NSAI Agrément

IRISH AGRÉMENT BOARD
CERTIFICATE NO. 15/0385
South West Insulation Solutions Limited
Unit D, Victoria Square, Victoria
Roche, Cornwall, PL26 8LQ

Tel: +44 1726 212860
Email: info@swis-lapolla.com
Website: www.lapolla.co.uk

Foam-Lok FL 500

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 2017**.

PRODUCT DESCRIPTION:
This Certificate relates to Foam-Lok FL 500 Spray foam insulation. Foam-Lok FL 500 foam is a low density spray-applied expanding polyurethane open celled insulation foam for use in new and existing buildings.

This Agrément Certificate certifies compliance with the requirements of the Building Regulations 1997 to 2017.

Foam-Lok FL 500 is manufactured in the USA by Lapolla Industries and distributed in Ireland by ECON Polyurethane Systems. ECON Polyurethane Systems are responsible for the design and supply of all components to approved specifications, in accordance with the ECON Polyurethane Systems approved supplier system.

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

- Timber frame walls
- Masonry walls (drylining)
- Pitched roof constructions with insulation on slope and roof underlay combined with adequate ventilation and vapour check layer.
- Pitched roof constructions with insulation at ceiling level where the attic space is non-habitable
- Flat timber roof constructions

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

MANUFACTURE AND MARKETING:
The product is manufactured by

Lapolla Industries, Inc.
15402 Vantage Parkway East, Suite 322
Houston
Texas 77032
USA

Tel: + 011-281-219-4100
Fax: + 011-281-219-4106
website: www.lapolla.com
e-mail: info@lapolla.com

and marketed by

South West Insulation Solutions Limited
Unit D, Victoria Square, Victoria
Roche,
Cornwall,
PL26 8LQ

Tel: +44 1726 212860
Email: info@swis-lapolla.com
Website: www.lapolla.co.uk

Part One / Certification 1

1.1 ASSESSMENT
In the opinion of the Irish Agrément Board, Foam-Lok FL 500 spray foam insulation, if used in accordance with this Certificate, meets the requirements of the Building Regulations 1997 - 2017 as indicated in Section 1.2 of this Certificate.

1.2 BUILDING REGULATIONS 1997 to 2017

REQUIREMENT:

Part D – Materials and Workmanship
D3 – Foam-Lok FL 500 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 – Foam-Lok FL 500 spray foam insulation, as certified in this Certificate, meets the requirements of the building regulations for workmanship.

Part B – Fire Safety
Part B Vol 2 – Fire Safety
B3 – Internal Fire Spread (Structure)
B8 – Internal Fire Spread (Structure)
Walls using Foam-Lok FL 500 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
B9 – External Fire Spread
Foam-Lok FL 500 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
Foam-Lok FL 500 spray foam insulation meets the requirements of this regulation when installed as indicated in Section 2.3, in walls and pitched roofs constructed in compliance with Part 3 of this Certificate.

Part F – Ventilation
F1 – Means of Ventilation
Foam-Lok FL 500 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
Foam-Lok FL 500 spray foam insulation meets the requirements of this regulation, when designed and installed in accordance with Section 2.4 and Part 3 of this Certificate.

Part J – Heat Producing Appliances
J3 – Protection of Building
Foam-Lok FL 500 spray foam insulation, if used in accordance with this Certificate, meets the requirements of the Building Regulations 1997 to 2017.

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 and attic floors incorporating Foam-Lok FL 500 spray foam insulation can meet current 'U-value' requirements (see Section 4.4 of this Certificate).

When Foam-Lok FL 500 spray foam insulation is incorporated into buildings in accordance with the certificate holders approved installation details there shall be no risk of mould growth arising from surface condensation.

Furthermore the certificate holders approved installation details and published Psi-values can be used to calculate the overall building heat transmission due to thermal bridging or the building y-value for inclusion in DEAP.

2.1 PRODUCT DESCRIPTION

Foam-Lok FL 500 is a low-density open celled polyurethane spray foam insulation product. The thermal insulation is spray-applied in a liquid form and expands in seconds to provide a flexible foam blanket. Typically Foam-Lok FL 500 has an approximate density of 8 kg/m^3. All product characteristics are outlined in Part 4 of this Certificate. The foam is prepared from two liquid components: isocyanate "A" and polymeric resin "B", which are mixed within the nozzle of the spray gun during the application process. Foam-Lok FL 500 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. Foam-Lok FL 500 has zero food value for rodents or insects.

On-site quality control checks include density and appearance.

Ancillary components consist of
- Rafter slider/breathable card
- Proprietary roof tile ventilators
- Proprietary soffit vents
- Vapor barrier, tapes and sealants

2.2 DELIVERY, STORAGE AND MARKING

The two components, isocyanate (A-side) and polymeric resin (B-side) are delivered to site in 55 gallon drums, bearing the product name, batch number, expiry date, designation code, thermal resistance, reaction to fire and NSAI Agrément identification mark incorporating the 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. It is critical that the A-side be protected from moisture, temperature fluctuations and the recommended storage temperature is above 10°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. Foam-Lok FL 500 insulation B-side must be used within 12 months of the date of manufacture.

The isocyanate and polyol components are homogenized (chemically stable) and as a result there is no requirement to pre-mixing the two components. Both 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 as '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, Foam-Lok FL 500 does not constitute a hazard.

2.3 INSTALLATION

2.3.1 Precautions

In general the recommendations of I.S. EN 14315-2:2013 *Thermal insulating products for buildings - In-situ formed sprayed rigid polyurethane (PUR) and polyisocyanurate (PIR) foam products - Part 2: Specification for the installed insulation Products* should be observed.

To comply with the requirements of the Safety, Health and Welfare at Work Act 2005 a full site specific risk assessment must be carried out prior to installation. As part of this process, it is essential that there is an exchange of information between the client and the installer before spray operations commence on any site. Safety hazards likely to be brought into the client's environment, such as the supply line to the spray gun, should be discussed and measures agreed to deal with such hazards both safely and effectively.

The process for the installation of Foam-Lok FL 500 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.

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 Foam-Lok FL 500 Spray insulation must be carried out by installers who have been trained and meet the requirements of the Lapolla Industries Installation manual and the certificate holder's requirements. The product forms a strong bond with clean and dry substrates.

2.3.3 Procedure

All building elements to be insulated must be surveyed for their suitability prior to installing Foam-Lok FL 500 Spray insulation and any underlying defects must be repaired prior to works commencing. The positioning and access to services should also be considered. Areas that are not to be sprayed with Foam-Lok FL 500 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 in a single pass.

Processing Data - Foam-Lok FL 500	
Cream time	3-6 sec
Tack Free time	7-11 sec
Rise time	15-24 sec
Free rise density (core)	8-11 kg/m³

Table 1

The product contains no organic blowing agents. Once the foam has fully cured, the product can then be covered with vapour barrier and lining board.

2.3.4 On-Site QC testing

The final cured density of the foam is an important on–site quality control check. The density of the installed Foam-Lok FL 500 insulation is checked at least once per spray session. A break in spraying or a drum change would constitute a new spraying session. 100x100x100mm cubes are cut from fully cured installed foam and the density is calculated to establish that it fall within the acceptable range as described in table 1 of this certificate.

Additional on-site quality control tests include

- A visual inspection of the fine cell structure.
- A visual inspection on colour consistence.
- A physical inspection of the final cured foam. Trained installers will recognise excessively spongy or brittle products which can be as a result or substandard or defective product/ installation.

2.3.5 Application Procedure General

When placing foam insulation at ceiling level within attics, timber ceiling joists or rafters should not be completely covered or encapsulated. When foam is placed at ceiling level, raised timber walkways must be provided on top of existing ceiling joists in order to provide a safe defined hard-standing for emergency maintenance access to services such as water tanks.

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 all key building junctions. The best practice recommendation outline in S.R. 54:2014 *Code of practice for the energy efficient retrofit of dwellings* must be observed. It is essential that adequate ventilation be provided in accordance with TGD Part F of the Building Regulations 1997 - 2017, for all installations as outlined hereunder.

2.4.1 Timber Frame Walls

Foam-Lok FL 500 insulation is sprayed into the cavity formed by timber studs and the sheathing board (either plywood or OSB with breathable membrane on the cavity side) once the moisture content of the timber is below 20%. The foam is built up in successive layers between timber studs (See Figure 1). Once the foam has fully cured, the product is trimmed flush to the inside edge of timber studs using a saw and then covered with vapour barrier and lining board.

When using a foil backed lining board it is necessary to retain a 20mm air gap at the back of the lining board in order to maximise the benefit of the low emissivity of the foil surfaces. Proprietary sealing tapes are installed to maintain the continuity and integrity of the vapor check layer at

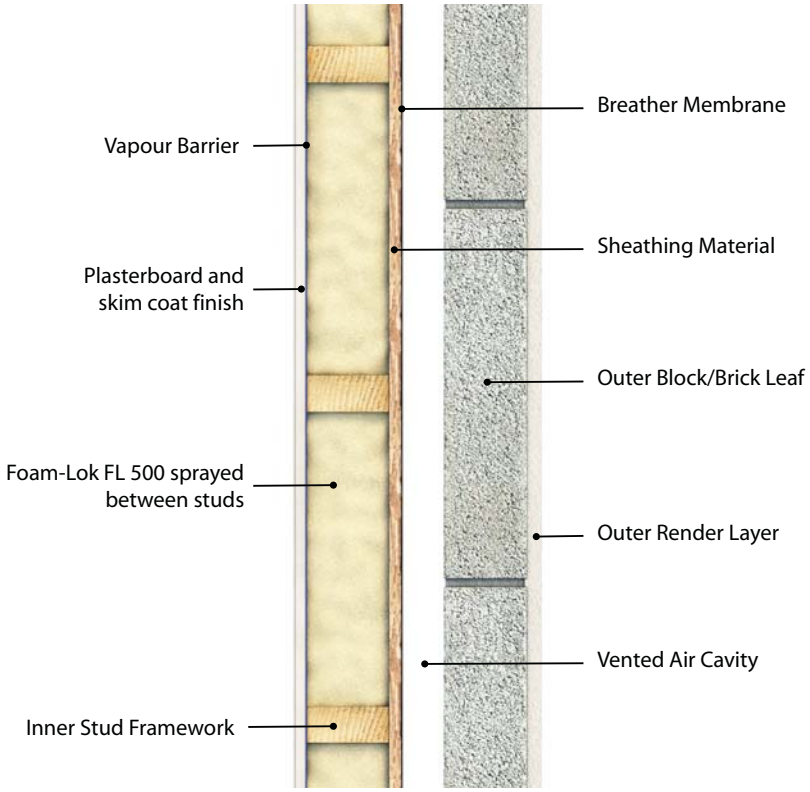

Figure 1: Timber Frame Wall

all reveals, corners, abutments and service penetrations.

2.4.2 Masonry Walls - Drylining

The internal surface of the masonry wall must be inspected for signs of defects/dampness and any underlying defects must be addressed prior to proceeding with an internal drylining installation.

Timber battens or metal studs are installed on the internal side of the masonry wall at typically 600mm centres. Foam-Lok FL 500 foam is built up in successive layers between timber studs. Once the foam has fully cured, the product is trimmed flush to the inside edge of timber studs using a saw and then covered with vapour barrier and lining board.

When using a foil backed lining board the guidance with respect to continuity of vapour check layer as outline in clause 2.4.1 of this certificate should be adhered to.

2.4.3 Pitched Roof - Insulation on Slope

When installing Foam-Lok FL 500 foam into a pitched roof, a 50mm deep ventilation void must be created between the foam insulation and the underside of the roof underlay. This 50mm deep ventilation void is required for both non-breathable HR[i] (high resistance) and breathable LR[ii] (low resistance) underlay. The ventilation gap can be created through the introduction of a breathable rafter card, with a water vapour resistance not be greater than 0.25 MN.s/g, fitted between the existing rafters. It is necessary to maintain continuity of cross ventilation and ventilation must be designed to avoid creating pockets of stagnant air. A vapour check layer fixed to the face of the timber rafters prior to applying board finishes.

In the case where a LR membrane is in place and a continuous 50mm ventilated void exists between the membrane and the roof tiles, through the provision of a batten and counter batten, the breathable rafter card can be placed up to the underside of the LR membrane. Placement of the breathable rafter card and subsequent installation of foam must not encroach on the natural drape of the LR membrane.

Foam-Lok FL 500 foam insulation can be applied into the cavity formed by roof rafters and a continuous sarking board when the following ventilation requirements are met. The roof coverings above the sarking board and breathable LR roof underlay are air permeable or, in the case of impermeable roof coverings, adequate ventilation exists between the underlay and the roof finishes. Adequate ventilation can be provided by using battens and counter battens. Again, it is necessary to maintain continuity of cross

[i] HR underlay are defined as membranes with a water vapour resistance greater than 0.25 MN.s/g

[ii] LR underlay are defined as membranes with a water vapour resistance not exceeding 0.25 MN.s/g

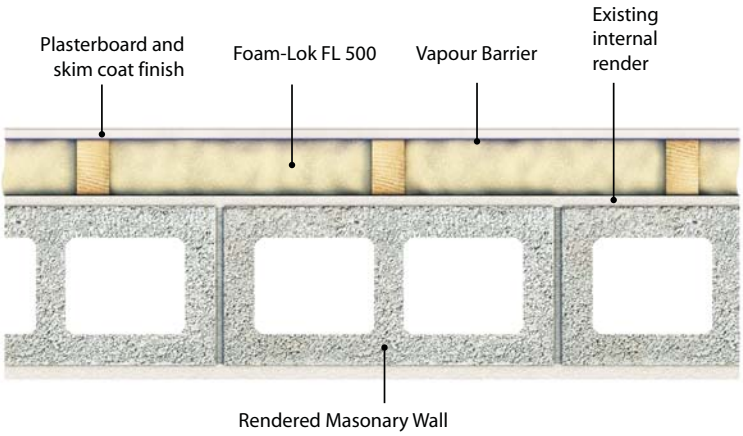

Figure 2: Masonry Wall – Dry Lining

ventilation and ventilation must be designed to avoid creating pockets of stagnant air. A vapour check layer is fixed to the face of the timber rafters prior to applying board finishes.

In all situations and to satisfy the requirements of ICP 2:2002 and BS 5250:2011+A1:2016, a vapour control layer must be installed on the warm side of the installation, unless an assessment shows it to be unnecessary.

In all roof type, continuity of insulation from rafter to wall must be maintained at eaves level. This will serve to limit thermal bridging at this junction. Designer and specifiers should refer to the Lapolla installation details manual for best practice at all building junctions.

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 - 2017. Furthermore care should be exercised to ensure that moisture vapour from the dwelling space below is restricted. The following guidance should be considered:

- Providing the means to remove moisture vapour at source i.e. ensure that adequate ventilation is present in the rooms below the attic space.
- Providing a well-sealed airtight ceiling.
- Services and recessed down-lighters which penetrate the ceiling should be made airtight and should be kept to a minimum.
- Installing an effective sealed vapour control layer where possible.
- Covering of water tanks in the loft space.

2.4.4 Attic Floors - Insulation at Ceiling level

The product is sprayed into the cavity formed by the ceiling joists and the attic lining board. Care must be taken to ensure that ventilation is maintained at eaves level through the correct installation of an eaves tray. Provision must be made for adequate ventilation as outlined in TGD Part F of the Building Regulations 1997 - 2017.

Attic trap door must be insulated and every effort should be made to ensure an airtight seal is achieved when closed.

When the depth of insulation exceeds the depth of the ceiling joists, access platforms must be provided to allow for safe access for maintenance (i.e. water tanks).

When insulating at ceiling level, appropriate measures must be taken to ensure that services which are above the line of the insulation are not susceptible to freezing. Water tanks and associated distribution pipe work must be fully insulated.

Existing electrical cables should be raised above the level of the foam insulation where possible (See section 4.5 of this certificate).

Figure 3 - Recessed down-lighters.

It is not recommended to install recessed lights in conjunction with Foam-Lok FL 500 insulation at ceiling level. Where recessed down-lighters exist, guards should be fitted to keep the insulation at least 75mm from the heat source. When 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,

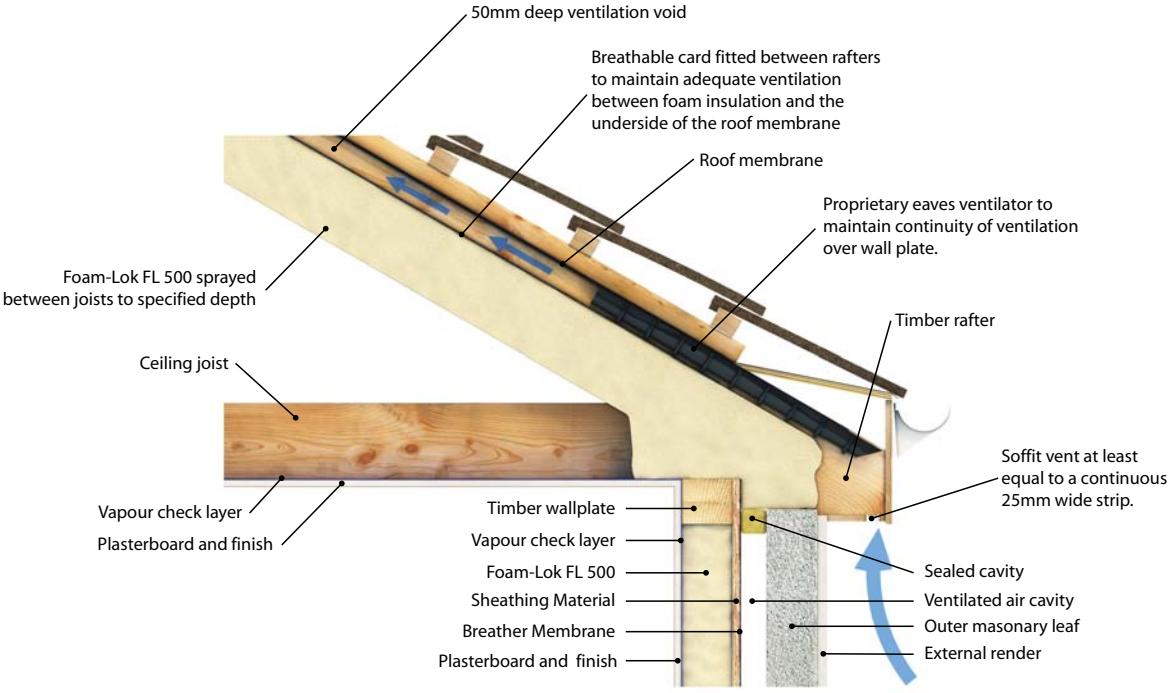

Figure 4: Pitched Roof Construction: non-habitable roof space

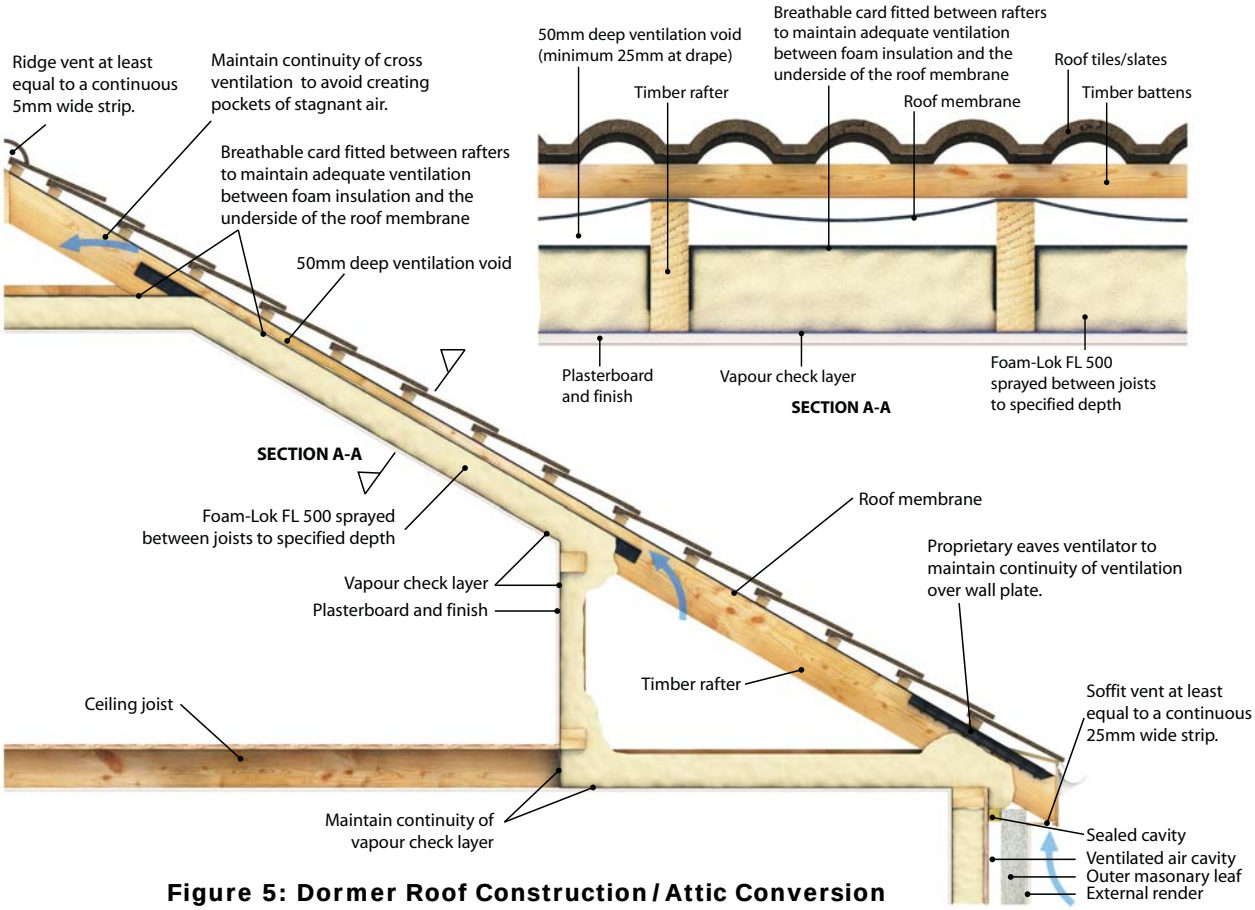

Figure 5: Dormer Roof Construction / Attic Conversion

provided they are of appropriate diameter (i.e. keep insulation 75mm away from heat source).

2.4.5 Suspended Timber Ground Floors

The product has not been assessed for use in suspended timber floors.

3.1 GENERAL

Foam-Lok FL 500 Spray foam insulation is satisfactory for use in reducing the U-value of walls and roofs of dwellings when used in accordance with the relevant requirements of this certificate and BS 5250:2011+A1:2016 *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 drylining on masonry walls in conjunction with timber studding, vapour barrier check and dry-lining boards.
- Between timber rafters in pitched roofs constructed in accordance with clause 2.4.3 of this certificate and the general provisions of S.R. 82:2017, *Slating and Tiling - Code of Practice.*
- Between attic floor joists onto existing drylined ceiling of room below (where attic is non-habitable).

In all situations sufficient ventilation must exists on the cold side of the insulation. It is recommended that the foam insulation be covered by suitable internal lining board and a vapour check layer. In the case where the product has been applied between rafters in a non-habitable roof space, and the covering and vapour check layer are deemed to be provided by the lining board of the ceiling below, an assessment to BS 5250:2011+A1:2016 to establish the adequacy of the existing ceiling must be carried out (see also clause 2.4.3. of this certificate).

3.2 PRE INSTALLATION SURVEY

Existing buildings must be in a good state of repair with no evidence of underlying defects, rain penetration or dampness. If defects are found, remedial action to rectify such defects must take place prior to installation of Foam-Lok FL 500.

Defects such as rain penetration or elevated levels of condensation can give rise to excessively high levels of moisture content within building materials. Following any remedial works, all materials, in particular timber must be allowed to dry out prior to installation of Foam-Lok FL 500. A moisture probe survey should be used to establish if moisture levels have returned to suitable levels.

3.3 CONDENSATION RISK

It is essential that all building elements are designed and constructed in a robust manner to eliminate the risk of moisture ingress and surface condensation occurring. 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 2017). Designers should also refer to the certificate holders approved installation details.

3.4 LOADING

Foam-Lok FL 500 does not contribution to the structural performance of any building element and should not be considered to contribute to the racking strength of wall panels.

3.5 VENTILATION

It is essential that adequate room ventilation be provided in accordance with TGD Part F of the Building Regulations 1997 - 2017, in order to limit the moisture content of air within the dwelling. Adequate room ventilation will contribute to reducing the risk of condensation and mould growth.

Adequate provision for roof ventilation must be provided for to prevent build-up of condensation in roofs. Roof ventilation systems must also be designed to avoid creating pockets of stagnant air

3.6 CE marking

The manufacturer has taken the responsibility of CE marking the products in accordance with harmonised standard I.S. EN 14315-1:2013 *Thermal insulating products for buildings - In-situ formed sprayed rigid polyurethane (PUR) and polyisocyanurate (PIR) foam products - Part 1: Specification for the rigid foam spray system before installation*. An asterisk (*) appearing in this Certificate indicates that data shown is given in the manufacturer's Declaration of Performance.

4.1 BEHAVIOUR IN FIRE

Foam-Lok FL 500 Spray insulation has a fire classification of class E when assessed in accordance with I.S. EN 13501:2007. A class E product is combustible and must be protected from naked flames and other ignition sources during and after installation.

Once installed, the insulation must be contained by a suitable lining board, e.g. 12.5mm plasterboard, with joints fully sealed and supported by rafters or studs.

The one exception where an installation will not require containment by suitable lining boards will be when the product is installed in an unoccupied loft area which is, in itself, contained from the habitable section of the dwelling. Foam-Lok FL 500 Spray insulation can remain exposed in an unoccupied loft subject to the provision of satisfactory ventilation (clause 4.5) and an assessment in accordance with clause 4.2 of this certificate, namely, an interstitial condensation risk analysis and an internal surface condensation risk analysis.

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 2017.

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 2017. 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 I.S. 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 Protection of Building from Heat Producing Appliances

Combustible wall insulation material should 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 5 - 14 of the TGD Part J Building Regulations 1997 to 2017. It should also be separated by 40mm from the external surface of a masonry chimney. The separation between this product and the external surface of the chimney shall be determined in accordance with Diagram 10 of TGD to Part J of the Building Regulations 1997 to 2017.

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 Foam-Lok FL 500 Spray insulation to eliminate the risk of interstitial condensation, unless an assessment to BS 5250:2011+A1:2016 indicates that it is not necessary for a particular construction.

When building elements do not follow the principles of BS 5250:2011+A1:2016, a robust hygrothermal assessment to either I.S. EN 15026:2007 *Hygrothermal performance of building components and building elements - Assessment of moisture transfer by numerical simulation* or I.S. EN ISO 13788:2001 *Hygrothermal performance of building components and building elements - Internal surface temperature to avoid critical surface humidity and interstitial condensation - Calculation methods* must be considered.

Foam-Lok FL 500 foam has a low water vapour resistance and as a result will not contribute to minimising the risk of interstitial condensation driven by convection. Foam-Lok FL 500 foam has a water vapour resistance factors or μ-value (see

table 4 of this certificate) of 2.8 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 clause 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 Part 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 clause 4.4 for further guidance).

When insulating buildings, the recommendations of BS 5250:2011+A1:2016 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 0.35 W/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 (ACD)*.

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 5 on this certificate. The U-value of a construction will depend on the materials used and the design. Examples of U-value calculations for pitched roofs and walls are given in Tables 1-4.

The certificate holder has carried out U-value calculations similar to build-up given in Table 1-4 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 Lapolla Technical Training documentation.

For retrofit installations on existing dwellings such as drylining or attic installations, end users should seek guidance from the certificate holder on U-values as the actual U-value of installation will depend on the construction of the existing building elements. Certificate holder 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. The certificate holder has 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 certificate holders Technical Training manual.

Window jambs, door reveals and all building junctions when shown to be equivalent or better than junctions detailed in either, certificate holders 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 2017. 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 cannot 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 junctions 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 2017.

4.5 VENTILATION

Adequate room and roof ventilation must be provided in accordance with TGD Part F of the Building Regulations 1997 - 2017, for all installations.

4.6 MATERIALS IN CONTACT WITH ELECTRICAL WIRING

When encapsulating electric cables, consideration should be given to de-rating of electrical cables where the product restricts the flow of air around cables. Where the foam is likely to be in contact with electric cables, suitable conduit or trunking should be used if de-rating is considered a risk. The positioning and future access to electrical cabling services should be carefully considered.

In attic areas, existing electrical cable at ceiling level 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)

4.7 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 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 Foam-Lok FL 500 in conjunctions with Zinc cause white corrosion and small perforations in the Zinc foil test coupons. As a result the product in not suitable to be placed in contact with Zinc or Zinc plated elements as the foam, given the correct environmental conditions, will accelerate the corrosion of such elements.

Zinc or Zinc plated elements are typically used as fixings 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.

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

- Density
- Water vapour permeability
- Dimensional stability
- Thermal conductivity
- Compressive behaviour
- Suitability of Foam-Lok FL 500 foam insulation in contact with timber.
- Adhesion of Foam-Lok FL 500 to timber.
- REACH compliance (Registration, Evaluation, Authorisation and Restriction of Chemicals).
- Safety Data Sheets Foam-Lok FL 500
- 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 both ISO 9001:2008 Quality Management System and ISO 14001:2004 Environmental Management System accreditation.

(iii) Site visits were conducted to assess the practicability of installation and the history of performance in use of the product.

Pitched Roof - Insulation at Ceiling Level
Partially Bridged  [-]
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)
200 [50]	0.19
240 [90]	0.16
270 [120]	0.14
310 [160]	0.12

Note:- construction (external to internal):
- Conventional tiled or slated pitched roof
- Ventilated roof space
- Homogeneous layer of insulation [depth in brackets]
- Inhomogeneous layer Insulation (92%)/timber rafters (8%) (150mm deep joists)
- Vapour control barrier
- Plasterboard – 12.5mm
- 3mm gypsum skim coat finish

Table 1

Timber Frame Walls
U-Value of timber frame inner leaf with rendered masonry outer leaf.

Thickness of Insulation (mm)	**U-Value (W/m²K)**
200	0.21
240	0.18
300	0.15
380	0.12

Note:- construction (external to internal):
- Concrete Block outer leaf (100mm) with external render.
- Air cavity
- Breather membrane
- OSB sheathing ply– 15mm
- Insulation (89%) and timber studs (11%) (insulation and timber depths as indicated above)
- Vapour control barrier
- Plasterboard – 12.5mm
- 3mm gypsum skim coat finish

Correction for air voids $\Delta U''$ = level 1 applied to bridged layer

Table 2

Pitched Roof - Insulation at Ceiling Level
Fully Bridged 
U-values for tiled or slated pitched roof, ventilated roof space, insulation placed between joists at ceiling level

Thickness of Insulation (mm)	**U-Value (W/m²K)**
270	0.16
320	0.14
460	0.10

Note:- construction (external to internal):
- Conventional tiled or slated pitched roof
- Ventilated roof space
- Insulation (92%)/timber ceiling joists (8%) (insulation and timber depths as indicated above)
- Vapour control barrier
- Plasterboard – 12.5mm
- 3mm gypsum skim coat finish

Correction for air voids $\Delta U''$ = level 1 applied to bridged layer

Table 3

Pitched Roof - Insulation at 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)**
220	0.20
250	0.18
280	0.16
320	0.14

Note:- 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.
- Insulation (92%)/timber rafters (8%) (timber battens added to rafters to achieve depths as indicated above)
- Vapour control barrier
- Plasterboard – 12.5mm
- 3mm gypsum skim coat finish

Correction for air voids $\Delta U''$ = level 1 applied to bridged layer

Table 4

Characteristics	Test method reference		Foam-Lok FL 500		
			Result		Units
Reaction to fire	EN 13501-1 + A1		Class E*		
Water adsorption/ permeability	IS EN 1609:1997, Method B		Max. 24.3*		kg/m^2
Thermal conductivity	I.S. EN ISO 10456 $\lambda_{90/90}$ - value		**0.037***		W/m.K
Water vapour permeability	I.S. EN 12086:1997 Water Vapour permeance (W)		13.97*		mg/(m^2.hour.Pa)
	I.S. EN 12086:1997 Water vapour resistance factor (μ)		2.8*		μ -value
	Diffusion-equivalent air-layer-thickness for 18mm thick test sample (S_d)		0.05*		m
Compressive behaviour	I.S. EN 826:1996 Compressive stress at 10% deformation		Min. 9*		kPa
Tensile strength	Tensile strength parallel to faces (EN 1608)		Min. 18*		kPa
	Tensile strength perpendicular to faces (delamination) (EN 1607)		Min. 9*		kPa
Dimensional stability	I.S EN 1604: 1997	at -20°C	+0.0*		%
		at +60°C/48hr	-0.4*		%
		at +23°C	+0.0*		%
Density (Range)	I.S. EN 1602		8	11	Kg/m^3
	Density for 1000cm^3 QA samples		8	11	g
* indicates that data shown is taken from the manufacturer's Declaration of Performance. § Without air gaps					

Table 5 – Foam-Lok FL 500 Characteristics

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 or revision date so long as:

(a) the specification of the product is unchanged.

(b) the Building Regulations 1997 to 2017 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. **15/0385** is accordingly granted by the NSAI to Lapolla on behalf of NSAI Agrément.

Date of Issue: **October 2015**

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

Revision:
June 2018: Change of distributor.

14th January 2021: General Revisions