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Introduction & Background

As the construction industry moves toward more energy-efficient buildings, installing continuous exterior insulation is an effective way to achieve higher thermal performance in wall assemblies. Research and in-situ performance has shown that attaching exterior strapping with just screws directly through layers of Outright rigid insulation is an efficient solution both thermally and structurally as a cladding attachment substrate.



Illustration of PIR Insulation in an exterior wall application

Historically, when failure occurs due to poor attachment mechanisms, it is due to adhesive fastenings, thus Outright recommends mechanical fasteners for long term performance.

The challenges with adhesive fixings include but are not limited to:

- Grade of the adhesive (is it strong enough for the loads)
- Conformance/compatibility of the adhesive with the membrane substrate (could erode the membrane and fail)
- Condition of the substrate during attachment (dusty/wet/etc.)
- Temperature during the application (too cold?)
- Applied pressure during application (not enough?)
- Thermal cycling/wetting prior to installation of insulation

Structural Considerations

This cladding attachment system uses vertical strapping (i.e. furring), on the front face of the exterior insulation, fastened with long screws through the exterior insulation and into a framed wall. The cladding is then attached and supported with separate fasteners through the strapping.

The bending resistance from the screw (when installed into the sheathing and studs), coupled with a truss system, where the fasteners take tension loads and the compression loads are resisted by the bearing of the strapping on the insulation layer, provide the primary support for the cladding. Additionally, the friction between the insulation and the strapping and sheathed wall (created by the force applied by the fasteners) also provides some vertical load resistance.

In addition to cladding weight, stud spacing of the backup wall, sheathing type and thickness, and exterior insulation thickness and type will all affect the required fastener spacing, size, and minimum embedment into the backup wall, as well as the strapping thickness and width.

Furthermore, the potential wind loads and seismic activity associated with the location will also impact design. Note that this structural system relies on the increased pullout strength of large screws. For this reason, nails are not recommended for use in this application unless designed for a specific project by an engineer.

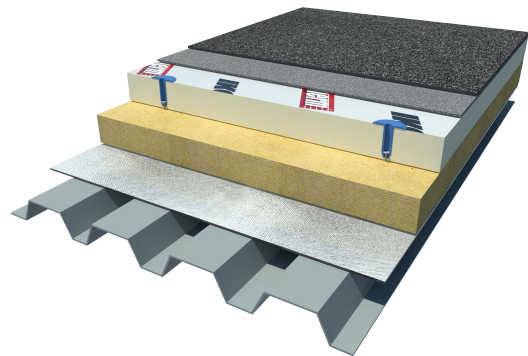


Illustration of Nuratherm Hybrid Warm Roof System

Fastener Tables

The following design tables are provided with respect to supporting the dead load of cladding systems installed using long screws through values provided pertain to wall assemblies on low- to mid-rise buildings up to six storeys, built using typical wood and steel stud framing techniques. The higher wind loads expected on larger buildings requires specific structural design.

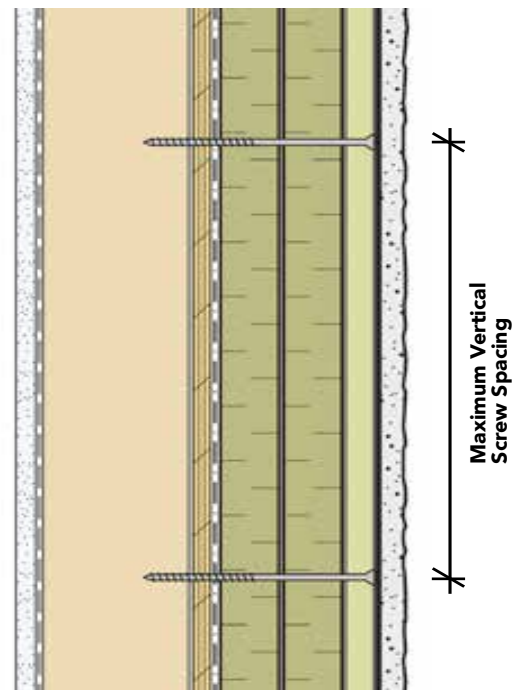
Exterior Insulation Thickness	Maximum Screw Spacing	Minimum Screw Diameter	Minimum Screw Embedment	Minimum Batten Size
400 mm Timber Frame Spacing				
Light Weight Cladding < 25 kg/m²				
up to 70mm	600 mm	#10	40mm	45 x 45mm
71 to 150mm	400 mm	#10	40mm	45 x 45mm
150mm +	400mm	#12	40mm	45 x 45mm
Medium Weight Cladding 25-50 kg/m²				
up to 70mm	600 mm	#12	40mm	45 x 45mm
71 to 150mm	400mm	#12	40mm	45 x 45mm
150mm +	300mm	#12	40mm	45 x 45mm
Heavy Weight Cladding > 50 kg/m²				
up to 70mm	400 mm	#14	40mm	45 x 45mm
71 to 150mm	300 mm	#14	40mm	45 x 45mm
150mm +	300mm	#14	40mm	45 x 45mm
600 mm Timber Frame Spacing				
Light Weight Cladding < 25 kg/m²				
up to 70mm	400 mm	#10	40mm	45 x 45mm
71 to 150mm	300 mm	#10	40mm	45 x 45mm
150mm +	300mm	#12	40mm	45 x 45mm
Medium Weight Cladding 25-50 kg/m²				
up to 70mm	400 mm	#12	40mm	45 x 45mm
71 to 150mm	300mm	#12	40mm	45 x 45mm
150mm +	300mm	#14	40mm	45 x 45mm
Heavy Weight Cladding > 50 kg/m²				
up to 70mm	300 mm	#14	40mm	45 x 45mm
71 to 150mm	200 mm	#14	40mm	45 x 45mm
150mm +	200mm	#14	40mm	45 x 45mm
400 mm Steel Framing Spacing				
Light Weight Cladding < 25 kg/m²				
up to 70mm	400 mm	#12	Through stud flange	45 x 45mm
71 to 150mm	300 mm	#12		45 x 45mm
150mm +	250mm	#12		45 x 45mm
Medium Weight Cladding 25-50 kg/m²				
up to 70mm	300 mm	#12	Through stud flange	45 x 45mm
71 to 150mm	250mm	#12		45 x 45mm
150mm +	200mm	#12		45 x 45mm
Heavy Weight Cladding > 50 kg/m²				
up to 70mm	300 mm	#14	Through stud flange	45 x 45mm
71 to 150mm	200 mm	#14		45 x 45mm
150mm +	150mm	#14		45 x 45mm

Screws

Screws used to attach the strapping through the insulation should be either stainless steel or galvanized, as they will be exposed to the exterior environment and should be protected from corrosion to ensure long term durability. Always ensure the screw type is compatible with both the strapping material (i.e. wood pressure treatment) and the cladding material.

This cladding attachment system may require specialty screws in order to accommodate large load torques when installed through thick insulation into the backup wall. One important constructibility consideration is the use of screws with a countersunk head so that the screw head can be embedded into the front face of the strapping and out of the way of cladding materials and attachment accessories.

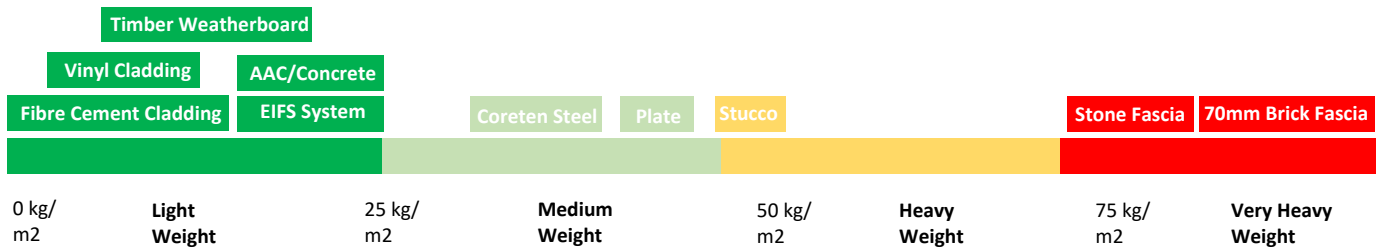
Section View



Cladding Weight

Cladding weights for the purpose of the structural calculations are categorized as Light (less than 5 lbs/ft² (24.5 kg/m²)), Medium (5 to less than 10 lbs/ft² (24.5–49 kg/m²)), Heavy (10–15 lbs/ft² (49–73 kg/m²)), and Very Heavy (over 15 lbs/ft² (73 kg/m²)) weight cladding.

The approximate weight and category for various common cladding types is shown below. Each cladding type will have different weights for different brands and cladding arrangements, so the specific cladding weight should be determined from product technical data to confirm which category it is in.



Disclaimer

Information provided in this technical bulletin is for general guidance. Design and installation of appropriate cladding support and building enclosure assemblies, both for structural capacity and air/water durability, remains the responsibility of the project team.

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