

Polystyrene External Wall Cladding Systems

Compliance

Polystyrene External Wall Cladding Systems are DTS (deemed-to-satisfy) in the building regulations, and therefore must be designed as an Alternative Solution.

Notes

1. This sample specification, may be used as a template for considering an Alternative Solution approach; but compliance with the specification does not infer compliance with the building regulations.
2. BCA Volume 2 Part 1.2.2 provides for the fooling means of demonstrating compliance.
 - (i) *A report issued by a Registered Testing Authority, showing that the material or form of construction has been submitted to the tests listed in the report, and setting out the results of those tests and any other relevant information that demonstrates its suitability for use in the building.....*
 - (ii) *A current Certificate of Conformity or a current Certificate of Accreditation.*
 - (iii) *A certificate from a professional engineer or other appropriately qualified person which-*
 - (A) *certifies that a material, design or form of construction complies with the requirements of the BCA; and*
 - (B) *sets out the basis on which it is given and the extent to which relevant specification, rules, codes of practice or other publication have been relied upon.*
 - (iv) *A current certificate issued by a product certification body that has been accredited by the Joint Accreditation System of Australia and New Zealand (JAS-ANZ)*
 - (v) *******
 - (vi) *Any other form of documentary evidence that correctly describes the properties and performance of the material or form of construction an adequately demonstrates its suitability for use in the building*
3. Assessments must consider the following:
 - Location, wind classification, fixings and overall building behaviour.
 - Articulation, expansion and contraction
 - Rainwater intensity and leakage
 - Humidity and condensation
 - Vermin, termites and rising damp.

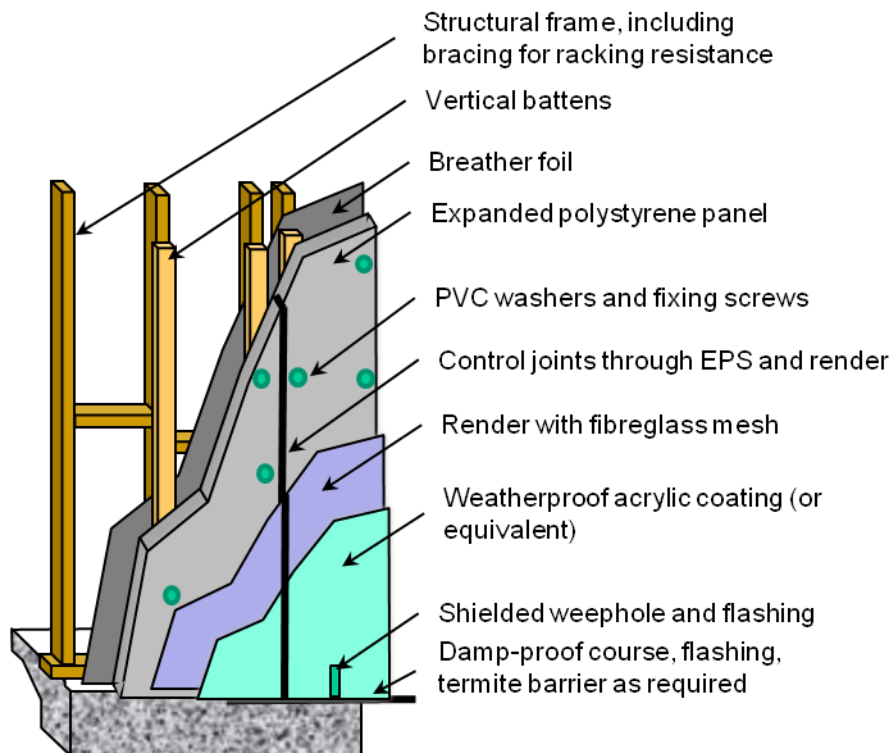
Scope

Set out below is a form of construction, which, subject to correct design and construction, should be satisfactory for EPS and XPS Cladding Systems in Wind Classes up to and including N3 (1.5 kPa net suction) and site Classifications A, S, M, M-D, H1, H1-D, H2, H2-D. For other applications, the system design shall be based on test results and assessed against the Performance Requirements in the building regulations.

Form of Construction

EPS and XPS Cladding Systems shall consist of:

- A structural support system, which can resist applied permanent, imposed, wind and other loads, without distortion that could damage the cladding or other components
- Breather foil (building wrap), which minimises the build up of condensation
- Vertical cavity battens, 20 to 25 mm thick and the same width at the studs, fixed over the breather foil to the studs
- Flashing system around window and door penetrations (refer to NZBC E2/AS1 for guidance)
- Expanding foam airseals around the window trim cavity (refer to NZBC E2/AS1 for guidance)
- Expanded polystyrene panels (EPS) or extruded polystyrene (XPS), fixed through the battens and breather foil into the studs by a series of corrosion-resistant screws and PVC washers, which prevent the panels being sucked off the frames by extreme wind
- A render system, strengthened by a fibre glass mesh to prevent crazing and cracking
- Control joints, which are spaced and detailed to prevent cracking of the cladding when the building is subject to movement
- Weatherproof acrylic coating
- Shielded weepholes and flashing system, which enables any moisture to drain from the cavity to the outside of the building
- Damp-proof course, flashings, termite barriers, vermin-proofing and the like to prevent the ingress of rising damp, vermin and termites
- Flashings and jointing, which prevent the ingress of rainwater at inter-storey junctions, parapets, openings, doors, windows and penetrations.



Support

The supporting structure shall comply with the requirements of the BCA. Some relevant referenced documents for the applicable wind class in accordance with AS 4055 are listed below.

Table 1
Referenced BCA documents for the supporting structures

Supporting Structure	Relevant BCA Referenced document
Timber framing	AS 1684.2 and AS 1684.3 or AS 1684.4
Residential and low rise steel framing	AS 4600 NASH Standard Part 1
Masonry	AS 4773.1 and AS 4773.2
Structural steelwork	AS 4100
Concrete	AS 3600

Polystyrene Board

Polystyrene board shall be:

- Expanded Polystyrene (EPS) Grade M, H or VH in accordance with AS 1366.3; or
- Extruded Polystyrene (XPS) Grade II, III or IV in accordance with AS 1366.4.

Note:

Care is needed with XPS, in particular the ability of the render to adhere to the panel.

Polystyrene board shall be not less than 60 mm thickness, fire retarded, vermin retarded, termite resistant.

The thickness of the Extruded Polystyrene (EPS) board shall be such that the energy efficiency requirements of the Building Code of Australia (BCA) are met. The following thermal resistances are deemed to be achieved by EPS Cladding systems when used in conjunction with internal plasterboard and a stud wall system.

Table 2
Thermal Properties EPS Cladding Systems with Internal Plasterboard Lining

Material	Thermal resistance, R m ² .K/W		
	60 mm	80 mm	100 mm
EPS Class M Cladding System			
External air film	0.04	0.04	0.04
Render and coating	0.01	0.01	0.01
EPS Cladding Class M	1.44	1.92	2.40
70 mm Air Gap <small>See Note 5</small>	0.17	0.17	0.17
10 mm Gypsum plasterboard	0.06	0.06	0.06
Internal air film	0.12	0.12	0.12
Total	1.84	2.32	2.80
EPS Class H Cladding System			
Other components as listed above	0.40	0.40	0.40
EPS Cladding Class H	1.50	2.00	2.50
Total	1.90	2.40	2.90
EPS Class VH Cladding System			
Other components as listed above	0.40	0.40	0.40
EPS Cladding Class VH	1.54	2.05	2.56

Total	1.94	2.40	2.96
Notes:			
1. This table provides the thermal resistance of EPS (expanded polystyrene) clad veneer walls, without added insulation.			
2. Thermal resistance of EPS is based on AS 1366.3.			
3. Steel studs, if used, should incorporate a thermal break in accordance with BCA.			
4. Allowances for air films and air spaces are included. There is no allowance for reflective foil.			
5. 90 mm studs may be substituted for 70 mm studs. The most common studs are either 90 mm or 70 mm softwood. 75 mm is a hardwood equivalent.			
6. Similar calculations may be performed for XPS (extruded polystyrene) clad veneer walls using published data.			

uPVC Beading and Mouldings

PVC Beading and Mouldings shall be polyvinyl chloride virgin material, mesh reinforced, UV stabilised, marine grade extruded to the specified shapes.

Fixing to supporting structures

The spacing of supports shall not exceed 600 x 600 mm

Screw Fixings

Screw fixings shall be:

- Self drilling, counter-sunk ribbed head with, coarse threaded, Class 3 (except where varied below);
- Teflon-coated for applications within 1 km breaking surf;
- Fixed through 40 mm diameter PVC washers.

In Wind Classes N1, N2 and N3, screws shall be:

- At least 010 gauge (8 mm);
- Of length at least 25 mm longer than the thickness of the EPS board plus the cavity width;
- At centres not exceeding 450 mm horizontally and 300 mm vertically;
- At least 5 per square metre of wall; and
- At least 10 per square metre of wall within 1.2 metres of the end of the building.

Corrosion resistance of screws

- For applications at least 1 km from breaking surf or polluting industry, screws shall be Teflon-coated steel, or of a material with higher resistant to corrosion
- For applications within 1 km of breaking surf or polluting industry, Grade 304 or 316 stainless steel screws shall be used.

Fibreglass Mesh

Fibreglass mesh shall be minimum 5 x 5 mm mesh, 150 g/m² mesh, and shall be alkali resistant; and laid over the whole surface.

Fibreglass Mesh at Joints

At joints between adjacent panels that have been meshed and rendered in the factory before despatch to site, install a layer of 200mm fibreglass mesh and render patching compound, ensuring that it overlaps the sheet by 100mm. This requirement does not apply to control joints.

At external corners, install mesh reinforced corner trim with extra 200mm mesh to the side where raw polystyrene is visible.

Construction Adhesive

Construction adhesive shall be:

- Synthetic rubber-based thixotropic gunable heavy paste, of
- Viscosity approximately 110,000 cps at 25°C, Low odour,
- Colour beige (unless specified otherwise),
- Solids content 77% +, -/-. 5%,
- Specific gravity 1.16 +, -/-. 0.05 ,
- Flammability flashpoint approximately -20°C,
- Service temperature -30°C to +80°C, with
- High green strength,
- High initial grab,
- High flexibility,
- Temperature resistant,
- Slump resistant,
- Water resistant,
- Styrene safe,
- Working time 5 to 10 minutes depending on temperature,
- Open time 20 to 30 minutes depending on temperature,
- Maximum bond achieved within 12 to 72 hours depending on temperature and thickness,
- Compatible with the EPS or XPS material as appropriate.

Render

Render shall be pre-blended polymer modified cement render, suitable for mixing with mortar immediately before use to provide a smooth trowelable paste. Render should not be applied in temperatures above 35°C or below 5°C. Render should not be applied when there is dew, rain or frost on the cladding or it is expected within 24 hours. The specific render should be proven to be compatible with the EPS or XPS substrate. The appropriate tensile adhesion strength shall be determined and specified.

Sealants

Sealant shall be an acrylic based texture coating suitable for external application over cement rendered surfaces. Sealants shall comply with NZBC E2/AS1 or equivalent:

- Type F, Class 20LM or 25LML of ISO 11600, or
- Low modulus Type II Class A of Federal Specification TT-S-00230C.

Coatings

Coatings shall be a long-life, high-build, low profile acrylic based texture coating suitable for external application over cement rendered surfaces. Coatings shall comply with AS/NZS 4548.2, and are classified as paint Type 38 of AS 2311, and correspond generally to the Australian Paint Approval Scheme specification Type 3 of GPC-C-117. They shall be applied by airless spray or nap roller in accordance with the manufacturer's instructions to typically achieve a spreading rate of 1.5-6.5 m²/L (0.67-0.15 L/m²).

Control Joints

Horizontal and vertical joints shall be 10 mm wide and shall consist of a polyethylene backer rod and polyurethane joint material, with a PVC cover moulding.

Backing rod for control joints, expansion joints and articulation joints shall be expanded polyethylene tube or bead. Joint sealant shall be gun grade multi-purpose polyurethane sealant.

Where panels are fixed across wall frames and onto other framing systems such as a trussed gable roof, horizontal control joints shall be incorporated. All joints shall have cover moulds, fixed to the top panel (but not to the bottom panel) and incorporate flexible sealant.

At corners of the building, horizontal control joint shall be detailed and erected such that the joints line up around the corner. All joints shall have cover moulds.

Articulation and Control Joints

In clad walls over 5.0 m high, horizontal control joints shall be installed at centres not exceeding 3.0 m

In clad walls over 6.0 m long, vertical control joints shall be installed at centres not exceeding the following:

- (a) In straight, continuous walls having no openings, at centres not more than the values given in the Table below.
- (b) Where the height of the cladding changes abruptly by more than 20% of its lesser height, at the position of change in height.
- (c) Where openings more than 900 × 900 mm occur, at not more than 5000 mm centres.
- (d) Where cladding changes thickness.
- (e) At control or construction joints in footings or slabs.
- (f) Within 4500 mm of all corners.

Table 3
Spacing Of Articulation Joints For Cladding

Site Class	Maximum Articulation Joint Spacing, m		
	Up to 4 m high for 10 mm joints	4 m to 8.5 m high for 10 mm joints	4 m to 8.5 m high for 1015 mm joints
A, S	Not required	Not required	Not required
M, M-D	6.0	4.2	6.0
H1, H1-D	5.5	3.9	5.5
H2, H2-D	5.0	3.5	5.0
Note Site class is defined in AS 2870. For Class P sites, joints spacing shall be determined by consideration of the specific site conditions.			

At window and door openings:

- Provide an 8 to 10 mm expansion gap between EPS panels and aluminium, timber or PVC window frames.
- Provide for a 1 in 6 slope at window sills.
- Install mesh reinforced corner trim

Specifications must include appropriate window and door joinery. Window joinery at wall junctions represent high weather-tightness risk, especially where the joinery has no facing.

Ground Clearance

EPS Cladding shall be finished at least 100 mm clear of finished ground level.

Weather proofing

Flashing and damp-proofing components of an EPS cladding system shall be detailed to suit the specific requirements of the system, and shall comply generally with the following:

- Flashings shall be provided at the following locations:
 - External Corner Flashing
 - Internal Corner Flashing
 - Roof/parapet flashing
 - Window head flashing
 - Window Sill Flashing
 - Balustrades
 - Parapet capping
- Flashings shall comply with AS/NZS 2904.
- Flashings and cappings shall be manufactured from galvanized zinc-coated steel with a thickness of not less than 0.6 mm
- Horizontal surfaces shall be sloped at 1 in 6.
- Flashings shall be lapped not less than 50 mm, sealed with a water-resistant sealant, and fixed with corrosion resistant screws. Flashings intended to drain accumulated moisture shall be securely fixed at least 25 mm under the cladding and extend over the ends and edges of framing of the openings to ensure that they maintain their position.
- Flashings shall hold their intended shape.
- Metal flashings shall be compatible with other metals with which they are in contact or spill water onto, or from which they receive water; to avoid galvanic corrosion. Lead flashings shall not be used on any roof that is part of a potable water catchment roof. The combination of lead with zinc aluminium alloy shall not be used.
- A cavity flashing shall be—
 - (a) turned up a minimum of 150 mm at the inner frame;
 - (b) fixed to the inner frame at 600 mm maximum centres;
 - (c) lapped at joints in a straight run by a minimum of 150 mm;
 - (d) lapped at corners by the width of the leaf and cavity or fanned; and

- Cavities should be drained by concealed/protected vent strips at the base of the wall, The minimum ventilation rate should be 1000 mm² per lineal metre of wall. Alternatively protected weepholes may be used.
- Where cavity flashings are penetrated, the flashing shall be punched through or cut from the inside of the wall, and be fitted around the penetration and sealed.
- In areas where termite management systems are required, all penetrations within the cavity walls shall be treated in accordance with AS 3660.1.