

0471P KINGSPAN IN THERMAL INSULATION AND PLIABLE MEMBRANES**Branded worksection**

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Worksection abstract

This branded worksection *Template* is applicable to KINGSPAN thermal insulation and pliable membranes for floors, walls, ceilings and roofs. It generally relies on AS 3999 (2015), AS 4200.1 (2017), AS 4200.2 (2017) and AS/NZS 4859.1 (2018). A pliable building membrane may be installed to act as a sarking membrane, vapour barrier, thermal insulation or any combination of the three. This worksection does not cover insulation for building services (e.g. for ductwork) or acoustic insulation.

Background

See NATSPEC TECHnote DES 004 and the *ABCB Condensation in buildings handbook (2023)* for information relating to the use of insulation and vapour control membranes to reduce condensation and moisture flow. Also see NATSPEC TECHnote DES 015 for information on the NCC energy efficiency provisions.

How to use this worksection

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

Related material located elsewhere in NATSPEC

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

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

- *0421 Roofing – combined.*
- *0431 Cladding – combined.*
- *0472 Acoustic insulation* for insulation for floors, walls and ceilings against the transmission of airborne and impact generated sound.

Related branded worksections include:

- *0428p KINGSPAN INSULATED PANELS roofing systems.*
- *0437p KINGSPAN INSULATED PANELS cladding systems.*
- *0762p KINGSPAN INSULATED PANELS in cool rooms.*

Documenting this and related work

You may document this and related work as follows:

- Show extent, type, location, arrangement, fixing and support details on the drawings.
- Where insulation and pliable building membranes are integral to other worksections, cross reference this worksection or take relevant text from here for inclusion in those other worksections. e.g. For IRMAs (inverted roof membrane assemblies) or PMRs (protective membrane roofs), relevant text may be taken for inclusion in *0411 Waterproofing – external and tanking* and deleted in this worksection.

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

Search acumen.architecture.com.au, the Australian Institute of Architects' practice advisory subscription service, for notes on the following:

- Construction details for cool temperate climates.
- Guarantees and warranties.
- Thermal mass and insulation for temperate climates.
- Strategies and resources for material selection.

Specifying ESD

The following may be specified by using included options:

- Bio-soluble fibres in blankets and batts.
- Thermal break strips.
- Thermal performance to reduce heating/cooling load by specifying the required R-Value for roofs, ceilings, walls and floors.

The following may be specified by including additional text:

- Recycled material content, e.g. recycled waste glass in glass wool insulation.
- Refer to NATSPEC TECHreport TR 01 on specifying ESD.

1 GENERAL

Kingspan Insulation is a world-leading manufacturer of innovative, high performance insulation products for roof, wall and underfloor applications in residential, commercial and modular buildings which help reduce the carbon footprint of the built environment. Kingspan Insulation manufactures AIR-CELL®, the region's leading thermo-reflective insulation brand and Kooltherm®, a world-leading CFC/HCFC-free rigid thermoset insulation with zero Ozone Depletion Potential (ODP). Kingspan Insulation's technical experts can provide thermal solutions for Section J, Green Star and NatHERS Star rating.

1.1 RESPONSIBILITIES

General

Requirement: Provide KINGSPAN insulation and pliable membrane systems, as documented.

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

It is the responsibility of the designer to nominate and detail insulation and pliable membranes conforming to the requirements of the NCC.

1.2 COMPANY CONTACTS

KINGSPAN technical contacts

Website: www.kingspan.com/au/en-au/contact-us.

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.

1.4 MANUFACTURER'S DOCUMENTS

Technical manuals

Product brochures, Installation guides, CAD drawings and Certificates & Warranties:

www.kingspan.com/au/en-au/products-brands/insulation/resources.

Kooltherm: www.kingspan.com/au/en-au/products-brands/insulation/insulation-boards/kooltherm-range.

AIR-CELL: www.kingspan.com/au/en-au/products-brands/insulation/air-cell-reflective-flexible-insulation.

1.5 INTERPRETATION

Definitions

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

- Fire hazard properties: To NCC (2022) Schedule 1.

This includes the Flammability Index, Smoke-Developed Index and the Spread-of-Flame Index of a material or assembly as applicable.

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

- Pliable building membrane: To AS 4200.1 (2017) and equivalent to sarking-type materials as defined in the NCC.

A pliable building membrane may be installed to act as a sarking membrane, vapour barrier, thermal insulation or any combination of the three.

- Thermal insulation terminology: To AS/NZS 4859.1 (2018).

See AS/NZS 4859.2 (2018) for additional definitions applicable when designing building components for thermal insulation systems.

- Vapour permeable (breathable) membrane: A flexible membrane material, normally used for secondary waterproofing that allows for the transmission of water vapour.

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

1.6 SUBMISSIONS

Fire performance

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

Products and materials

Thermal insulation properties: Submit evidence of conformity to AS/NZS 4859.1 (2018) and AS/NZS 4859.2 (2018).

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

AS/NZS 4859.1 (2018) is applicable to the R-Value of bulk insulation only and excludes insulation built up from layers of different materials and the effects of air spaces and surface resistance. If the system or total R-Value relies on layers of different materials, air spaces or reflective surfaces, the R-Value must be calculated to AS/NZS 4859.2 (2018).

AS/NZS 4859.2 (2018) includes standard assumptions for calculating R-Values including de-rating of the insulation performance to compensate for dust, labelling ink and so on. The effect of the de-rating may be significant and in situations where reflective foil is used in combination with bulk insulation, a conservative approach would be to ignore the reflective surface effect, i.e. treat the surface as high emittance. Calculations performed to AS/NZS 4859.2 (2018) are not to be used for the purposes of labelling.

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

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

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

Warranties

Kingspan Insulation published product and project specific warranties: Submit on completion.

Describe the requirements in PRODUCTS or EXECUTION, as appropriate, and list the submissions required here.

1.7 INSPECTION

Notice

Inspection: Give notice so that inspection may be made of the following:

- Insulation or pliable membrane materials after installation and before concealment.

Amend to suit the project adding critical stage inspections required.

Hold points, if required, should be inserted here.

2 PRODUCTS

2.1 GENERAL

Product substitution

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

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

Storage and handling

Kooltherm: Store in a clean, dry area and unaffected by weather.

- Temporary outdoor storage: If required, stack boards on a level base clear of the ground and protect from weather. Do not use boards that have been exposed to moisture.

The packaging of Kingspan Kooltherm is not adequate for long term outdoor protection. Boards should ideally be stored inside a building.

AIR-CELL: Deliver products clean and dry in original packaging. Stand rolls on end, keep unpacked products free of contaminants such as dust and grease and prevent foil surfaces from contact with alkaline materials.

Standing rolls on end reduces risk of damage should moisture be present in the packaging.

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.

2.2 FIRE PERFORMANCE

Combustibility

Insulation: Tested to AS 1530.1 (1994).

Check if your construction is required to be non-combustible. Refer to BCA (2022) Section C. If non-combustible construction is required, change this *Optional* style text to *Normal* style text and add to **SUBMISSIONS, Fire performance**.

Non-combustible construction required: [complete/delete]

List any parts of the project that the NCC requires to be non-combustible or delete, if none. The NCC requires that construction required to be non-combustible (e.g. fire walls and spandrels with a specific FRL) must be constructed wholly of materials that are not deemed combustible. See BCA (2022) C2D10(6). In other situations the NCC does not prohibit the use of combustible insulation materials provided they meet the other fire properties.

If non-combustible construction is required, change this *Optional* style text to *Normal* style text.

Fire hazard properties

See NATSPEC TECHnote DES 003 for more information on the fire hazard properties of insulation materials and NATSPEC TECHnote DES 020 on fire behaviour of building materials and assemblies. See also BCA (2022) Table S7C7.

Insulation materials: Tested to AS/NZS 1530.3 (1999). Fire hazard indices as follows:

- Spread-of-Flame Index: ≤ 9 .
- Smoke-Developed Index: ≤ 8 if Spread-of-Flame Index > 5 .

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

AS/NZS 1530.3 (1999) Informative Appendix clause 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 that AS/NZS 1530.3 (1999) clause 4.12.2(c) requires insulation materials faced with reflective surface materials to incorporate a representative vertical joint in three test specimens.

Pliable membranes: Flammability Index ≤ 5 tested to AS 1530.2 (1993).

Flammability Index is determined under AS 1530.2 (1993). There has been some debate about the adequacy of the test procedure in predicting performance of material in real fire situations. Pliable membranes are tested to AS 1530.2 (1993) as they are not suitable for testing to AS/NZS 1530.3 (1999).

Exposed insulation/linings: Group number to AS 5637.1 (2015).

Non-sprinklered buildings: Wall and ceiling linings must either have an *average specific extinction area* less than 250 m²/kg tested to AS/NZS 3837 (1998) or a *smoke growth rate index* not more than 100 tested to AS ISO 9705 (2003), as determined by AS 5637.1 (2015).

2.3 MATERIALS

Thermal insulation

Standard: To AS/NZS 4859.1 (2018).

AS/NZS 4859.1 (2018) categorises insulation as follows: Formed shapes, Formed in situ, Compressible, Loose fills, IR reflective and Vacuum panels. It also outlines requirements for the following types of insulation:

- Rigid cellular foam insulation (EPS, PF, PIR, PUR and XPS): Section 8. These materials exhibit high combustibility (as do most of the organic fibre materials) and release various toxic products of combustion (e.g. hydrogen cyanide from polyurethane foam). Other alternatives include strawboard and woodwool.
- IR reflective (formed shapes and compressible with one or more external IR reflective surfaces): Section 9.

Pliable building membranes

Standard: To AS 4200.1 (2017).

Where optional material classifications are required, AS 4200.1 (2017) Appendix A sets out tests for resistance to UV exposure, surface corrosion of low emittance surface, heat shrinkage, surface water absorbency classification and air control classification. Contact manufacturers for the availability of these test results.

Vapour control membranes:

AS 4200.1 (2017) Table 4 categorises vapour control membranes (VCMs) as vapour barriers when classified Class 1 or Class 2, and vapour permeable membranes when classified Class 3 or Class 4.

- Vapour barrier:
 - . Vapour control classification: Class 1 or Class 2, as documented.
- Vapour permeable (breathable) membrane:
 - . Vapour control classification: Class 3, as documented.

AS 4200.1 (2017) Table 4 documents minimum and maximum vapour permeance values ($\mu\text{g}/\text{N}\cdot\text{s}$) tested to ASTM E96/E96M (2016) for vapour control membranes. Vapour permeance is the inverse of vapour resistance ($\text{MN}\cdot\text{s}/\text{g}$), the higher the permeance value, the greater the permeability.

The NCC cites ASTM E96/E96M (2016). The current edition is ASTM E96/E96M (2022).

Water control (sarking) membrane (other than walls and gables):

- Water control classification: Water barrier.

If the water control membrane fails the test documented in, or has not been tested to AS/NZS 4201.4 (1994), the classification is Non-water barrier.

2.4 COMPONENTS**Fasteners and supports**

General: Metallic-coated steel.

Consider nominating stainless steel in areas of high corrosivity.

Mesh support to roof insulation

Welded safety mesh: To AS/NZS 4389 (2015).

Welded safety mesh may be used for fall arrest if required by WHS authorities. Coordinate with *0421 Roofing – combined*, which also cites AS/NZS 4389 (2015). Mesh support for roof insulation may not be required where fall arrest sarking is used.

2.5 KINGSPAN KOOLTHERM INSULATION PRODUCTS**Kooltherm® K3 floorboard**

Application: Suitable for below concrete on ground.

Available in R-Values R1.10 (25 mm) to R2.30 (50 mm).

Description: Floorboard comprising a rigid thermoset phenolic insulation core with an upper tissue based facing and a lower facing of highly reflective aluminium foil.

Kooltherm® K8 cavity board

Application: Suitable for cavity masonry applications.

Available in R-Values R1.10 (25 mm) and R1.75 (40 mm).

Description: Cavity board comprising a rigid thermoset phenolic insulation core with two highly reflective aluminium foil facings.

Certification: CodeMark Certificate of Conformity CM20042.

The date of expiry of this CodeMark Certificate of Conformity is 12/12/2025.

See CodeMark Certificate of Conformity for conditions and limitations. To confirm it has not been withdrawn, suspended or superseded by later issue, see register.jasanz.org/codemark-register for the CodeMark Register of Certificates of Conformity.

Kooltherm® K10 G2 soffit board

Application: Suitable for concrete soffit applications as an exposed or concealed lining.

Available in R-Values R1.10 (25 mm) to R4.60 (100 mm).

Description: Soffit board comprising a rigid thermoset phenolic insulation core with a tissue based facing to upper side and a plain foil facing to lower side.

Group Number to AS 5637.1 (2015): 2.

Certification: CodeMark Certificate of Conformity CM20201.

The date of expiry of this CodeMark Certificate of Conformity is 26/10/2023.

See CodeMark Certificate of Conformity for conditions and limitations. To confirm it has not been withdrawn, suspended or superseded by later issue, see register.jasanz.org/codemark-register for the CodeMark Register of Certificates of Conformity.

Kooltherm® K10 G2W white soffit board

Application: Suitable for concrete soffit applications as an exposed lining.

Available in R-Values R1.10 (25 mm) to R4.60 (100 mm).

Description: Soffit board comprising a rigid thermoset phenolic insulation core with an upper tissue based facing and a lower facing of white aluminium foil.

Group Number to AS 5637.1 (2015): 2.

Certification: CodeMark Certificate of Conformity CM20201.

The date of expiry of this CodeMark Certificate of Conformity is 26/10/2023.

See CodeMark Certificate of Conformity for conditions and limitations. To confirm it has not been withdrawn, suspended or superseded by later issue, see register.jasanz.org/codemark-register for the CodeMark Register of Certificates of Conformity.

Kooltherm® K10 PLUS soffit board

Application: Suitable for concrete soffit applications as an exposed lining.

Available in R-Values R1.10 (31 mm) to R4.15 (96 mm).

Description: Soffit board comprising a rigid thermoset closed cell phenolic insulation core with a front facing fibre cement sheet and a reverse tissue based facing autohesively bonded to the insulation core.

Group Number to AS 5637.1 (2015): 1.

Kooltherm® K12 framing board

Application: Suitable for cavity masonry, framed and concrete wall systems.

Available in R-Values R1.10 (25 mm) to R2.30 (50 mm).

Description: Framing board comprising a rigid thermoset phenolic insulation core with two highly reflective aluminium foil facings.

Kooltherm® K17 insulated plasterboard

Application: Suitable for cavity masonry and solid wall lining applications.

Available in R-Values R1.15 (35 mm) to R3.70 (90 mm).

Description: Insulated plasterboard comprising a rigid thermoset phenolic insulation core with plasterboard facing bonded to one side and tissue based facing to the other side.

Alternatively document wall linings using *0511 Lining*.

2.6 KINGSPAN AIR-CELL INSULATION PRODUCTS

AIR-CELL Insulbreak®

Application: Suitable for roof and wall steel or timber framing.

Available in R-Values R0.15 (5.5 mm) to R0.25 (9.0 mm).

Description: Reflective insulation, vapour barrier and thermal break comprising a cross-linked, closed cell foam core sandwiched between an anti-glare foil facing on one side and a plain foil facing on the other side.

AIR-CELL Insuliner®

Application: Suitable for unlined roof and wall steel or timber framing.

Available in R-Value R0.15 (5.5 mm).

Description: Reflective insulation and vapour barrier comprising a cross-linked, closed cell foam core sandwiched between an anti-glare foil facing on one side and a plain foil facing on the other side.

Group Number to AS 5637.1 (2015): 2.

AIR-CELL Insulwhite®

Application: Suitable for attic conversions.

Available in R-Value R0.15 (5.5 mm).

Description: Reflective insulation and vapour barrier comprising a cross-linked, closed cell foam core sandwiched between a white facing on one side and a plain foil facing on the other side.

AIR-CELL Permivav XV™

Application: Suitable for masonry walls.

Available in R-Value R0.15 (5.5 mm).

Description: Vapour permeable reflective insulation, comprising a cross-linked, closed cell foam core sandwiched between an anti-glare foil facing on one side and a plain foil facing on the other side.

AIR-CELL Permifloor®

Application: Suitable for under suspended framed floors.

Available in R-Value R0.11 (4.0 mm).

Description: Water permeable reflective insulation, comprising a cross-linked, closed cell foam core sandwiched between an anti-glare foil facing on one side and a plain foil facing on the other side.

AIR-CELL Permishield® XV 70

Application: Suitable for wall applications that require vapour permeance.

Available in R-Value R0.15 (7.2 mm).

Description: Vapour permeable reflective insulation and thermal break, comprising a cross-linked, closed cell foam core sandwiched between an anti-glare foil facing on one side and a plain foil facing on the other side.

2.7 KINGSPAN THERMA INSULATION PRODUCTS**Therma™ TR26**

Available in R-Values R2.3 (50 mm) to R5.5 (120 mm).

Description: Fibre-free rigid thermoset insulation, faced on both sides with a low emissivity composite foil autohesively bonded to the insulation core.

Therma™ TR27

Available in R-Values R1.80 (50 mm) to R5.3 (130 mm).

Description: Fibre-free rigid thermoset insulation, faced on both sides with a coated glass tissue autohesively bonded to the insulation core.

Therma™ TT46

Consult the manufacturer for the R-Value of the roof system for the project.

Thickness:

- For systems with a 1:30 and 1:40 fall: 50 mm minimum.
- For systems with a 1:60 and 1:80 fall: 25 mm minimum.
- For systems with a 1:120 fall: 30 mm minimum.

Description: Tapered fibre-free rigid thermoset insulation, faced on both sides with a low emissivity composite foil autohesively bonded to the insulation core.

Therma™ TT47

Consult the manufacturer for the R-Value of the roof system for the project.

Thickness:

- For systems with a 1:30 and 1:40 fall: 50 mm minimum.
- For systems with a 1:60 and 1:80 fall: 25 mm minimum.
- For systems with a 1:120 fall: 30 mm minimum.

Description: Tapered fibre-free rigid thermoset insulation, faced on both sides with a coated glass tissue autohesively bonded to the insulation core.

3 EXECUTION**3.1 GENERAL****General**

Installation: Conform to KINGSPAN's installation instructions.

Refer to KINGSPAN Insulation Resources for the product documented.

Thermal insulation

Requirement: To AS 3999 (2015) and BCA (2022) J4D3 or BCA (2022) H6D2(1)(b)(i), as appropriate.

AS 3999 (2015) includes vapour barriers used in conjunction with bulk insulation. Bulk insulation includes thermal insulation materials in the form of batts, blankets, rigid boards or loose fills as classified in AS/NZS 4859.1 (2018). For the purposes of AS 3999 (2015), segmented foil products are also considered bulk insulation.

Installation: Firmly butt together with no gaps except as follows:

- Access openings and vents: Do not obstruct.
- Light fittings: To AS/NZS 3000 (2018) clause 4.5.
- Electrical cables: To AS 3999 (2015) clause 2.6.

The flow of electric current in cables generates heat, which needs to dissipate to the surroundings. The insulation should not be installed to completely surround the cable.

Pliable building membrane

Installation: To AS 4200.2 (2017) and BCA (2022) J4D3 or BCA (2022) H6D2(1)(b)(i), as appropriate.

AS 4200.2 (2017) Table 2.6 documents the duty classification and allowable usage for the application and level of support. See the *ABCB Condensation in buildings handbook (2023)* for information on condensation and use of vapour barriers, vapour permeable membranes and sarking.

3.2 FLOORS

The following covers general applications for floor insulation. Delete materials and applications not required and add other materials and applications, as appropriate. See AS 3999 (2015) clause 5.5 on the installation of bulk insulation for floors. See also AS 4200.2 (2017) clauses 3.10 and 3.11 for pliable membranes for concrete floors and framed floors.

Under suspended framed floors

Rigid cellular insulation boards:

- Installation: Fix to the underside of timber strip flooring. Butt tightly to joists.

Alternatively: Fix to the underside of timber joists. Butt tightly to bearers.

If the insulation is exposed, check for fire hazard properties.

- Fixing: Adhesive or mechanical fasteners.

Over suspended framed floors

Rigid cellular insulation boards:

- Installation: Over sheet flooring and between battens supporting a final flooring finish.

Amend if only required at door thresholds.

Coordinate with the *065 Floor surfacing* subgroup for the flooring and adhesive system.

Below concrete slab on ground

Preparation: Sand blinding or working slab, as documented.

Rigid cellular extruded boards:

- Laying pattern: Stretcher bond, with edges tightly butted.
- Damp-proof membrane: Lay over insulation.

Over concrete slab on ground

Substrate preparation: Prepare substrate as follows:

- Clean and remove any deposit or finish that may impair adhesion or location of insulation.
- Remove excessive projections.
- Voids and hollows > 10 mm with abrupt edges: Fill with a cement:sand mix not stronger than the substrate or weaker than the bedding.

Rigid cellular insulation boards:

- Laying pattern: Stretcher bond, with edges tightly butted.
- Fixing: Adhesive fix directly to the concrete floor slab.

Coordinate with the *065 Floor surfacing* subgroup for the flooring and adhesive system, and *0612 Cementitious toppings and requirements for separation strips*.

Under suspended concrete slab

Use where slab incorporates in-slab heating or the slab separates a conditioned space from an unconditioned space.

Rigid cellular insulation boards:

- Fixing: Adhesive or mechanical fasteners.

- Joints: Apply reinforced foil tape to all joints.

3.3 WALLS

The following covers general applications for wall insulation. Delete materials and applications not required and add other materials and applications, as appropriate. See AS 3999 (2015) clause 5.4 on the installation of bulk insulation for walls. See also AS 4200.2 (2017) Section 3 for pliable membranes for walls.

Masonry veneer cavity walls

Rigid cellular insulation boards:

- Installation: Fix boards to external face of framing. Make sure edges are lightly abutted. Secure in place with insulation retaining clips or discs on wall ties. Keep boards clean, dry and free from mortar and grout. Do not bridge the cavity.
- Fixing: Proprietary plastic clips or discs on pre-installed wall ties. Large head clout nails or screws as temporary fasteners before attaching clips or discs.

Flashings: Install flashings before installing insulation. Prevent entry of water behind the insulation boards.

If construction is required to be non-combustible, refer to BCA (2022) H3D2.

Full masonry cavity walls – external face of internal leaf

Rigid cellular insulation boards:

- Installation: Fix boards to external face of internal leaf. Make sure edges are lightly abutted. Secure in place with insulation retaining clips or discs on wall ties. Keep boards clean, dry and free from mortar and grout. Do not bridge the cavity.
- Fixing: Proprietary plastic clips or discs on pre-installed wall ties.

Flashings: Install flashings before installing insulation. Prevent entry of water behind the insulation boards.

Full masonry cavity walls – internal face of internal leaf

Insulation fixed to the internal face of masonry walls may also be used for retrofitting of insulation to existing walls.

Substrate preparation: Conform to the following:

- Clean and remove any deposit or finish that may impair adhesion or location of insulation.
- Remove excessive projections and fill voids and hollows with plaster.
- Maximum surface deviation from a 2400 mm straightedge: 6 mm.

Substrate correction: Skim plaster.

Rigid cellular insulation boards:

- Installation: Fix boards horizontally with staggered vertical joints, all close butted and without crushing.
- Fixing: Proprietary adhesive compatible with the insulation. Apply sufficient pressure to evenly distribute adhesive.

If the construction is required to be non-combustible, see BCA (2022) Spec 7.

Vapour permeable (breathable) membrane

The primary function of the membrane is to direct any water that may penetrate the cladding, masonry veneer or exterior finish to the outside of the structure and act as a barrier to draughts, wind driven rain and dust. There must be adequate provision for the draining, absorption or diffusion of moisture so that moisture is not left trapped between the membrane and the external cladding.

If used as reflective thermal insulation, an air space adjacent to the reflective (low emittance) face is required.

See AS 4200.2 (2017) clause 3.7 for common requirements for walls, and the *ABC Condensation in buildings handbook (2023)* for information on condensation and use of vapour barriers, vapour permeable membranes and sarking. Also see BCA (2022) F8D3 requirements for managing condensation in external walls of a sole-occupancy unit in a class 2 building and a class 4 part of a building.

Requirement: Provide a vapour permeable membrane behind external facing material that does not provide permanent weatherproofing or that may be subject to condensation forming on the internal face, including the following:

- Boards or planks fixed vertically or diagonally.
- Boards or planks fixed in exposed locations where wind driven rain can penetrate the joints.
- Unpainted or unsealed cladding.

- Masonry veneer.

Installation: Run the vapour permeable membrane horizontally on the outer face of external wall framing, over the flashing, from the bottom plate up. Pull taut over the framing and fix to framing members. Seal across the wall cavity at the top.

Horizontal laps: At least 150 mm wide, lapped to make sure water is shed to the outer face of the membrane.

End or vertical overlaps laps: At least 150 mm wide made over framing.

Openings: Run the vapour permeable membrane over the openings and leave covered until windows and doors are installed. Cut the membrane on a 45° diagonal from each corner of the opening, fold the flaps inside and fix to the inside frame of the opening. If the membrane is used to provide a continuous airtight layer, seal all joints with pressure sensitive adhesive tape.

A complete watertight seal that maintains vapour permeability is achieved at penetrations by installation of a proprietary fabricated corner piece.

Fixing: Install as follows:

Consider nominating stainless steel in areas of high corrosivity.

- Timber frames: Metallic-coated clouts, 20 mm long 6 to 8 mm staples or punched multi-point metallic-coated steel brads.
- Steel or aluminium frames: Hex head screws, with either 20 mm diameter washers or through hardboard strips.
- Plywood: Alternatives:
 - . Metallic-coated clouts, 20 mm long 6 to 8 mm staples or punched multi-point metallic-coated steel brads at minimum 300 mm centres.
 - . Water based contact adhesive with a 50% adhesive cover.

3.4 CEILINGS

The following covers general applications for ceiling insulation. Delete materials and applications not required and add other materials and applications, as appropriate. See AS 3999 (2015) clause 5.3 on the installation of bulk insulation for ceilings. See also AS 4200.2 (2017) clause 3.6 for pliable membranes for ceilings and the *ABCB Condensation in buildings handbook (2023)* for information on condensation and use of vapour barriers, vapour permeable membranes and sarking.

Cathedral ceilings

Rigid cellular insulation boards:

- Installation: Lay boards with their long edges at right angles to the rafters and with the tongue pointing up the slope. Start laying at eaves and progress towards the ridge. Cut boards and tightly fit to abutments and penetrations.
- Fixing: Secure temporarily by occasional nailing to the rafters. Fix permanently by nailing counter battens to the rafters.
- Sealing: Seal gaps with polyurethane foam.

Alternatively use fibre batts installed between ceiling joists.

3.5 ROOFS

The following covers general applications for roof insulation. Delete materials and applications not required and add other materials and applications, as appropriate. See AS 3999 (2015) clause 5.2 on the installation of bulk insulation for roofing. See also AS 4200.2 (2017) Section 3 for pliable membranes for roofs.

General

Requirement: Provide insulation to the whole of the roof area including skylight shaft walls, except the following:

- Eaves, overhangs, skylights, vents and openings.
- Roofs to outbuildings, garages, and semi-enclosed spaces such as verandahs, porches and carports.

Amend if insulation is required in semi-enclosed spaces (balconies, verandahs) or ancillary buildings (garages, workshops, carports etc.).

Mesh support to roof insulation

Welded safety mesh may be required by WHS authorities for fall arrest, along with perimeter guard rails. Coordinate with 0421 Roofing – combined. Do not call up welded safety mesh in more than one clause in the specification.

Requirement: Provide support to the following:

- Water control (sarking), vapour barrier or reflective thermal insulation membranes laid over roof framing members that are spaced at more than 900 mm centres.
- Blanket type thermal insulation laid over roof framing members as sound insulation to metal roofing.

Installing welded safety mesh: To AS/NZS 4389 (2015).

Waterproof membrane roofs

Roofs with insulating membrane protection are also known as IRMA (inverted roof membrane assembly) or PMR (protective membrane roof). Delete if documented in 0411 Waterproofing – external and tanking.

Preparation: Make sure membrane is clean and free of loose material. Lay separation layer over membrane with edges lapped 300 mm and turned up at upstands and penetrations.

Rigid cellular insulation boards: Lay boards in brick pattern with shiplap edges pushed together firmly, cut neatly around penetrations and extend up upstands.

Document separation layer and surface finish in 0411 Waterproofing – external and tanking, or delete if not required.

Pliable building membranes

See AS 4200.2 (2017) clause 3.3 for common requirements for roofs.

Vapour barrier: Lay over the roof framing with sufficient sag to allow the bulk insulation to achieve its full thickness. Overlap all edges 150 mm and seal all joints with pressure sensitive adhesive tape.

Any separate bulk thermal insulation should be placed on the cold side of the vapour barrier.

Water control (sarking) membrane: Provide sarking under tile and shingle roofing.

AS 2050 (2018) specifies sarking requirements for tiled roofs. AS 2050 (2018) is cited in the NCC for structural sufficiency and weatherproofing.

If used as reflective thermal insulation, an air space adjacent to the reflective (low emittance) face is required.

3.6 COMPLETION**Warranties**

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

Insulation and pliable membranes: KINGSPAN's published product warranties, including:

- KINGSPAN Kooltherm: 10 year minimum period.
- KINGSPAN AIR-CELL: 15 year minimum period.
- KINGSPAN Therma: 10 year minimum period.

Project specific warranty: Warranty provided by KINGSPAN following satisfactory site inspection.

To register your specification for your project specific warranty, enter the details here www.kingspaninsulation.com.au/PSW.

4 SELECTIONS

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

4.1 THERMAL INSULATION**Kingspan Insulation thermal insulation schedule**

	A	B	C
Application			
Product			
R-Value (m ² .K/W)			

	A	B	C
Thickness (mm)			
Airborne sound insulation			
Compressive strength (kPa)			

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

Application and Product: Select from the following:

- Under suspended framed floors: AIR-CELL Permifloor®.
- Below concrete slab on ground: Kooltherm K3 Floorboard.
- Over concrete slab on ground: Kooltherm K3 Floorboard.
- Under suspended concrete slab: Select from Kooltherm® K10 G2 Soffit Board, Kooltherm® K10 G2W White Soffit Board or Kooltherm® K10 PLUS Soffit Board.
- Framed walls with cladding: Select from AIR-CELL Insulbreak® 70/90 (for steel framing) or AIR-CELL Permishield® XV 70 (for timber and steel framing).
- Framed walls without linings: AIR-CELL Insuliner.
- Masonry veneer cavity walls: Select from AIR-CELL Permivac XV 70, Kooltherm K12 framing board or Kooltherm® K17 insulated plasterboard.
- Reverse masonry veneer cavity walls: AIR-CELL Permishield XV 70.
- Full masonry cavity walls – internal face of external leaf: AIR-CELL Permivac XV 70.
- Full masonry cavity walls – external face of internal leaf: Select from AIR-CELL Permivac XV or Kooltherm K8 cavity board.
- Masonry or concrete walls – internal face: Kooltherm® K17 insulated plasterboard.
- Cathedral ceilings: AIR-CELL Insulwhite.
- Suspended or framed ceilings: AIR-CELL Insulwhite.
- Metal roofs with internal linings – Reflective foil insulation: Select from Insulbreak 55 or Insulbreak 70.
- Metal roofs without internal linings – Reflective foil insulation: Insuliner.
- Tiled roofs – reflective insulation: Select from Insulbreak 55 or Insulbreak 70.
- Concrete roof slab soffit: Select from Kooltherm® K10 G2 Soffit Board, Kooltherm® K10 G2W White Soffit Board or Kooltherm® K10 PLUS Soffit Board.
- Waterproof membrane roofs: Therma™ TR26, Therma™ TR27, Therma™ TT46 or Therma™ TT47.

R-Value (m².K/W) and Thickness (mm): Select from the following:

- Kooltherm® K3 floorboard: R1.10 (25 mm), R1.30 (30 mm), R1.75 (40 mm), R2.30 (50 mm).
- Kooltherm® K8 cavity board: R1.10 (25 mm), R1.75 (40 mm).
- Kooltherm® K10 G2 soffit board: R1.10 (25 mm), R1.30 (30 mm), R1.75 (40 mm), R2.05 (45 mm), R2.30 (50 mm), R2.75 (60 mm), R3.20 (70 mm), R3.65 (80 mm), R4.10 (90 mm), R4.60 (100 mm).
- Kooltherm® K10 G2W white soffit board: R1.10 (25 mm), R1.30 (30 mm), R1.75 (40 mm), R2.05 (45 mm), R2.30 (50 mm), R2.75 (60 mm), R3.20 (70 mm), R3.65 (80 mm), R4.10 (90 mm), R4.60 (100 mm).
- Kooltherm® K10 PLUS soffit board: R1.10 (31 mm), R1.40 (36 mm), R1.75 (46 mm), R2.30 (56 mm), R2.75 (66 mm), R3.25 (76 mm), R3.70 (86 mm), R4.15 (96 mm).
- Kooltherm® K12 framing board: R1.10 (25 mm), R1.3 (30 mm), R1.75 (40 mm), R2.30 (50 mm).
- Kooltherm® K17 insulated plasterboard: R1.15 (35 mm), R1.35 (40 mm), R1.80 (50 mm), R2.35 (60 mm), R2.80 (70 mm), R3.25 (80 mm), R3.70 (90 mm).
- AIR-CELL Insulbreak®: R0.15 (5.5 mm), R0.20 (7.2 mm), R0.25 (9.0 mm).
- AIR-CELL Insuliner®: R0.15 (5.5 mm).
- AIR-CELL Insulwhite®: R0.15 (5.5 mm).
- AIR-CELL Permivac XV™: R0.15 (5.5 mm).
- AIR-CELL Permifloor®: R0.11 (4.0 mm).
- AIR-CELL Permishield® XV 70: R0.15 (7.2 mm).
- Therma™ TR26: R1.35 (30 mm), R2.30 (50 mm), R2.75 (60 mm), R3.45 (75 mm), R3.65 (80 mm), R4.10 (90 mm), R4.60 (100 mm), R5.05 (110 mm), R5.50 (120 mm).
- Therma™ TR27: R1.05 (30 mm), R1.80 (50 mm), R2.15 (60 mm), R2.70 (75 mm), R3.05 (80 mm), R3.45 (90 mm), R3.85 (100 mm), R4.25 (110 mm), R4.90 (120 mm).

- Therma™ TT46: Consult the manufacturer.
- Therma™ TT47: Consult the manufacturer.

AS/NZS 4859.1 (2018) requires that R-Value is declared at 23°C for insulation products sold in Australia.

Airborne sound insulation: State the required rating to AS/NZS ISO 717.1 (2004) for either the weighted sound reduction index (R_w) or weighted sound reduction index with spectrum adaptation ($R_w + C_{tr}$). This rating is for a building system e.g. partition wall, of which the building element is only one component. It may be better to provide the rating in the appropriate system schedule. It is advisable to obtain the advice of an acoustic consultant on the selection of an R_w or $R_w + C_{tr}$ rating for airborne sound transmission reduction. Refer to NATSPEC TECHnote DES 032 for information.

Compressive strength (kPa): Refer to structural engineer and product manufacturer for advice.

4.2 PLIABLE MEMBRANES

Pliable membranes schedule

	A	B	C
Application			
Product			
Location			
Electrical conductivity classification			
Duty classification			
Surface emittance classification			
Membrane emittance category			
Vapour control membrane classification			
R-Value ($m^2.K/W$)			

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

Application: Select from the following:

- Vapour control membrane (vapour barrier).
- Vapour control membrane (vapour permeable (breathable) membrane).
- Water control (sarking) membrane.
- Thermal control membrane.

Product: Nominate the selected product.

Location: Describe location or show on the drawings.

Electrical conductivity classification: Select from Electrically non-conductive or Electrically conductive.

Duty classification: Select from Extra heavy, Heavy, Medium, Light, Light wall or Extra light.

Surface emittance classification: Select from IR Reflective, IR Semi-reflective or IR Non-reflective.

Membrane emittance category: Select from RR, RS, RN, SS, SN or NN. These categories describe the emittance of each surface, for example for RS, surface 1 is IR Reflective and surface 2 is IR Semi-reflective.

Vapour control membrane classification:

- Vapour barrier: Class 1 or Class 2.
- Vapour permeable (breathable) membrane: Class 3.

R-Value ($m^2.K/W$): AS/NZS 4859.1 (2018) requires that R-Value is declared at 23°C for insulation products sold in Australia.

REFERENCED DOCUMENTS

The following documents are incorporated into this worksection by reference:

AS 1530		Methods for fire tests on building materials, components and structures
AS 1530.1	1994	Combustibility test for materials
AS 1530.2	1993	Test for flammability of materials
AS/NZS 1530.3	1999	Simultaneous determination of ignitability, flame propagation, heat release and smoke release
AS/NZS 3000	2018	Electrical installations (known as the Australian/New Zealand Wiring Rules)
AS 3999	2015	Bulk thermal insulation - Installation
AS 4200		Pliable building membranes and underlays
AS 4200.1	2017	Materials
AS 4200.2	2017	Installation
AS/NZS 4389	2015	Roof safety mesh
AS/NZS 4859		Thermal insulation materials for buildings

AS/NZS 4859.1	2018	General criteria and technical provisions
AS/NZS 4859.2	2018	Design
AS 5637		Determination of fire hazard properties
AS 5637.1	2015	Wall and ceiling linings
BCA H6D2	2022	Class 1 and 10 buildings - Energy efficiency - Application of Part H6
BCA J4D3	2022	Energy efficiency - Building fabric - Thermal construction - General
NCC Schedule 1	2022	Schedule 1 Definitions
CM20042	2022	KINGSPAN Kooltherm® K8 Cavity Board
CM20201	2020	KINGSPAN Kooltherm® K10 G2 Soffit Board & K10 G2W Soffit Board
The following documents are mentioned only in the <i>Guidance text</i>:		
AS ISO 717		Acoustics - Rating of sound insulation in buildings and of building elements
AS/NZS ISO 717.1	2004	Airborne sound insulation
AS 2050	2018	Installation of roof tiles
AS/NZS 3837	1998	Method of test for heat and smoke release rates for materials and products using an oxygen consumption calorimeter
AS/NZS 4201		Pliable building membranes and underlays - Methods of test
AS/NZS 4201.4	1994	Resistance to water penetration
AS ISO 9705	2003	Fire tests - Full-scale room test for surface products
BCA C2D10	2022	Fire resistance - Fire resistance and stability - Non-combustible building elements
BCA F8D3	2022	Health and amenity - Condensation management - External wall construction
BCA H3D2	2022	Class 1 and 10 buildings - Fire safety - Fire hazard properties and non-combustible building elements
BCA Section C	2022	Fire resistance
BCA Spec 7	2022	Fire resistance - Fire hazard properties
BCA Table S7C7	2022	Fire resistance - Fire hazard properties - Other materials - Other materials
ABCB Condensation	2023	Condensation in buildings handbook
NATSPEC DES 003		Fire hazard properties of insulation and pliable membranes
NATSPEC DES 004		Air, moisture and condensation
NATSPEC DES 015		NCC - BCA Volume One Energy efficiency provisions
NATSPEC DES 020		Fire behaviour of building materials and assemblies
NATSPEC DES 031		Specifying R-Values
NATSPEC DES 032		Airborne sound insulation
NATSPEC GEN 006		Product specifying and substitution
NATSPEC GEN 024		Using NATSPEC selections schedules
NATSPEC TR 01		Specifying ESD
ASTM E96/E96M	2016	Standard test methods for water vapor transmission of materials
ASTM E96/E96M	2022	Standard test methods for gravimetric determination of water vapor transmission rate of materials