NSAI Agrément

IRISH AGRÉMENT BOARD CERTIFICATE NO. 11/0365
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E:Zero™ E500 Foam

Isolation
Wärmedämmung

NSAI Agrément (Irish Agrément Board) is designated by Government to issue European Technical Approvals.

NSAI Agrément Certificates establish proof that the certified products are **'proper materials'** suitable for their intended use under Irish site conditions, and in accordance with the **Building Regulations 1997 to 2010**.

PRODUCT DESCRIPTION:
This Certificate relates to E:Zero™ E500 Spray foam insulation. E:Zero™ E500 foam is a spray-applied, low density, open cell soft insulation foam, for use in new and existing buildings.

This Certificate certifies compliance with the requirements of the Building Regulations 1997 to 2010.

PUR-Systems are responsible for the manufacture of E:Zero™ E500. CPI Foam Ltd. is responsible for the design and supply of all components to approved specifications, in accordance with the CPI Foam Ltd. approved supplier system.

The installation of the foam is only carried out by installers who have been trained by either CPI Foam Ltd. or PUR-Systems Ltd. Installers must be registered with the CPI approved installers scheme.

USE:
The product is used as a thermal insulation, and contributes to thermal performance of:

- Timber frame walls
- Masonry walls (drylining)
- Pitched roof constructions with breathable roof underlay and where a ventilation space exists under roof tiles as provided by timber battens
- The top side of attic floors where the attic space is non-habitable
- Suspended timber ground floors where loading is not applied to the product

Further information can be found in Section 2.4 of this Certificate.

MANUFACTURE AND MARKETING:
The product is manufactured:

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Werner-von-Siemens-Straße 22
D-49124 Georgsmarienhütte
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Part One / Certification 1

1.1 ASSESSMENT
In the opinion of NSAI Agrément, E:Zero™ E500 spray foam insulation, if used in accordance with this Certificate, meets the requirements of the Building Regulations 1997 - 2010 as indicated in Section 1.2 of this Certificate.

1.2 BUILDING REGULATIONS 1997 to 2010

REQUIREMENT:

Part D – Materials and Workmanship
D3 – E:Zero™ E500 spray foam insulation, as certified in this Certificate, is comprised of proper materials fit for their intended use (See Part 4 of this Certificate).

D1 – E:Zero™ E500 spray foam insulation, as certified in this Certificate, meets the requirements of the building regulations for workmanship.

Part B – Fire Safety
B3 – Internal Fire Spread (Structure)
Walls using E:Zero™ E500 spray foam insulation meet the requirement, provided the completed walls comply with the conditions described in Section 4.1 of this Certificate.

B4 – External Fire Spread
E:Zero™ E500 spray foam insulation will not affect the external fire rating of any building construction in which it is incorporated.

Part C – Site Preparation and Resistance to Moisture
C4 – Resistance to Weather and Ground Moisture
E:Zero™ E500 spray foam insulation meets the requirements of this regulation when installed as indicated in Section 2.3, in walls, floors and pitched roofs constructed in compliance with Part 3 of this Certificate.

Part F – Ventilation
F1 – Means of Ventilation
E:Zero™ E500 spray foam insulation can meet the requirements of this regulation, when installed in accordance with Part 2 and 3 of this Certificate.

F2 – Condensation in Roofs
E:Zero™ E500 spray foam insulation meets the requirements of this regulation, when designed and installed in accordance with Section 2.3 and Part 3 of this Certificate.

Part J – Heat Producing Appliances
J3 – Protection of Building
E:Zero™ E500 spray foam insulation, if used in accordance with this Certificate, meets the requirements of the Building Regulations 1997 to 2010.

Part L – Conservation of Fuel and Energy
L1 - Conservation of fuel and energy
Based on the measured thermal conductivity's (See Part 4 of this Certificate), walls, pitched roofs, suspended ground floors and attic floors incorporating E:Zero™ E500 spray foam insulation can meet current 'U-value' requirements (see Section 4.4 of this Certificate).

2.1 PRODUCT DESCRIPTION

E:Zero™ E500 spray foam insulation consists of a open celled structure. The insulation is spray-applied in a liquid form and expands in seconds to provide a flexible foam blanket. Typically E:Zero™ E500 has a density range of 8.0 - 11.0 kg/m^3. All product characteristics are outlined in Part 4 of this Certificate. The foam is prepared from two liquid components: E:ISO:500 (Isocyanate or A-side) and E:500 (Polyol or B-side), which are mixed within the nozzle of the spray gun during the application process. E:Zero™ E500 is a water blown spray foam insulation and has a low thermal conductivity value. No VOC's, CFC's, HCFC's or Urea formaldehyde are used in the manufacture of the foam. E:Zero™ E500 has zero food value for rodents or insects.

On-site quality control checks include density and appearance.

2.2 DELIVERY, STORAGE AND MARKING

The two components, isocyanate E:ISO:500 and polyol E:500, are delivered to site in drums of up to 250kg net capacity, bearing the product name, batch number, expiry date and NSAI Agrément identification mark incorporating the NSAI Agrément Certificate number.

Drums should be stored in a well-ventilated area, away from possible ignition sources. The drums must be protected from frost at all times. The recommended storage temperature is 25°C. Polyol should not be stored below 15°C and the isocyanate not below 20°C. Short term exposure to lower temperatures must be kept to a minimum.

It is recommended that the drums remain factory-sealed with gaskets in place until they are to be used, in order to reduce the chance of contamination of the chemicals and spillage of chemicals while moving the drums. Protective clothing must always be worn when handling and moving the drums. E:Zero™ E500 Spray insulation polyol must be used within 2 months of the date of manufacture.

The isocyanate ISO:500 and polyol E:500 remain homogenized (chemically stable) and as a result there is no requirement to pre-mixing the two components. The two components are re-circulated through a heater in order to bring both components to optimal pre-heat temperature for spraying.

Drums must be completely empty of liquid components before disposal. Drums must not be re-used once emptied. In general drums are returned to the manufacture for reconditioning and recycling.

Isocyanate and polyol are classified at 'harmful' and 'irritant', and the packaging bears the appropriate hazard warning labels. Direct contact with the raw material must be avoided and operatives must be equipped with the appropriate protective clothing. When fully reacted and cured, E:Zero™ E500 does not constitute a hazard.

2.3 INSTALLATION

2.3.1 Precautions

To comply with the requirements of the Safety, Health and Welfare at Work Act 2005, it is essential that there is an exchange of information between the client and the installer before spray operations commence on any site. Existing health hazards at the premises and those likely to be brought into the client's environment by the installer should be discussed and measures agreed to deal with them effectively.

The process for the installation of E:Zero™ E500 requires worker controls for exposure to vapours. Applicators must wear full personal protection equipment when working with the product, including full-face fresh-air supplied respirators, protective clothing and gloves. Other trades and personnel must vacate all spaces in which spraying is taking place. In addition, supplemental ventilation, in the form of natural ventilation or mechanical ventilation may be required in order to prevent off gassing during the manufacturing/spraying process entering other potentially habited areas of the building.

Vapours given off by certain components of the system, e.g. "MDI" methylene diphenyl diisocyanate or Isocyanate, are generally heavier than air and will tend to move to lower parts of the dwelling. These parts must be ventilated by opening windows and doors to prevent the build-up of toxic vapours. A 24 hour waiting period prior to re-occupancy is recommended for buildings that are already occupied. Certain applications, e.g. confined roofs, require the use of extractor fans as recommended by the Certificate holder.

Under extreme conditions of temperature and humidity, foam can be corrosive when in contact with Zinc plates. Additional protective measures

should be considered as outlined in Clause 4.6 of this Certificate.
Care should be taken to minimise the degree of overspray generated whilst spraying. This is in the form of a fine mist of particles that can travel considerable distances and will adhere strongly to surfaces they land on.

To prevent the product from entering occupied space, for example during installation in the loft area, the loft hatch must be kept closed during the spraying process. Protective covers must be placed over water tanks to prevent contamination during application, and should not be removed until sufficient time has elapsed for potentially harmful vapours to be ventilated from the roof space.

2.3.2 General

Installation of E:Zero™ E500 Spray insulation must be carried out by installers who have been approved and trained by the Certificate holder, and are also NSAI Agrément registered spray foam applicators. The requirements of the CPI Foam Ltd. Installer Training Manual must be followed at all times.

The product forms a strong bond with clean and dry substrates.

2.3.3 Procedure

Building elements to be insulated must be assessed for suitability and any necessary repairs carried out. The positioning and access to services should also be considered. Areas that are not to be sprayed with E:Zero™ E500 must be masked off by taping plastic sheeting in place, as overspray will stick to most surfaces and cannot be removed without damaging that surface.

The product should be spray applied to clean and dry substrates, and built-up in layers of 100mm in a single pass.

Processing Data - E:Zero™ E500	
Cream time	1-2 sec
Gel time	4-5 sec
Rise time	5-6 sec
Free rise density (core)	8-11 kg/m³

Table 1

Density of the foam is more important that rise height, as the density is directly related to the yield of the foam. E:Zero™ E500 trained installers take 3 number insitu samples in the form of cut out cubes per 'session' of spraying. These large samples are then accurately cut down to 10x10x10cm cubes (1000cm^3) and appropriately labelled and weighted to confirm 'on-ratio' spraying. The acceptable range for these quality control samples are given in table 1 and 6 of this certificate.

A 'session' is deemed to end when machinery is switched off, when either barrel is changed, if off ratio spraying is observed, if climatic conditions i.e. temperature drop outside allowable levels, if problems arise with equipment. A full list of 'session end' are outlined in CPI Foam Ltd. quality control documentation and training manual.

The product contains no organic blowing agents. The polyol component contains water which vaporises due to the exothermic reaction to create the cell structure. The resulting solid foam is reacted (cured) in seconds and contains no residual water.

Once the foam has fully cured, the product is trimmed flat to the inside edge of timber studs or rafters, using a saw and then covered with vapour barrier and lining board.

2.3.3 Application Procedure General

- When placing foam insulation at ceiling level within attics, timber ceiling joists or rafters should not be completely covered or encapsulated. Timber counter battens should be provided on top of existing ceiling joist in order to provide a safe defined hard-standing for emergency maintenance access to water tanks or services.
- When placing foam insulation at ceiling level within an attic, attic hatches must be modified such that they will have an equivalent thermal resistance to that of the upgraded ceiling.

2.4 BUILDING INSTALLATIONS

Particular attention must be paid to avoiding thermal bridging at key junctions for all details below. It is essential that adequate ventilation be provided in accordance with TGD Part F of the Building Regulations 1997 - 2010, for all installations as outlined hereunder.

2.4.1 Timber Frame Walls

The product is sprayed into the cavity formed by timber studs and the sheathing board (either plywood or OSB). When cured, excess foam is trimmed flush with the studs and the lining board (plasterboard per Table 7) with vapour barrier is installed. (Figure 1)

2.4.2 Masonry Walls - Drylining

The internal surface of the masonry wall must be inspected for signs of dampness – any existing defects with the existing structure must be resolved prior to installation of the product. (see Figure 2).

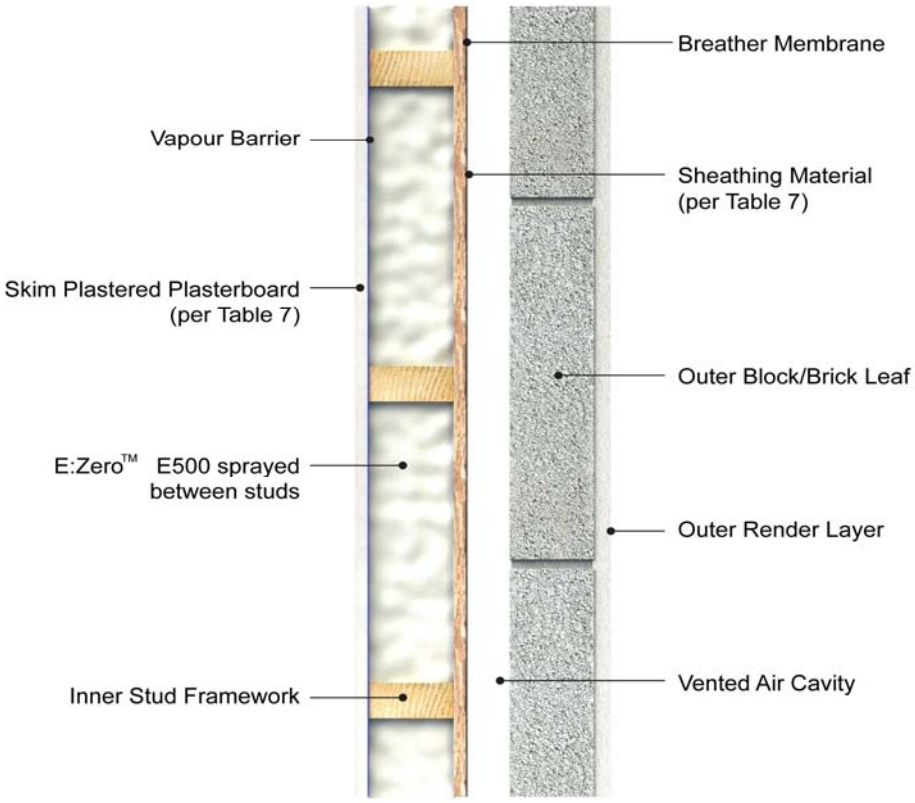


Figure 1: Timber Frame Wall

Timber battens are installed on the internal side of the masonry wall at typically 600mm centres. E:Zero™ is sprayed into the cavity formed by the battens. When cured, the excess foam is trimmed flush with the battens. A lining board with vapour barrier (plasterboard per Table 7) is installed.

2.4.3 Pitched Roof - Insulation on Slope

The product is sprayed into the cavity formed by the rafters and the CPI breathable card. When cured, the excess foam is trimmed flush with the rafters and the lining board with vapour barrier is installed. (Figure 4 & 5)

To satisfy the requirements of ICP 2:2002 and BS 5250:2002, a vapour control layer must be installed behind the plasterboard lining, unless an assessment shows it to be unnecessary.

For new build roof constructions where a non-breathable HR underlay or a breathable LR underlay is fitted, a continuous 50mm gap must be maintained between the insulation and the underlay, which is vented at the eaves and ridge. This ventilation gap can be created by installing CPI's breathable card as indicated in Figure 4 & 5 of this Certificate. In general, tiling counter battens are not required for non-breathable HR underlay. Designer should refer to the specific requirements of breathable LR underlays as counter battens are generally required. Alternatively if sarking boards are provide under the breathable LR underlay with tiling battens and counter battens above, no 50mm ventilated gap is required between the insulation and the sarking board.

For the refurbishment of existing roof where the roof tiles and roof tile underlay are not being removed, in these circumstances a continuous 50mm gap must be maintained between the insulation and the roof tile underlay which is vented at the eaves and ridge.

For all roof installations the foam insulation must be installed between the proprietary eaves ventilator and over the wall plate at the eaves to provide continuity with the wall insulation.

For both habitable and non-habitable attics, provision must be made for adequate ventilation as outlined in TGD Part F of the Building Regulations 1997 - 2010.

In addition, care should be taken to ensure that ingress of moisture vapour from the dwelling space below is restricted as follows:

- providing the means to remove it at source
- providing a well-sealed ceiling in accordance with BS 5250:2002
- installing an effective sealed vapour control layer
- covering of water tanks in the loft space

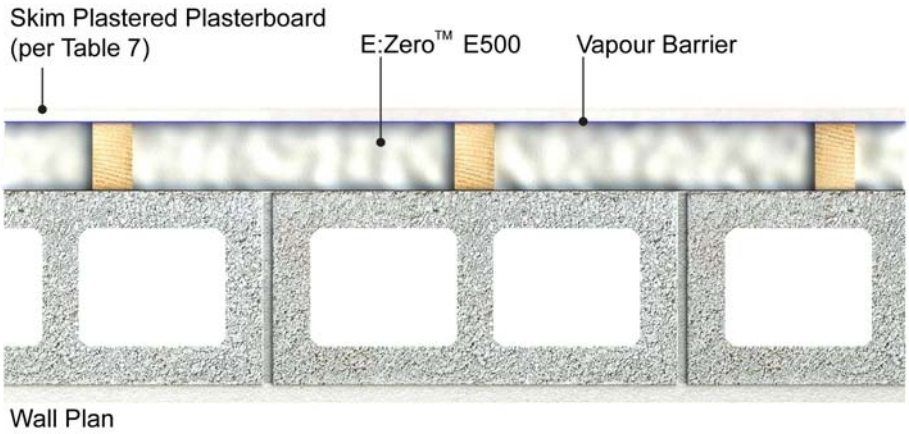


Figure 2: Masonry Wall – Dry Lining

2.4.4 Attic Floors - Insulation at Ceiling level
The product is sprayed into the cavity formed by the joists and the attic floor (lining board).

Figure 3 - Recessed down-lighters.

Where recessed lights exist, or are to be used, particularly recessed down-lighters, guards should be fitted to keep the insulation at least 75mm from the heat source. Where used with down-lighters and recessed light fittings, the guard should be open-topped or ventilated by drilling holes in the top of the guard. Guards should be made of rigid boards, light gauge non-magnetic metal; terracotta plant pots can also be used, providing they are of appropriate diameter (i.e. keep insulation 75mm away from heat source).

2.4.5 Suspended Timber Ground Floors
A barrier, such as thin plywood or a vapour permeable membrane, must be fixed to the underside of the joists to contain the foam. The product is then sprayed from above into the cavity formed by this barrier and the joists. When cured, the excess foam is trimmed flush with the joists and the flooring board installed.

An air gap of at least 150mm must be left between the joists and the ground to allow for sub-floor ventilation.

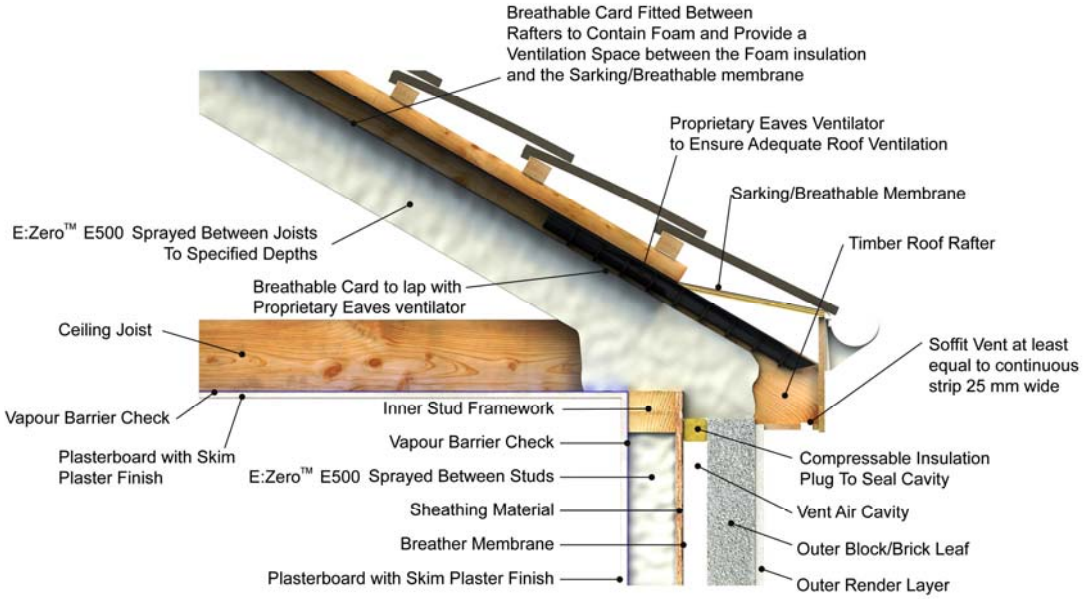


Figure 4: Pitched Roof Construction: non-habitable roof space

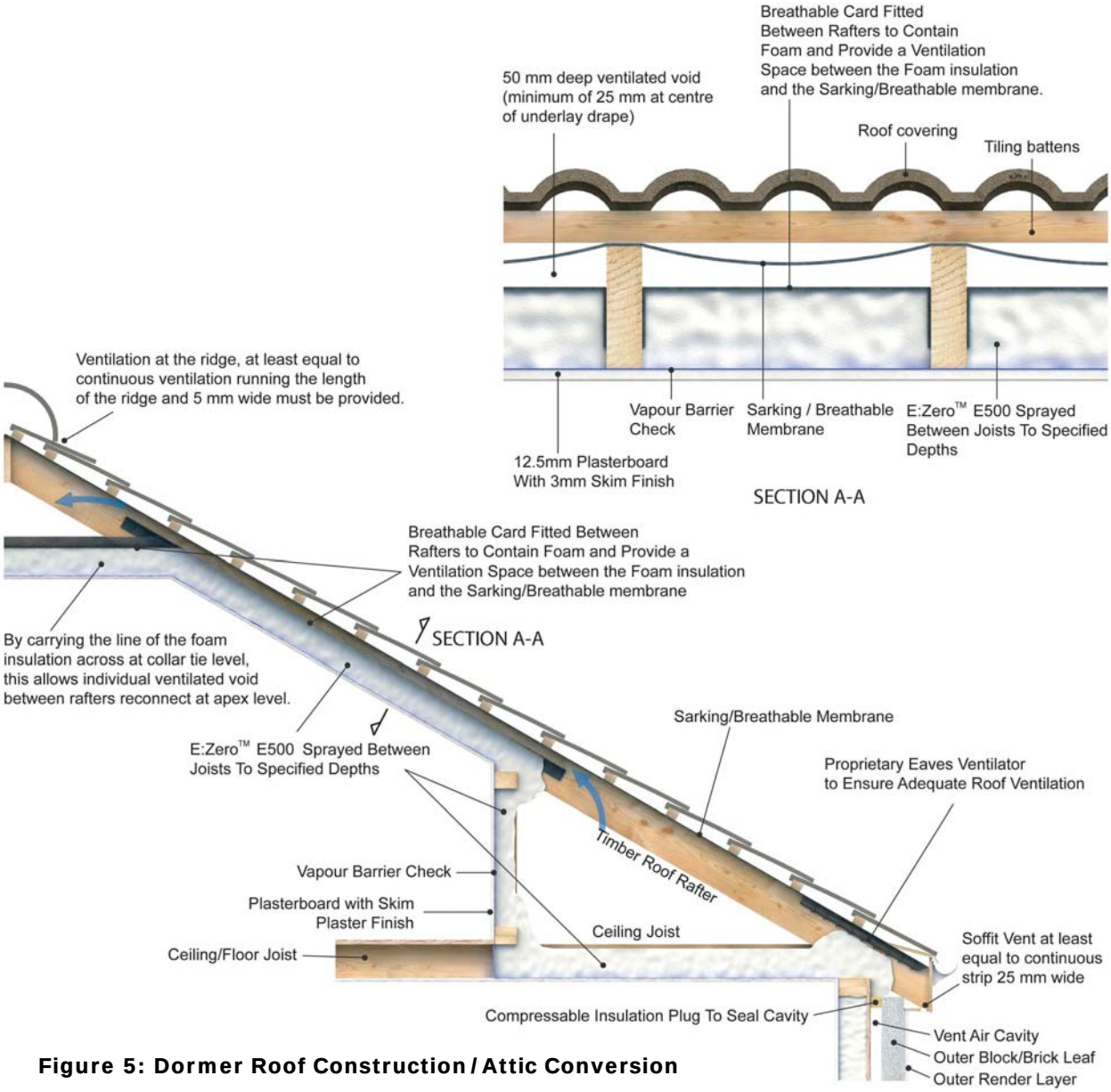


Figure 5: Dormer Roof Construction / Attic Conversion

3.1 GENERAL

E:Zero™ E500 is satisfactory for use in reducing the U-value of walls, pitched roofs, and suspended ground floors of dwellings when used in accordance with the relevant requirements of BS 5250:2002 *Code of practice for control of condensation in buildings*. The product can be used

- between the studs of conventional timber frame wall constructions.
- for internal new and remedial work on masonry walls utilising timber battens, breathable membrane or CPI's breathable card, vapour barrier check and dry-lining boards.
- between timber rafters in pitched roofs constructed in accordance with ICP 2:2002 *Code of practice for slating and tiling*, with a breathable roof underlay where the space beneath the roof tiles is ventilated by means of timber battens and the underlay is separated by CPI's breathable card, or where the rafters have been covered by a timber sarking board (i.e. roof underlay is fully supported).
- between attic floor joists onto existing drylined ceiling of room below (where attic is non-habitable).
- between joists in suspended timber ground floors provided these situations are non-loadbearing.

In all situations, the product must be covered by suitable internal lining boards and vapour barrier check. In the case where the product has been applied between rafters in a non-habitable roof space, if the covering will be deemed to be provided by the lining board of the ceiling below, an assessment to BS 5250:2002 establishing same is required.

It is essential that elements are designed and constructed to incorporate normal precautions against moisture ingress before the application of E:ZeroTM E500. Acceptable construction details should be followed for limitation of thermal bridging (see Section 1.3.3.2 of TGD to Part L of the Building Regulations 1997 to 2010).

New constructions must be designed in accordance with the relevant requirements of BS 5268-6.1:1996 *Structural use of timber – Code of practice for timber frame walls – Dwellings not exceeding seven storeys*, BS 5268-3:1998 *Structural use of timber – Code of practice for trussed rafter roofs*, BS 8103-3:1996 *Structural design of low-rise buildings – Code of practice for timber floors and roofs for housing*, IS 325-1:1996 *Use of masonry – Structural use of unreinforced masonry*, BS 5628-3:2005 *Code of practice for use of masonry – Materials and components, design and workmanship*, BS 5628-2:2005 *Code of practice for use of masonry – Structural use of reinforced and prestressed masonry*, and BS 5250:2002. The relevant recommendations of Section 3 of BS 5390:1976 *Code of practice for stone masonry* should be followed where the wall incorporates stone or cast stone. Roofs subject to the relevant requirements of the Building Regulations 1997 to 2010 should be constructed in accordance with ICP 2:2002.

Roof tile underlay's must be the subject of a current NSAI Agrément Certificate for such use. Underlay's should be installed in accordance with, and within the limits of, that Certificate.

Existing buildings must be in a good state of repair with no evidence of rain penetration or damp. Defects must be made good prior to installation of E:Zero™ E500.

3.2 LOADING

The floor design loadings for self contained single family dwelling units as defined in BS 6399-1:1996 *Loading for buildings – code of practice for dead and imposed loads* and Eurocode 1 are:

- Uniformly distributed load 1.5 kPa
- Concentrated load 1.4 kn

Where E:Zero™ E500 is used in a suspended timber ground floor, resistance to concentrated and distributed loads is a function of the floor specification.

E:Zero™ E500 foam is a soft foam and does not contribute to the structural performance of any building element.

3.3 UNDERFLOOR HEATING SYSTEMS

The maximum continuous working temperature of the insulation is 70°C. Where underfloor heating systems are to be used, the advice of the Certificate holder should be sought.

4.1 BEHAVIOUR IN FIRE

Although E:Zero™ E500 Spray insulation is not classified as non-combustible and must be protected from naked flames and other ignition sources during and after installation, when used in the context of this Certificate the increase in fire loads in the building consequent to its use is negligible.

The fire ratings to IS EN 13501-1:2007 *Fire classification of construction products and building elements – Classification using data from reaction to fire tests*, when tested to IS EN 13823:2002 *Reaction to fire tests for building products – Building products excluding floorings exposed to the thermal attack by a single burning item* are shown in Table 7.

Once installed, the product must be contained by a suitable lining board, e.g. 12.5mm plasterboard, with joints fully sealed and supported by rafters or studs. Therefore, it will not contribute to the development stages of a fire or present a smoke or toxic hazard until the lining is compromised.

Care must be taken to ensure continuity of fire resistance at junctions with fire-resisting elements, in accordance with the relevant provisions of the Building Regulations 1997 to 2010.

Elements must incorporate cavity barriers at edges, around openings, at junctions with fire-resisting elements and in extensive cavities in accordance with the relevant provisions of the Building Regulations 1997 to 2010. The design and installation of cavity barriers must take into account any anticipated differential movement.

4.1.1 Walls

The product can be added to the void between studwork, or used as a substitute for glass mineral wool or combustible insulation material, in any load-bearing, timber frame inner leaf to a double leaf wall system providing that:

- the outer leaf is masonry, and
- the existing inner leaf system has been shown to satisfy the load-bearing capacity performance criteria of BS 476-21:1987 *Fire tests on building materials and structures – Methods for determination of the fire resistance of load-bearing elements of construction* or IS EN 1365-1:2000 *Fire resistance tests for load-bearing elements - Walls* for the required resistance period.

The suitability of constructions other than those described above should be demonstrated by appropriate test or assessment.

4.1.2 Roofs

The use of the product in a tiled pitched roof will not affect its external rating when evaluated by assessment or test to BS 476-3:2004 *Fire tests on building materials and structures – Classification and method of test for external fire exposure to roofs*.

The product must not be applied over junctions between roofs and walls required to provide a minimum period of fire resistance.

4.1.3 J3 – Protection of Building

Combustible wall insulation material shall generally be separated by solid non combustible material not less than 200mm thick, from any heating appliance or from any flue pipe or opening to a heating appliance. Particular details are given in Diagrams 2 - 8 of the TGD Part J Building Regulations 1997 to 2010. It should also be separated by 40mm from the external surface of a masonry chimney. For chimneys covered by BS 4543-1:1990 *Factory made insulated chimneys – Methods of test* separation between this product and the external surface of the chimney shall be determined in accordance with clause 2.17, Part J Building Regulations 1997 to 2010.

4.2 CONDENSATION RISK

Areas where there is a significant risk of condensation due to high levels of humidity should be identified during the initial site survey.

4.2.1 Interstitial Condensation

A vapour control layer is required on the warm side of E:Zero™ E500 Spray insulation, unless an assessment to BS 5250:2002 indicates that it is not necessary for a particular construction. E:Zero™ E500 will not contribute to minimising the risk of interstitial condensation driven by convection, but has a low "λ" value. E:Zero™ E500 has a low water vapour resistance factors or μ-value (see table 6 of this certificate). E:Zero™ E500 has a vapour resistivity value (μ - value) of 11.44 when tested to IS EN 12086:1997 *Thermal insulating products for building applications – Determination of water vapour transmission properties*. Typically masonry would have a water vapour resistance factors or μ-values of 22 while render would have a value of 100.

Care should be taken to provide adequate ventilation, particularly in rooms expected to experience high humidity, and to ensure the integrity of vapour control layers and linings against vapour ingress.

4.2.2 Internal Surface condensation.

When improving the thermal performance of the external envelope of an existing building, through internal drylining with infill foam insulation or in attic spaces, designers need to consider the impact of these improvements on other untouched elements of the building.

Likewise, as discussed in section 4.4 of this certificate, thermally bridged sections of the envelope such as window jambs, cills and eves will experience a lower level of increased thermal performance. The degree of improvement to these junctions can be limited due to physical restrictions on site i.e. window boards, opening window sashes, access to eves and around wall plates.

When bridged junctions meet the requirements of TGD L appendix D table D1, the coldest internal surface temperature will satisfy the requirements of section D2, namely that the temperature factor (f_{Rsi}) shall be equal to or greater than 0.75. As a result best practice will have been adopted in order to limit the risk of internal surface condensation which can result in dampness and mould growth.

When site limiting factors give rise to substandard level of insulation at bridged junctions, guidance should be sought from the certificate holder as to acceptable minimum requirements (see section 4.4 for further guidance).

When insulating buildings, the recommendations of BS 5250:2002 should be followed to minimise the risk of condensation within the building elements and structures.

Walls, floors and roofs will adequately limit the risk of surface condensation where the thermal transmittance (U-value) does not exceed 0.7W/m^{2}K for walls and floors, and 0.35W/m^{2}K for roofs at any point, and openings and junctions with other elements are designed in accordance with the DoEHLG publication *Limiting Thermal Bridging & Air Infiltration – Acceptable Construction Details*.

4.3 THERMAL INSULATION

Calculations of the thermal transmittance (U-value) of specific constructions should be carried out in accordance with IS EN ISO 6946:2007 *Building components and building elements – Thermal resistance and thermal transmittance – Calculation method*, using a thermal conductivity (λ value) as outlined in Table 6 for E:Zero™ E500. The U-value of a construction will depend on the materials used and the design. Examples of U-value calculations for new builds for pitched roofs, walls and floors are given in Tables 2 to 5.

CPI Foam Ltd. have carried out u-value calculations similar to build-up given in Table 2-5 of this certificate. They have also carried out u-value calculations for a wide range of existing building installations. A full listing of u-value calculations, along with AutoCAD building details on which calculations are based, are contained within the CPI Foam Ltd. Technical Training documentation.

For retrofit installations on existing dwellings such as drylining or attic installations, end users should seek guidance from the manufacture on u-values as the actual u-value of installation will depend on the construction of the existing building elements. CPI Foam Ltd. and NSAI Agrément approved installers are required to carry out a preliminary site survey to establish existing building details and insulation levels. On completion of the works, installers will provide a job specific sign off sheet and this records both initial and final building element u-values.

The product can contribute to maintaining continuity of thermal insulation at junctions between elements and around openings. Guidance in this respect, and on limiting heat loss by air infiltration, can be found in the DoEHLG publication *Limiting Thermal Bridging & Air Infiltration – Acceptable Construction Details*.

4.4 LIMITING THERMAL BRIDGING

The linear thermal transmittance ψ (Psi) describes the heat loss associated with junctions and around openings. CPI Foam Ltd. have carried out ψ-value calculations for a wide range of thermally bridged junctions for both new build and refurbishment work to existing dwellings. A full listing of ψ-value calculations, along with AutoCAD building details on with calculations are based, are contained within the CPI Foam Ltd. Technical Training manual.

Window jambs, door reveals and all building junctions when shown to be equivalent or better than junctions detailed in either, CPI Foam Ltd. Technical Training manual or DoEHLG publication *Limiting Thermal Bridging & Air Infiltration – Acceptable Construction Details,* then it is acceptable to use the linear thermal transmittance values outline in Table D1 of Appendix D of TGD to Part L of the Building Regulations 1997 to 2010. When **all** bridged junctions within a building comply with the requirements of Table D1 of appendix D of TGD to Part L, the improved 'y' factor of 0.08 can be entered into the Dwelling Energy Assessment

Procedure (DEAP) Building Energy Rating (BER) calculation.
Where either of the above options are shown to be valid, or when the required values can not be achieved, all relevant details should be recorded on the 'Certificate of Compliance' for that project for use in future BER calculations.

'Ψ' values for other junction outside the scope of this certificate should be assessed in accordance with the BRE IP1/06 "Assessing the effects of thermal bridging at junctions and around openings" and BRE Report BR 497 "Conventions for calculating linear thermal transmittance and temperature factors" in accordance with appendix D of TGD to Part L of the Building Regulations 1997 to 2010.

4.5 MATERIALS IN CONTACT WITH ELECTRICAL WIRING

The product is compatible with materials in contact. E:Zero™ E500 Spray insulation is compatible in direct contact with CPVC piping systems, as per Paschal Engineering Study for the Spray Polyurethane Foam Alliance (SPFA). Building elements to be insulated must be assessed for suitability and any necessary repairs carried out. The positioning and access to services should also be considered.

In attic areas, existing electrical cable should be raised above the level of the foam insulation where possible. Encapsulating cables presents an obstruction when tracing and locating faults in a circuit. Electrical cabling when embedded within the foam insulation should be run in conduits to facilitate repairs.

Electrical installations should be in accordance with the ETCI publication ET 207: 2003 *Guide to the National Rules for Electrical Installations as Applicable to Domestic Installations.* In relation to recessed spotlights and other luminaries, ET 207 requires they be not less than the minimum distances from combustible materials as specified in clause 559.3.2 of the TCI National rules of the Electro Technical Council of Ireland (ET 101). (See Figure 3)

4.6 CORROSION DEVELOPING CAPACITY ON METAL CONSTRUCTIONS

An evaluation of corrosion developing capacity on metal constructions and plates was carried out.

Corrosion developing capacity was determined following the regulation CUAP/ETA request No 12.01/21, Annex C (2007-06). This involved exposing metal foil samples to wetted insulation for a period of 336 hours followed by examination to determine if samples had suffered perforation as a result of corrosion.

Both Zinc and Copper foil samples were assessed. The results of the assessment demonstrated little or no risk of corrosion to copper, however E:Zero™ E500 in conjunction with Zinc failed the corrosion test requirements. As a result the product in not suitable to be placed in contact with Zinc or Zinc plated elements as foam, given the correct environmental conditions, will accelerate the corrosion of such element.

Zinc or Zinc plated elements are used as fixing for timber elements and extensively in prefabricated roof truss. In all situations when foam is in contact with Zinc, the Zinc **must** be separated from the foam by covering the Zinc plate with a protective coating.

4.7 SUSCEPTIBILITY TO MOULD GROWTH

Susceptibility to mould growth test report indicates that there was no apparent mould growth on samples which were subjected to temperature and humidity. Expression of results; the presence of mould fungus is expressed in classes of intensity of growth according to table 4 of IS EN ISO 846. For all samples tested, E:Zero™ E500 achieved a class 0 rating in accordance with table 4 of IS EN ISO 846.

4.8 TESTS AND ASSESSMENTS WERE CARRIED OUT TO DETERMINE THE FOLLOWING:

- Density
- Water vapour resistivity
- Dimensional stability
- Thermal conductivity
- Compressive behaviour
- Tensile strength parallel to face
- Suitability of foam insulation in contact with timber.
- REACH compliance (Registration, Evaluation, Authorisation and Restriction of Chemicals).
- Safety Data Sheets E:Zero™ E500
- Assessment of Spray Rig information
- Adequacy of fill
- Safe storage

4.9 OTHER INVESTIGATIONS

(i) Existing data on product properties in relation to fire, toxicity, thermal conductivity and dimensional stability were assessed.
(ii) The manufacturing process was examined including the methods adopted for quality control, and details were obtained of the quality and composition of the materials used. The manufacture has ISO 9001:2008 accreditation.
(iii) Site visits were conducted to assess the practicability of installation and the history of performance in use of the product.

New Construction - E:Zero™ E500

Pitched Roofs Ceiling Level	
New Construction	
U-values for tiled or slated pitched roof, ventilated roof space, insulation placed between and over joists at ceiling level	
Thickness of insulation (mm)	**U-Value (W/m²K)**
250	0.16
290	0.14

Note:- These values are based on the following construction (external to internal):
- Conventional tiled or slated pitched roof
- Ventilated roof space
- Timber ceiling joists at 400mm centres
- E:Zero™ E500 insulation (92%)/timber rafters (8%) (insulation and timber depths as indicated above)
- Vapour check barrier
- Plasterboard – 12.5mm
- 3mm gypsum skim coat finish

Table 2

Timber Frame Walls	
New Construction	
U-values for timber frame walls with masonry and rendered external finish.	
Thickness of insulation (mm)	**U-Value (W/m²K)**
155	0.27
190	0.21
270	0.15

Note:- These values are based on the following construction (external to internal):
- Concrete Block outer leaf (100mm) with external render.
- Ventilated air cavity – 50mm
- Breather membrane
- OSB sheathing ply– 15mm
- E:Zero™ E500 insulation (85%) and timber studs (15%) (insulation and timber depths as indicated above)
- Vapour check barrier
- Plasterboard – 12.5mm
- 3mm gypsum skim coat finish

Table 3

Pitched Roofs Sloping Level	
New Construction	
U-values for tiled or slated pitched roof with 50mm ventilated space over breathable roofing felt, insulation placed against roofing cards between rafters at sloping level	
Thickness of insulation (mm)	**U-Value (W/m²K)**
200	0.20
240	0.16
280	0.14

Note:- These values are based on the following construction (external to internal):
- Conventional tiled or slated pitched roof
- 50mm ventilated space over breathable roofing felt
- Timber ceiling joists at 400mm centres
- Roofing cards placed between rafters.
- E:Zero™ E500 insulation (92%)/timber rafters (8%) (timber battens added to rafters to achieve depths as indicated above)
- Vapour check barrier
- Plasterboard – 12.5mm
- 3mm gypsum skim coat finish

Table 4

Suspended timber floor	
New Construction	
Ground floor insulation between joists.	
P/A (Perimeter/Area)	**U-Value (W/m²K)**
0.2	0.18
0.4	0.21
0.6	0.22
0.8	0.23
1.0	0.23

Note:
These values are based on the following construction (external to internal):
- E:Zero™ E500 insulation (89%)/timber joists (11%) 150mm (insulation full depth of timber joist)
- Floorboards 19mm

Table 5

Characteristics	Test method reference		E:Zero™ E500		
			Sample A		Units
Water adsorption	IS EN 1609:1997 (Method A)		19.82		kg/m^2
Water vapour permeability	I.S. EN 12086:1997 Water vapour transmission rate (g)		951		mg/m^2/Hour
	I.S. EN 12086:1997 Water Vapour Permeance (W)		1.19		mg/m^2hourPa
	I.S. EN 12086:1997 Water vapour resistance (Z)		0.85		m^2HourPa/mg
	I.S. EN 12086:1997 Water vapour resistance factor (μ)		11.44		μ -value
Thermal conductivity	I.S. EN 12667:2001 (λ - value)		**0.038**		W/mK
Compressive behaviour	I.S. EN 826:1996 - Compressive stress at 10% relative deformation		9.7		kPa
Tensile strength parallel to face	I.S. EN 1608:1997		7.5		kPa
Tensile strength perpendicular to face	I.S. EN 1607:1997		17.4		kPa
Dimensional stability	I.S EN 1603: 1997 Method B	Length	0.09		%
		Width	0.10		%
Dimensional stability	I.S EN 1604: 1997 With 48 hours at 60°C	Length	0.60		%
		Width	0.67		%
		Depth	-0.80		%
Dimensional stability	I.S EN 1605: 1997	Step A	-75		%
		Step B	-76		%
Air Permeability	I.S. EN 29053 - Length related airflow resistance		543		$kPa.s/m^2$
Density (Range)	I.S. EN 1602		**8.0**	**11.0**	Kg/m^3
	Density for $1000cm^3$ QA samples		**8**	**11**	g
Susceptibility to Mould growth	IS EN ISO 846		Class 0		

Table 6: E:Zero™ E500 - Characteristics

Insulation	Description	Result to EN 13501-1[1,2]
E:Zero™ E500	Facing - 12mm, 700kg/m^3 plasterboard sheet 75mm Insulation core Facing - 12mm, 700kg/m^3 plasterboard sheet Surrounding timber Framework - 576kg/m^3	**B-s1,d0**

[1] The classification is valid for the following substrates and air gaps:
- i) Nominal thickness plasterboard: 12 mm (open joints)
- ii) Nominal thickness polyurethane open cell foam: 75 mm
- iii) Measured density polyurethane open cell foam: 16 kg/m^3
- iv) Nominal thickness wood: 40 mm

[2] This classification for the product, is valid for the following end use conditions:
- i) Self-supporting
- ii) With or without a void
- iii) Fixing plaster board on wood: mechanically
- iv) With vertical and horizontal joints

Table 7: Fire test results

5.1 National Standards Authority of Ireland ("NSAI") following consultation with NSAI Agrément has assessed the performance and method of installation of the product/process and the quality of the materials used in its manufacture and certifies the product/process to be fit for the use for which it is certified provided that it is manufactured, installed, used and maintained in accordance with the descriptions and specifications set out in this Certificate and in accordance with the manufacturer's instructions and usual trade practice. This Certificate shall remain valid for five years from date of issue so long as:

(a) the specification of the product is unchanged.

(b) the Building Regulations 1997 to 2010 and any other regulation or standard applicable to the product/process, its use or installation remains unchanged.

(c) the product continues to be assessed for the quality of its manufacture and marking by NSAI.

(d) no new information becomes available which in the opinion of the NSAI, would preclude the granting of the Certificate.

(e) the product or process continues to be manufactured, installed, used and maintained in accordance with the description, specifications and safety recommendations set out in this certificate.

(f) the registration and/or surveillance fees due to NSAI Agrément are paid.

5.2 The NSAI Agrément mark and certification number may only be used on or in relation to product/processes in respect of which a valid Certificate exists. If the Certificate becomes invalid the Certificate holder must not use the NSAI Agrément mark and certification number and must remove them from the products already marked.

5.3 In granting Certification, the NSAI makes no representation as to;

(a) the absence or presence of patent rights subsisting in the product/process; or

(b) the legal right of the Certificate holder to market, install or maintain the product/process; or

(c) whether individual products have been manufactured or installed by the Certificate holder in accordance with the descriptions and specifications set out in this Certificate.

5.4 This Certificate does not comprise installation instructions and does not replace the manufacturer's directions or any professional or trade advice relating to use and installation which may be appropriate.

5.5 Any recommendations contained in this Certificate relating to the safe use of the certified product/process are preconditions to the validity of the Certificate. However the NSAI does not certify that the manufacture or installation of the certified product or process in accordance with the descriptions and specifications set out in this Certificate will satisfy the requirements of the Safety, Health and Welfare at Work Act 2005, or of any other current or future common law duty of care owed by the manufacturer or by the Certificate holder.

5.6 The NSAI is not responsible to any person or body for loss or damage including personal injury arising as a direct or indirect result of the use of this product or process.

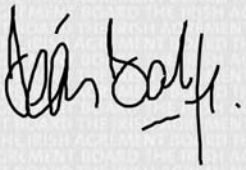
5.7 Where reference is made in this Certificate to any Act of the Oireachtas, Regulation made thereunder, Statutory Instrument, Code of Practice, National Standards, manufacturer's instructions, or similar publication, it shall be construed as reference to such publication in the form in which it is in force at the date of this Certification.

NSAI Agrément

This Certificate No. **11/0365** is accordingly granted by the NSAI to CPI Foam Ltd. on behalf of NSAI Agrément.

Date of Issue: **September 2011**

Signed



Seán Balfe
Director of NSAI Agrément

Readers may check that the status of this Certificate has not changed by contacting NSAI Agrément, NSAI, 1 Swift Square, Northwood, Santry, Dublin 9, Ireland.
Telephone: (01) 807 3800. Fax: (01) 807 3842. www.nsai.ie