 **PANEL CONSTRUCTION** for the system selected.

Insulation thickness: Same thickness as the wall in which the door is located.

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

Viewing panel

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

Size: As documented.

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

Finish: Powder coated frame to match the door finish.

Anti-condensation heater cables

Heater cables: Incorporate a thermal break and dual heater cables (1 spare) to prevent condensation on outside face of door. Locate heater cables at door seals.

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

Installation: Install heating cables, accessible for replacement, in the door frame and threshold.

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

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

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.

Heater cables: Incorporate a thermal break and dual heater cables (1 spare) to prevent condensation on outside face of door.

Threshold

Construction: Aluminium checker plate 200 mm wide x 2.5 mm thick. Fix to the floor across the full width of the door opening.

Gaskets

Construction: Provide naturally resilient, non-hygroscopic neoprene or silicone rubber gaskets with not less than 2 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 embossed 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.

2.7 EMERGENCY ACCESS DOORS**General**

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

- Locks: Openable from inside the cool room only.

2.8 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.

Materials: Heavy duty brass or gunmetal, chromium plated to AS 1192, service condition number 2, satin finish, for catches, hinges, handles and similar items.

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 and bottom roller guides with turned nylon ballbearing rollers 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.

2.9 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:

This is for conventional systems. For higher energy efficiency, consider inverter or digital compressors. Heat exchangers to recover heat for water heating are also available.

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.

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

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

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 kW(R).
- 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.
- 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.

Electronic is usually more energy efficient.

- 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.
- Evaporator isolating valves.
- Test valves.
- Liquid receiver with service valves. Size to hold the full refrigerant charge.
- Suction line vibration eliminator.
- Replicable filter-dryer.
- Low oil pressure cutout.
- Liquid line sight glass and moisture indicator.
- Room temperature $\leq 0^{\circ}\text{C}$: 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.

2.10 EVAPORATORS**Description**

General: Provide low-silhouette evaporators which include an extended surface aluminium finned copper cooling coil with externally mounted externally equalised expansion valve, refrigerant distributors, one or more fan and motors, air outlet baffles, insulated 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 (IDC) or forced draft (FDC).

Casing: Stainless steel or heavy gauge aluminium.

Coils

Fins: ≤ 236 fins per 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 inbuilt 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 $\leq 2^{\circ}\text{C}$: 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.

Heater size: $\leq 15\%$ of evaporator cooling capacity.

2.11 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 $\leq 0^{\circ}\text{C}$: 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

Crankcase heaters are assumed to be provided simply to manufacturer's instructions.

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: If documented, 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/NZS 1571 or AS 1572 designation C12200.
- Fins: Aluminium alloy plate fins ≥ 0.12 mm thick to AS 2848.1, designation 3003 or 8011.

- Fin pitch: ≤ 550 fins/m.
- Subcooling: $> 5K$.

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

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 rev/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.

Design pressures:

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

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 and AS 2239 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: If documented, 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.

2.12 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 (SHS) tubes at 65 mm centres.

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

Material: Metallic-coated steel, hot-dip galvanized steel or stainless steel as documented.

Include material in **SELECTIONS** or show on the drawings.

3 EXECUTION

3.1 INSTALLATION

Substrates or framing

Preparation: Before fixing cladding, check the alignment of substrates or framing and adjust if required.

Execution details

Construction details: Conform to KIP Technical Services recommended construction details.

Site assembly instructions are available from KIP Technical Services. KINGSPAN recommend the contractor attends the appropriate product installation training course prior to installation which is provided by KINGSPAN Field Service Department.

KIP Technical Services recommendations: Conform to KINGSPAN recommendations and use KINGSPAN approved installers for installation. Conform to the following:

- Fasteners, seals and fillers: Install as documented.
- Site cut panels:
 - . Provide accurate, true lines with no distortion.
 - . Cut with a suitable metal cutting circular type saw and treat exposed edges with a suitable edge protection lacquer.

Refer to KINGSPAN technical bulletin, Method statement for the on-site cutting of insulated panels.

- Openings: Cut to the minimum size necessary.
- Penetrations: Cut to the minimum size necessary.
- Edge reinforcement: Provide trimming plates.
- General: Install neatly and accurately, and to suit sizes and edge details of fittings.
- Services: Position services accurately, support adequately. Align and level in relation to the ceiling and suspension system and correctly seal maintaining the vapour barrier and continuity of insulation. Do not diminish performance of ceiling system.
- Penetrations up to 300 mm: Supported by ceiling panel.
- Penetrations for ducting, access hatches, etc: Support independently and provide flanges to support ceiling system.
- Swarf: Remove swarf and any foreign matter immediately from the external surface of panels.
- Protection: Protect surfaces and finishes, including the retention of protective coatings during installation.

Joints

General: Provide aluminium extrusions or steel flashings of the same material as the panel skin internally and externally:

- At panel junctions except where KINGSPAN proprietary panel to panel joint is used.
- Make sure the visible facing joint engages with a gap of less than 3 mm so the foam faces form a butt joint and maintain an effective seal.
- Between panels and building structures, if documented.

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

Floor joint: Provide a steel angle or F extrusion base mould with mitred corners at the base of walls. Fix at 400 mm centres to Professional engineer's recommendations.

See 0171 General requirements for the definition of Professional engineer.

Panel butt jointing

General: Join using KINGSPAN proprietary panel to panel joint with sealant applied to inside and outside to KIP Technical Services recommendations.

Cut panels

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

Joint types

Vertical corner joints: Create a rebate for one panel to receive the other to KINGSPAN standard details to provide continuous insulation contact.

Wall to ceiling joints: Form a rebate in the wall panel to receive the ceiling panel. If panels join at the corner without a rebate, cut back the internal skin of the panel that is receiving the other panel for the width of the panel thickness.

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

Construction: Provide flanged PVC-U sleeves for service penetrations through wall and ceiling panels. Fill the void between the service and the sleeve with a one component polyurethane sealant. Vapour seal to the panel. Provide a plastic flange to the sleeve on the outside of the panel and vapour seal to the panel.

External flashing

Construction: Provide extruded aluminium cove moulding not less than 25 mm radius, as a flashing moulding between the external wall skin and the external floor.

This is typical. Alter to suit external floor finish.

Internal wall protection

Requirement: If documented, 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 RHS 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.

High ambient humidity environments

Requirement: If KS1100 CS Controlled Environments panels are installed in situations where ambient humidity could cause condensation, provide the following:

High ambient humidity situations include the wet tropics and within buildings with high internal humidity such as swimming pools. Document in **SELECTIONS**.

- Intermediate supports in high humidity applications: Seal along purlins using two unbroken runs of sealant tape or neoprene foam tape: 4.8 mm x 60 mm wide.
- Coating for High humidity internal environments other than swimming pools): AQUAsafe.
- Coating for swimming pools environments: AQUAsafe55.

Firemaster Lite/Extra/ Ultima:

- Contact Kingspan Insulated Panels for project specific recommendation for high humidity environments.

For Firemaster Lite/Extra/ Ultima contact KINGSPAN for project specific recommendations.

3.2 SEALING**Sealants**

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

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

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 internal butt and corner joints up to 1 m above the floor to facilitate cleaning.

3.3 PRESSURE RELIEF**Relief port**

Requirement: For all rooms with an operating temperature not more than 0°C provide two relief ports in one wall.

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

Size: $\geq 150 \times 125$ mm.

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

3.4 CEILING SUPPORT**Execution details**

Requirement: Conform to KIP Technical Services recommendations.

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.

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 cool rooms constructed on suspended floors.
- Under all room with an operating temperature not more than 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/m².

Mat installation

Location: Lay the mats on insulated spacers 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: If documented, provide bituminous sheeting over the sub base or sub-floor 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 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 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 as required 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 sub-floor using masonry anchors. Vapour seal the fastener penetration with sealant before inserting the fastener.

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

3.7 FLOOR INSULATION**Concrete wearing surface**

Construction: Lay rigid cellular polyurethane sheet insulation to AS 1366.1 over the whole of the internal floor area tightly fitted without gaps immediately above the vapour barrier membrane. Lay the insulation boards in two layers using ship-lapped joints.

Insulation thickness:

- Room operating temperature > 0°C: ≥ 100 mm (2 layers each 50 mm).
- Room operating temperature ≤ 0°C: ≥ 150 mm (2 layers each 75 mm).

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 to **PANEL CONSTRUCTION**, 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.

Insulation thickness:

- Room operating temperature > 0°C: ≥ 100 mm.
- Room operating temperature ≤ 0°C: ≥ 150 mm.

3.8 RECESSED COOL ROOM FLOORS**General**

Grout: If the cool room floor is recessed into a slab such that a space exists between the cool room wall panels and slab, grout the space.

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 Section 3.

AS 4674 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 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 clause 4.7.

For 10 mm aggregate and concrete subject to freezing, AS 3600 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).

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 silicone 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: Requirement: Bed and grout selected slip-resistant ceramic tiles to the concrete surface.

Aluminium checker plate wearing surface

Construction: Provide 20 mm thick marine plywood to AS/NZS 2272, formaldehyde emission class E₁ or lower, bonded over the whole surface area to the floor insulation metal skin. Over this bond over the whole surface area 2.5 mm thick aluminium embossed checker plate, with a 2 pack epoxy adhesive. 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 where 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. Consider including this *Optional style text by changing to Normal style text.*

Plywood wearing surface

Construction: Provide 20 mm thick marine plywood to AS/NZS 2272, formaldehyde emission class E₁ 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 molding. 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: 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. Size bearers to suit the load and span.

Hardware: Nylon or stainless steel to suit the load.

Condensing units

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.

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. Where 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

General: Conform to the following:

- Provide hangers, brackets, saddles, clips, and support system components, incorporating provisions for adjustment of spacing, alignment, grading and load distribution.
- Support pipework from associated equipment or building structure.
- Support valves, strainers and major line fittings so that no load is placed on adjacent tubes or transmitted to them during operation and maintenance.

Support type: Proprietary metallic-coated steel channel section with clamps and hangers sized match external diameter of pipe being supported.

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, clause 3.2.9.

Vertical pipes: Provide anchors and guides to maintain long pipes in position, and supports to balance the mass of the pipe and its contents.

Saddles: Do not provide saddle type supports for pipes more than DN 25.

Uninsulated pipes: Clamp piping supports directly to pipes.

Insulated pipe support:

- Spacers: Provide spacers at least as thick as the insulation between piping supports and pipes. Extend either side of the support by at least 20 mm.
- Spacer material: Rigid insulation material of sufficient strength to support the piping and suitable for the temperature application.
- Vapour barriers: For cold pipes apply aluminium foil tape over the circumference of the spacer to form a vapour barrier.
- Metal sheathing: Provide a 0.55 mm thick metallic-coated steel band between the aluminium foil tape and the support, for the full width of the spacer.

Pipe support spacing table

Nominal pipe size, DN	Maximum spacing (m)	
	Horizontal	Vertical
10	1	2
≥ 15, ≤ 20	1.5	2.5
25	2	3
32	2.5	3
40	2.5	4
50	3	4
65	3	4

Pipes

Piping: Provide copper tubes as follows:

- ≤ DN 15: To AS/NZS 1571-O.
- > DN 15: To AS/NZS 1571-1/2H. 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, 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 which 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, where possible clean internal accessible joints before proceeding with further assembly work, to provide the maximum possible internal cleanliness.

Brazing alloy: To AS/NZS 1167.1 Table 2 alloy B4 not less than 15% silver content.

Brazing alloy for jointing dissimilar metals: To AS/NZS 1167.1 Table 1 alloy A18 or an alloy with an equivalent silver content ($\geq 34\%$) and impurity levels.

Sleeves

General: Provide copper pipe sleeves where pipes pass through building elements to **BUILDING PENETRATIONS, Sleeves** in 0171 General requirements. Insulate the space between the pipe and sleeves.

Sleeves are covered in 0171 General requirements.

Valves

General: Provide valves to AS/NZS 5149.2. 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 fixings with non-setting mastic.

3.13 CONDENSATE DRAINS

See AS/NZS 3666.1 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 $> 0^{\circ}\text{C}$: PVC-U.
- Room operating temperature $\leq 0^{\circ}\text{C}$:
 - . Inside room: Copper.
 - . Outside room: PVC-U.
- All cool rooms in kitchens: Chrome plated copper.

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

Pipe support spacing: To AS/NZS 3500.1 Table 5.6.4.

AS/NZS 3500.1 Table 5.6.4 includes copper and PVC-U, and other materials.

Sealing: Seal drain pipes where 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 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 $\leq 2^{\circ}\text{C}$: 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 not less than 13 mm thick insulation to **REFRIGERATION PIPE INSULATION**.

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

3.14 REFRIGERATION PIPE INSULATION

Material

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

Thickness:

- Room operating temperature $> 2^{\circ}\text{C}$:
 - . Suction line: 19 mm.
 - . Condensate line: Not required.
- Room operating temperature $\leq 2^{\circ}\text{C}$:
 - . Suction line: 38 mm (2 to 19 mm layers).
 - . Condensate line: 13 mm.

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 diffusion resistance μ : ≥ 5000 to EN 13469.

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

Timing: Leak test piping before insulating joints, fittings and valves.

Finish: Where 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.

Fire performance

Fire hazard properties: Tested to AS/NZS 1530.3. Fire hazard indices as follows:

- Spread-of-Flame Index: 0.
- Smoke-Developed Index: ≤ 3 .

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 microns) connected to both high and low pressure sides of the system with valves open and controls connected. Measure the pressure with approved 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 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 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.

Service lighting requirement: Provide at least one single 18 W service light fitting in each cool room.

Luminaires

Cool rooms for food storage: To AS 4674.

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

Diffuser: High impact acrylic or UV stabilised polycarbonate.

Protection: Provide luminaires to IP65. House the controlgear in a moisture proof moulded polycarbonate glass reinforced plastic (GRP) box. 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.

Luminaire: Prismatic bulkhead type, fitted with a 10 watt 12 volt quartz halogen incandescent lamp, with non-corrosive body and hinged one piece polycarbonate cover, separated by a neoprene gasket. The fitting to be completely waterproof and suitable for use at both the cool room operating temperature and ambient temperature.

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.

Luminaires

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

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 which disconnects main supply to the luminaires and tests for discharge performance, after testing, this switch must automatically revert to normal operating mode.

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 25°C and subjected to charging and discharging at 6 monthly intervals.

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

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

See also AS/NZS 2293.1 clause 6.4.8.

Power supply

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

3.20 PERSONNEL SAFETY ALARM

Ensure 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

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 $> 0^{\circ}\text{C}$: 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 $\leq 0^{\circ}\text{C}$: 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.

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 (BACnet) compliance.

The **DIGITAL SYSTEM CONTROLLER INTERFACE** clause (*Optional style text*) in 0773 Building management systems 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 safeties.

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.

Safety signs: To AS 1319.

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: $\geq 2 \text{ mcd/m}^2$, 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.
- Control boards.
- Condensing units.

3.24 WARRANTIES

General

Requirement: On completion and when inspected by KINGSPAN, provide KINGSPAN warranty.

Period: Provide KINGSPAN warranties as follows:

- 10 years for thermal performance.
- 10 years for structural performance.
- 10 years for coating performance.

List the requirements of the action to be warranted.

4 SELECTIONS

Schedules are a way of documenting a selection of proprietary or generic products or systems by their properties. Indicate their locations here and/or on the drawings. Refer to NATSPEC TECHnote GEN 024 for guidance on using and editing schedules.

4.1 COOL ROOMS

Cool room schedule

Property	Cool room 1	Cool room 2	Cool room 3
Room function			

Property	Cool room 1	Cool room 2	Cool room 3
KINGSPAN panel type			
Ambient humidity			
Panel width (mm)			
Panel length (m)			
External Sheet: Thickness (mm)			
External sheet: Profile			
External sheet: Finish			
External sheet: Colour			
Internal sheet: Thickness (mm)			
Internal sheet: Profile			
Internal sheet: Finish			
Internal sheet: Colour			
Core thickness (mm):			
R-Value			
Fire-resistance level (FRL)			
Room internal dimensions: Length (mm)			
Room internal dimensions: Width (mm)			
Room internal dimensions: Height (mm)			
Room operating temperature (°C)			
Room operating temperature tolerance (°C)			
Ambient conditions: Dry bulb (°C)			
Ambient conditions: Wet bulb (°C)			
Air cooled condenser: Air entering temperature (°C)			
Water cooled condenser: Water entering temperature (°C)			
Water cooled condenser: Water leaving temperature (°C)			
Refrigeration plant capacity at above conditions (kW(r))			
Refrigeration plant operating hours per day			
Wall panel facing profile: Inside			

Property	Cool room 1	Cool room 2	Cool room 3
Wall panel facing profile: Outside			
Ceiling panel facing profile: Inside			
Ceiling panel facing profile: Outside			
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 (mm) x height (mm))			
Main door: Viewing panel size (width (mm) x height (mm))			
Emergency access doors: Number required			
Emergency access doors: Door action			
Emergency access doors: Door clear opening (width (mm) x height (mm))			
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			

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

Some items in this schedule may be omitted if the respective clauses are deleted (e.g. Internal wall protection if the **INTERNAL WALL PROTECTION** clause is deleted. Alternatively, some or all of the details in this schedule may be shown on the drawings and deleted from the schedule.

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

KINGSPAN panel type: e.g. KS1100 CS, KS1200 CS, Firemaster Lite, Firemaster Extra, Firemaster Ultima or Firemaster Ceiling.

Ambient humidity: e.g. High humidity or Low Humidity.

Panel width (mm):

- KS1100 CS panels: 1100 or 1200.
- Firemaster panels: 1100.

Panel length (m):

- KS1100 CS panels: Standard 2 to 13.7 or Non Standard.
- Firemaster panels: Standard 2 to 11.8 or Non Standard.

External sheet: Thickness: KS1100 CS panels: Standard 0.5 mm or Non Standard.

External sheet: Thickness: Firemaster panels:

- Lite: 0.5.
- Extra: 0.5.
- Ultima: 0.7.
- Ceiling: 0.5.

External sheet: Profile:

- KS1100 CS panels: Flat, Ribbed or Multigroove with 1,2 or 3 grooves.
- Firemaster panels: Flat or Ribbed.

External sheet: Finish:

- KS1100 CS panels: Standard CLEANSafe25 (Permagard), AQUASafe (for high humidity environments), or AQUASafe55 (for swimming pools).
- Firemaster panels: Standard PE 25, Foodsafe.

External sheet: Colour:

- KS1100 CS panels: Off white (Permagard), Pearl (AQUASafe), or As Per Standard External Colour Range.
- Firemaster panels: RAL 9010.

Internal sheet: Thickness: KS1100 CS panels: Standard 0.5mm.

Internal sheet: Thickness: Firemaster panels:

- Lite: 0.5.
- Extra: 0.5.
- Ultima: 0.7.
- Ceiling: 0.7.

Internal sheet: Profile:

- KS1100 CS panels: Flat, Ribbed or Multigroove with 1,2 or 3 grooves.
- Firemaster panels: Flat or Ribbed.

Internal sheet: Finish:

- KS1100 CS panels: Standard CLEANsafe25 (Permagard), AQUAsafe (for high humidity environments), or AQUAsafe55 (for swimming pools).
- Firemaster panels: Standard PE 25, Foodsafe.

Internal sheet: Colour:

- KS1100 CS panels: Off white (Permagard), Pearl (AQUAsafe), or As Per Standard External Colour Range.
- Firemaster panels: RAL 9010.

Core thickness (mm): KS1100 CS panels: 50, 75, 100, 125, 150 or 200.

Core thickness (mm): Firemaster panels:

- Lite: 75, 100, 125, 150, 175, 200, or 240.
- Extra: 50, 75, 100, 125, 150, 175, 200, or 240.
- Ultima: 150, 200, or 240.
- Ceiling: 75, 100, 125, 150, 175, 200, or 240.

R-Value: KS1100 CS panels: 2.65, 3.90, 5.15, 6.40, 7.65 or 10.15.

Fire-resistance level (FRL): e.g. 60/60/60. Consult KINGSPAN for fire resistance level testing and further information:

- Firemaster Wall Lite: Up to 90 minutes.
- Firemaster Wall Extra: Up to 120 minutes.
- Firemaster Wall Ultima: Up to 240 minutes

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.

Wall panel facing profile: Inside: Flat or Ribbed.

Wall panel facing profile: Outside: Flat or Ribbed.

Ceiling panel facing profile: Inside: Flat or Ribbed.

Ceiling panel facing profile: Outside: Flat or Ribbed.

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

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

Floor: Floor wearing surface type: e.g. Concrete, Aluminium checker plate, Plywood.

Floor: Concrete wearing surface finish: e.g. As laid, Epoxy coated, Steel tiles, Ceramic tiles.

Floor: Tanking option: e.g. Required, Not required.

Main Door: Door type: e.g. Hinged, Sliding.

Main door: Viewing panel size (width (mm) x height (mm)): Insert dimensions or Not required.

Refrigeration plant: Type: e.g. Split system, Single drop in unit, Single slide in unit.

Refrigeration plant: Acceptable refrigerants: This may be omitted if the refrigerants permitted under the respective legislation are acceptable. See NATSPEC TECHnote PRO 007 on refrigerant options.

Refrigeration plant: Compressor type: e.g. Belt driven open drive, Direct driven open drive, Hermetic, Semi hermetic.

Refrigeration plant: Compressor drive: e.g. a.c., inverter, digital.

Refrigeration plant: Suction and discharge pressure gauges: e.g. Required, Not required.

Refrigeration plant: Condensing unit enclosure: e.g. Required, Not required (omit for drop in and slide in types).

Refrigeration plant: Condenser fan motor: e.g. a.c., or EC.

Refrigeration plant: 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.

Control options: Condensing unit fault indication: e.g. Required, Not required.

Control options: Lamp test switch: e.g. Required, Not required.

Remote alarms: Refrigeration plant fault: e.g. Required, Not required.

Remote alarms: Room over temperature: e.g. Required, Not required.

Adapting the Cool room schedule for design and construct projects

If the contractor is to calculate the required performance and to select the equipment, the **SELECTIONS** schedules can be used to set generic selection parameters. Note that the documents should include sufficient information for items to be determined by

the contractor, for example from documented performance parameters and drawing information. For these items, insert suitable text such as, *To the documented requirements*. The **Cool room schedule** can then form the basis of the contractor's submissions with the text replaced by design values:

- Refrigeration plant capacity at above conditions (kW(r)).

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**.

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 and construct projects

Insert the information described in the above guidance.

4.3 COOL ROOM ACCESSORIES

Shelving schedule

Property	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			

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 and construct projects

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	Refrigerating systems - Refrigerant classification
AS/NZS 1167		Welding and brazing - Filler metals
AS/NZS 1167.1	2005	Filler metal for brazing and braze welding
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 1397	2011	Continuous hot-dip metallic coated steel sheet and strip - Coatings of zinc and zinc alloyed with aluminium and magnesium
AS 1530		Methods for fire tests on building materials, components and structures
AS 1530.1	1994	Combustibility test for materials
AS/NZS 1530.3	1999	Simultaneous determination of ignitability, flame propagation, heat release and smoke release
AS 1530.4	2014	Fire-resistance tests for elements of construction
AS/NZS 1571	1995	Copper - Seamless tubes for airconditioning and refrigeration
AS 1572	1998	Copper and copper alloys - Seamless tubes for engineering purposes
AS 2129	2000	Flanges for pipes, valves and fittings
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	2018	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 - Metallic fittings and end connectors
AS 4040		Methods of testing sheet roof and wall cladding
AS 4040.3	2018	Resistance to wind pressures for cyclone regions
AS/NZS 4671	2001	Steel reinforcing materials
AS 4674	2004	Construction and fit out of food premises
AS/NZS 4859		Thermal insulation of buildings
AS/NZS 4859.1	2018	General criteria and technical provisions
AS/NZS 4859.2	2018	Design
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)
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
AHRI 450	2007	Performance Rating Of Water-cooled Refrigerant Condensers, Remote Type
FM 4880	2017	Approval standard for Class 1 fire rating of insulated wall or wall and roof/ceiling panels, interior finish materials or coating and exterior wall systems
FM 4881	2017	Approval standard for Class 1 exterior wall systems
EN 13469	2012	Thermal insulation products for building equipment and industrial installation – Determination of water vapour transmission properties of performed pipe insulation.

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

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 2896	2011	Medical gas systems - Installation and testing of non-flammable medical gas pipeline systems
BCA C1.10	2019	Fire resistance - Fire resistance and stability - Fire hazard properties
NATSPEC DES 003	2006	Fire hazard properties of insulation and pliable membranes
NATSPEC DES 020	2011	Fire behaviour of building materials and assemblies
NATSPEC DES 022	2010	Microbial control
NATSPEC DES 031	2014	Specifying R-Values
NATSPEC GEN 006	2007	Product specifying and substitution
NATSPEC GEN 024	2015	Using NATSPEC selections schedules
NATSPEC PRO 007	2016	Refrigerant options

NATSPEC TR 01	2019	Specifying ESD
NATSPEC TR 03	2018	Specifying design and construct for mechanical services
ANSI/ASHRAE 135	2016	BACnet: A data communication protocol for building automation and control networks
ISO 5149 series		Refrigeration systems and heat pumps - Safety and environmental requirements