

**IRISH AGRÉMENT BOARD
CERTIFICATE NO. 10/0346**

Techrete Ireland Ltd.,
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Techrete Architectural Cladding System

Systèmes pour constructions Bausystem

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 the Techrete Architectural Cladding System, which is based on precast concrete wall panels involving a range of cladding types for bespoke designs for buildings. Techrete Ireland Ltd and Techrete (UK) Ltd are responsible for the design, manufacture and installation of the system, and for the integration of the design of the system into the building.

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

USE:

The Techrete Architectural Cladding System consists of bespoke designs developed in consultation with the customer's architectural design team. Panels are manufactured using traditionally reinforced concrete (RC) and glass fibre reinforced concrete (GRC). It includes non-loadbearing and loadbearing single skin precast concrete wall panels and precast concrete sandwich panels.

MARKETING, DESIGN AND MANUFACTURE:

The product is designed, manufactured and marketed by:

Techrete Ireland Ltd.,
Stephenstown Industrial Estate,
Balbriggan,
Co. Dublin.

and

Techrete (UK) Ltd.,
Feldspar Close,
Warren Park Way,
Enderby,
Leicester LE19 4SD.



1.1 ASSESSMENT

In the opinion of NSAI Agrément, the Techrete Architectural Cladding System if used in accordance with this Certificate can meet the requirements of the Building Regulations 1997 to 2017, as indicated in Section 1.2 of this Agrément Certificate.

1.2 BUILDING REGULATIONS 1997 to 2017

REQUIREMENTS:

Part D – Materials and Workmanship

D3 – Proper Materials

The Techrete Architectural Cladding System, as certified in this Certificate, is comprised of 'proper materials' fit for their intended use (see Part 4 of this Certificate).

D1 – Materials & Workmanship

The Techrete Architectural Cladding System, as certified in this Certificate, meets the requirements for workmanship.

Part A - Structure

A1 – Loading

The Techrete Architectural Cladding System has adequate strength and stability to meet the requirements of this Regulation (see Part 3 of this Certificate).

Part B – Fire Safety

Part B Vol 2 – Fire Safety

B4 & B9– External Fire Spread

The concrete in the walls has a Class O surface spread of flame rating and when installed and used in the context of this Certificate will provide adequate resistance to the spread of flame over the external walls and can satisfy the relevant requirements of this Regulation as indicated in Section 4.1 of this Certificate.

Part C – Site Preparation and Resistance to Moisture

C4 – Resistance to Weather and Ground Moisture

The Techrete precast external walls have adequate weather resistance in all exposures to prevent the passage of moisture from the external atmosphere into the building as specified in section 3.4 of this Certificate.

Part E – Sound

E1 – Airborne Sound (Walls)

The walls of the Techrete Architectural Cladding System can be appropriately designed, detailed and constructed to meet the airborne sound requirements of this Regulation where such construction is part of the Techrete package (see Section 4.3 of this Certificate).

Part L – Conservation of Fuel and Energy

L1 – Conservation of Fuel and Energy

The walls of the Techrete Architectural Cladding System are designed as a dry cavity and can, if required, have the required thickness of insulation incorporated to meet the Elemental Heat Loss method calculations for walls as recommended in Part L of the Building Regulations 1997 to 2017 (see Section 4.2 of this Certificate).

2.1 PRODUCT DESCRIPTION

The Techrete Architectural Cladding System typically consists of an architectural precast concrete panel faced or unfaced on the external face of the building. The system includes non-loadbearing and loadbearing single skin precast concrete wall panels and precast concrete sandwich panels which include the following:

- Non-loadbearing single skin concrete panels supported off the structural frame.
- Self-supporting single skin concrete cladding independent of the structural frame.
- Non-loadbearing sandwich concrete panels supported off the structural frame.
- Self-supporting stacking concrete sandwich panels.
- Loadbearing concrete sandwich panels which act as part of the structure.
- High rise cladding systems.

There are numerous options of finish for the Techrete Architectural Cladding System such as:

- Acid-etched coloured concrete
- Polished/honed colour concrete
- Sand-blasted coloured concrete
- Ex-mould
- Natural stone
- Textures
- Fired clay brick
- Terracotta

Concrete	
Compressive strength 28 day	45N/mm ²
Cover to reinforcement	
Front & exposed horizontal surfaces	40mm (allows for 10mm deep mock joint or polished finish)
Back face & corbel	25mm
Reinforcement	
All high yield fy	460N/mm ²
Stainless steel	
Plate & strip	
– allowable tensile stress	118N/mm ²
– allowable shear stress	70N/mm ²
Threaded rod & bolt	
– allowable tensile stress	124N/mm ²
– allowable shear stress	103N/mm ²
Erection & demoulding sockets	
Design in accordance with manufacturer's recommendations	

Table 1: Structural Design Data

2.2 DESIGN

The Techrete architectural cladding system is intended for use where architects and engineers

drawings are available and satisfy the requirements of the Building Regulations. The developer or client's architect and engineer have overall responsibility for the project.

The Techrete cladding panels are project specific and designed in accordance with BS 8297:2017 *Design, manufacture and installation of architectural precast concrete cladding – Code of practice* and IS EN 1992-1-1:2010+AMD1:2016 National Annex *Irish National Annex to Eurocode 2: Design of concrete structures – General rules and rules for buildings*.

The design solutions by Techrete for each project are managed by an experienced Chartered Structural Engineer.

Steel angle fixings for non-load-bear panels shall be designed to meet the requirements of Tables A1 and A2 of TGD to Part B of the Building Regulations 1997 to 2017.

Fire stopping must be designed in accordance with Table A2 of TGD to Part B of the Building Regulations 1997 to 2017.

Thermal movement, live load deflection, elastic shortening of columns and building sway must all be taken into account when designing the cladding and its fixing and jointing system.

Non loadbearing single skin panel	<ul style="list-style-type: none"> • Support & restraint by doweled corbels • Top restraint by steel angle fixing
Self supporting single skin panel	<ul style="list-style-type: none"> • Steel dowel fixing to panel below • Top restraint by steel angle fixing
Non loadbearing sandwich panel supported off structure	<ul style="list-style-type: none"> • Support & restraint by doweled corbels on inner leaf • Top restraint by steel angle fixing on inner leaf
Self supporting stacking sandwich panel	<ul style="list-style-type: none"> • Inner leaf steel dowel fixing to panel below • Top restraint by steel angle fixing on inner leaf
Loadbearing concrete sandwich panels which act as part of the structure	<ul style="list-style-type: none"> • Inner leaf supported on shims and dry pack mortar with cast or grouted in steel reinforcing dowels and ties to the floor slabs

Table 2: Wall Panel Fixings & Brackets

	Target size	Permissible deviation
a) Length and height	<3m	±3mm
	3m to 6m	±5mm
	6m to 9m	±8mm
	9m to 12m	±10mm
b) Thickness	<500mm	±3mm
	500mm to 750mm	±5mm
c) Straightness or bow i.e. deviation from the intended line	<3m	6mm
	3m to 6m	9mm
	6m to 12m	12mm
d) Squareness i.e. the difference in length of the two diagonals	3mm per 2m of diagonal up to a maximum of 9mm	
e) Twist i.e. any corner should not be more than the dimension stated from the plane containing the other three corners	Length of longer side	
	<3m	6mm
	3m to 6m	9mm
	6m to 12m	12mm
f) Openings	1) Within one unit (size)	±6mm
	2) Within one unit (location)	
	i) With structural or cover implications	±6mm
	ii) Without structural or cover implications	±12mm
	iii) Formed by several units e.g. spandrels, mullions etc	±8mm
g) Anchors and inserts	1) Isolated insert or group of inserts	±6mm
	2) Individual insert relative to others within a group	±3mm
	3) Non-structural cast-in items	Twice the above

Table 3: Permissible Deviations in the Manufacture of Cladding Units (Table 6 BS 8297:2017)

Panel to panel joints are designed to accommodate all the calculated movements and tolerances and still remain water and air tight. When all the movements have been calculated, the width of the joint can be designed based on the movement accommodation factor of the joint sealant. These calculations are carried out in accordance with BS 6093:2006+A1:2013 *Design of joints and jointing in building construction – Guide*. This calculation will also allow for the dimensional tolerance of the precast units.

Unless the panels have a cavity, as may be the case with stone cladding, double seals are used at joints and window interfaces to exclude the weather, in accordance with the Techrete Design Manual

2.2.1 Tolerances

The cladding of a structural frame with architectural precast panels involves dealing with three sets of tolerances:

1. Frame or Building Tolerances

The structure onto which the architectural precast panels are being erected is constructed to a tolerance. This tolerance is defined by BS 5606:1990 *Guide to accuracy in building*.

2. Precast Panel Manufacturing Tolerance

The precast panels themselves are manufactured to a tolerance which is given in Table 6 of BS 8297:2017, which is reproduced in this Certificate as Table 3.

3. Precast Panel Erection Tolerances

The accuracy of erection of precast panels is covered by Clause 11.5 of BS 8297:2017. Frequently panels will have to be adjusted to achieve a best fit. Allowable tolerances are listed in Table 4.

Joint width	±6mm
Tapering of joint	5mm
Edge alignment	6mm
Out of plane	6mm which must be read in conjunction with bow tolerance
Window Ope Tolerance	
Size within 1 unit	±6mm
Multiple units	±8mm
Location	±12mm

Table 4: Precast Panel Erection Tolerances

2.3 DELIVERY, STORAGE AND HANDLING

The panels are delivered to site and lifted off the lorry and into position onto the building using designated lifting points and equipment. Lifting shall be carried out by competent personnel in accordance with Techrete Ireland Ltd and Techrete (UK) Ltd instructions.

2.4 INSTALLATION

Installation is carried out by trained and approved installers on behalf of Techrete Ireland Ltd and Techrete (UK) Ltd in accordance with the Techrete Construction Procedures Manual.

In the case of single skin concrete panels, the insulation can be either fitted by Techrete in the factory or site fitted by others. In the case of the sandwich panels, the insulation is fitted between

the outer and inner leaf of concrete. Proprietary stainless steel lattice ties are used to connect the two leaves. Internal plasterboard with appropriate finishes is fitted by others.

Where a natural stone facing is fixed to the cladding panel, it is done in accordance with BS 8298-1:2010 *Code of practice for design and installation of natural stone cladding and lining - General*.

Where brick slips are used on the cladding panels they are mechanically keyed to the backing concrete using grooves on the bricks. Each brick slip is set face down in a template laid on the casting bed, then the backing concrete with reinforcement is poured on top to give a composite panel. The brick slips are not allowed to have any holes which would form air pockets as these would increase the risk of damage through freezing if water were to get trapped in them.

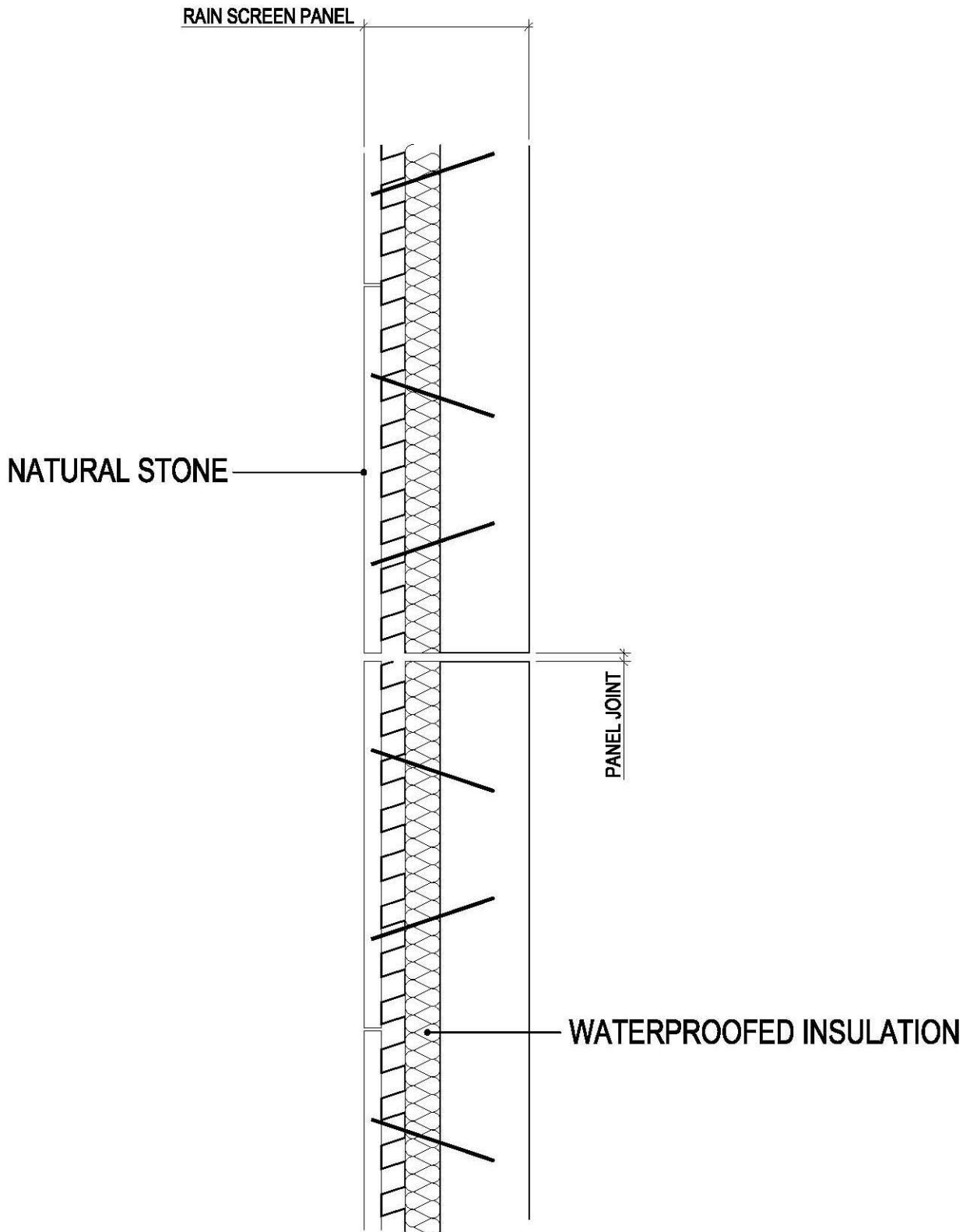


Figure 1: Typical Rain Screen Panel System

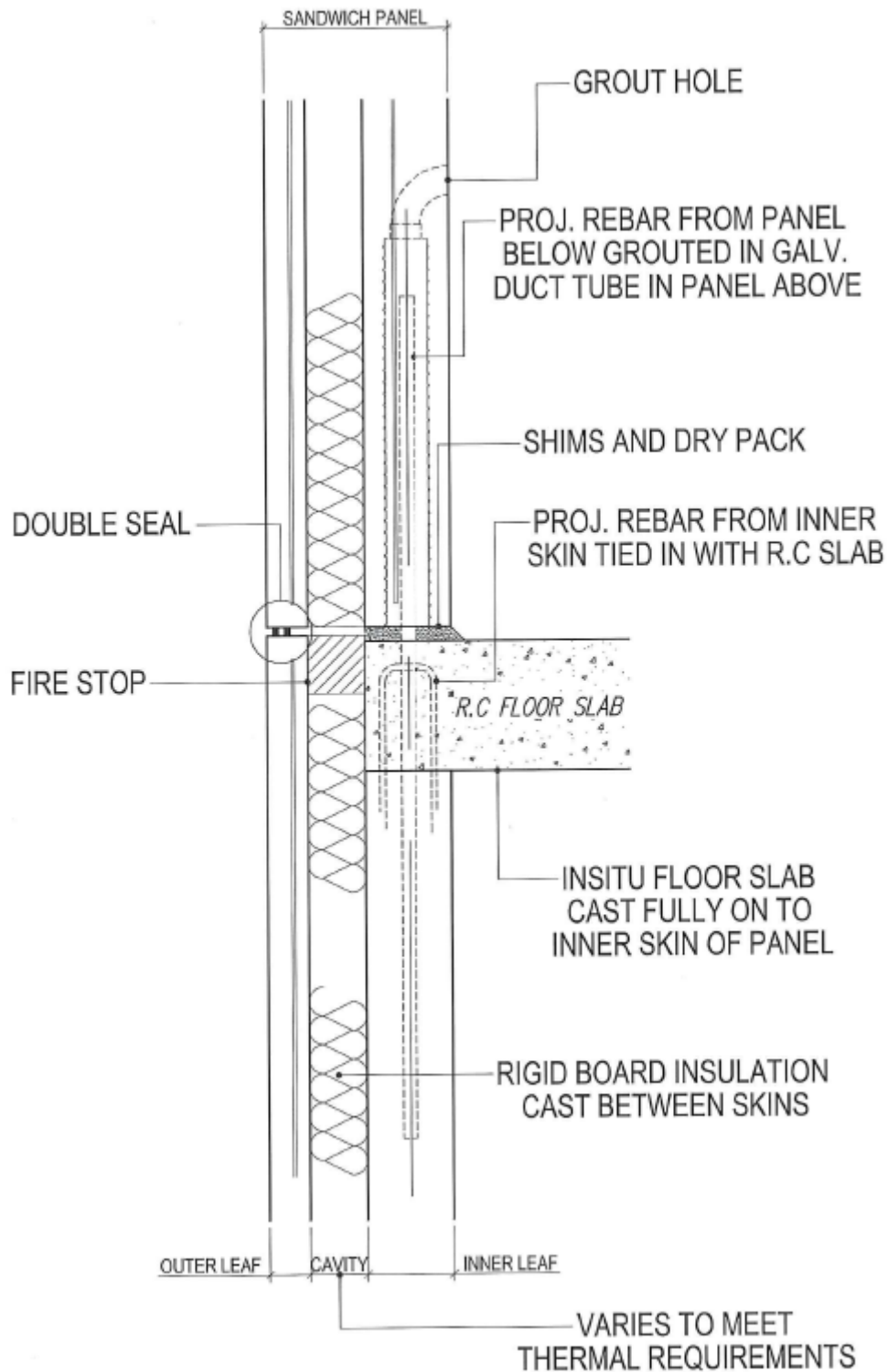


Figure 2: Sandwich Panel Insitu Floor Interface

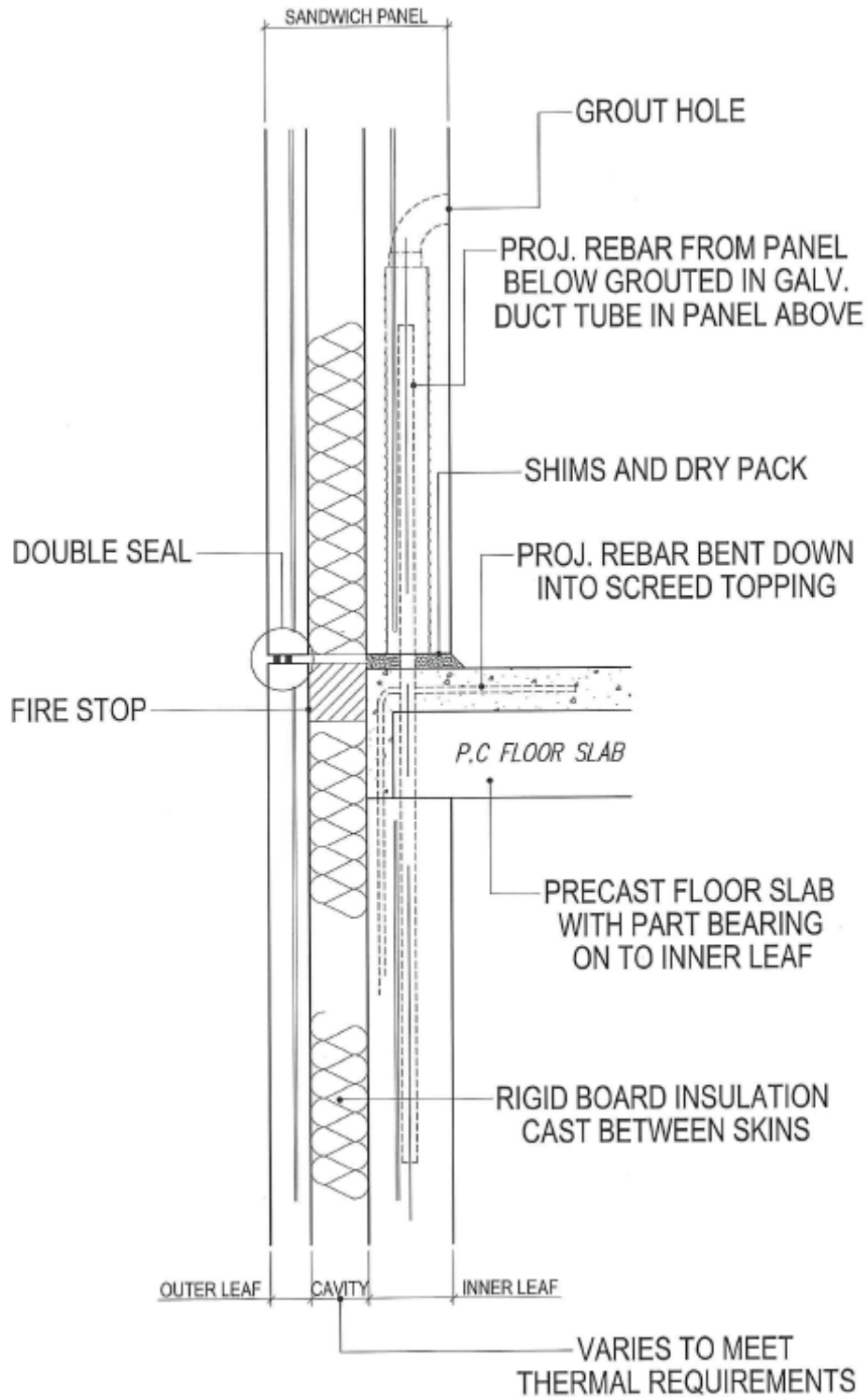


Figure 3: Sandwich Panel Precast Floor Interface

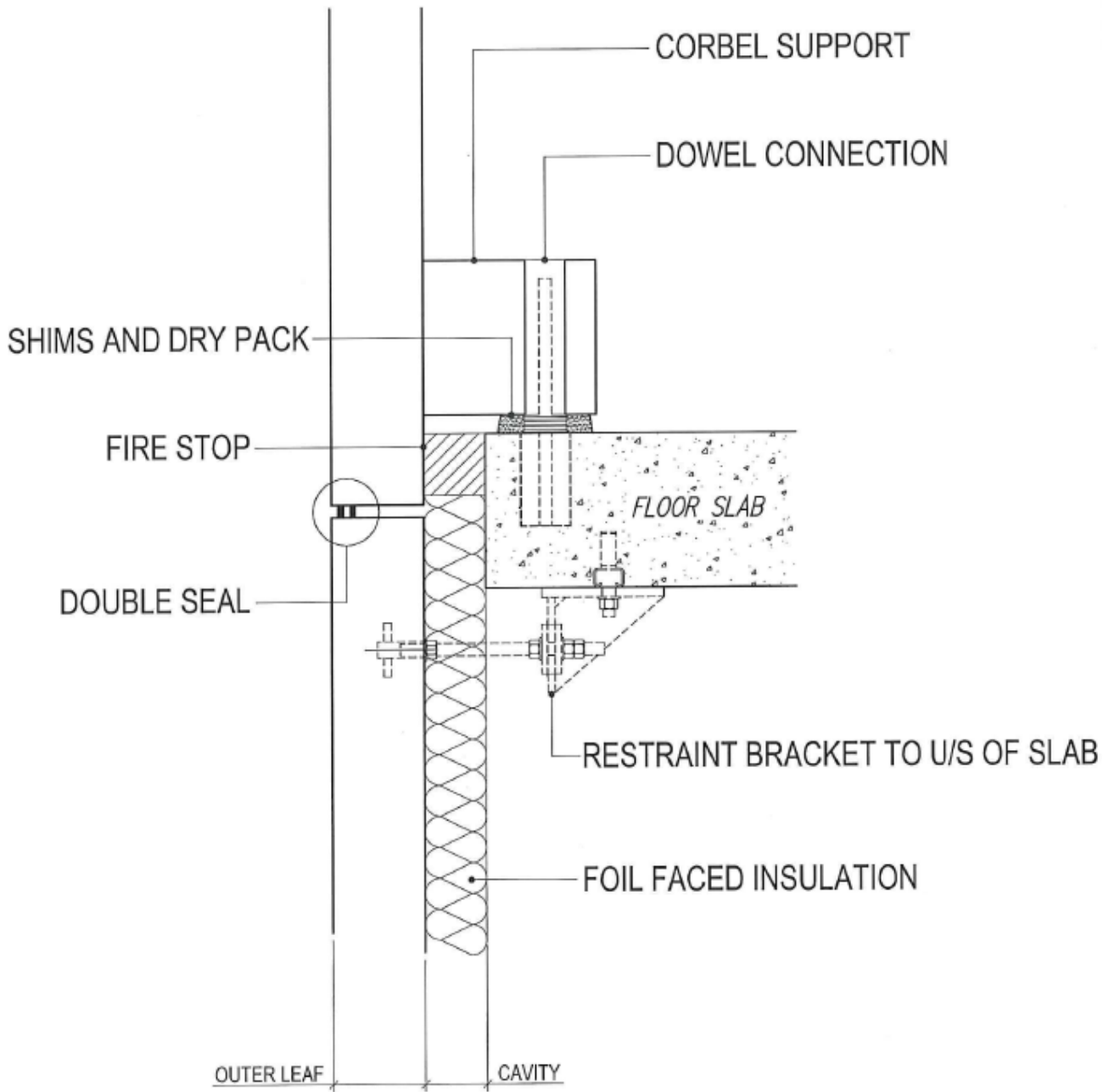


Figure 4: Single Skin Support At Each Floor Level

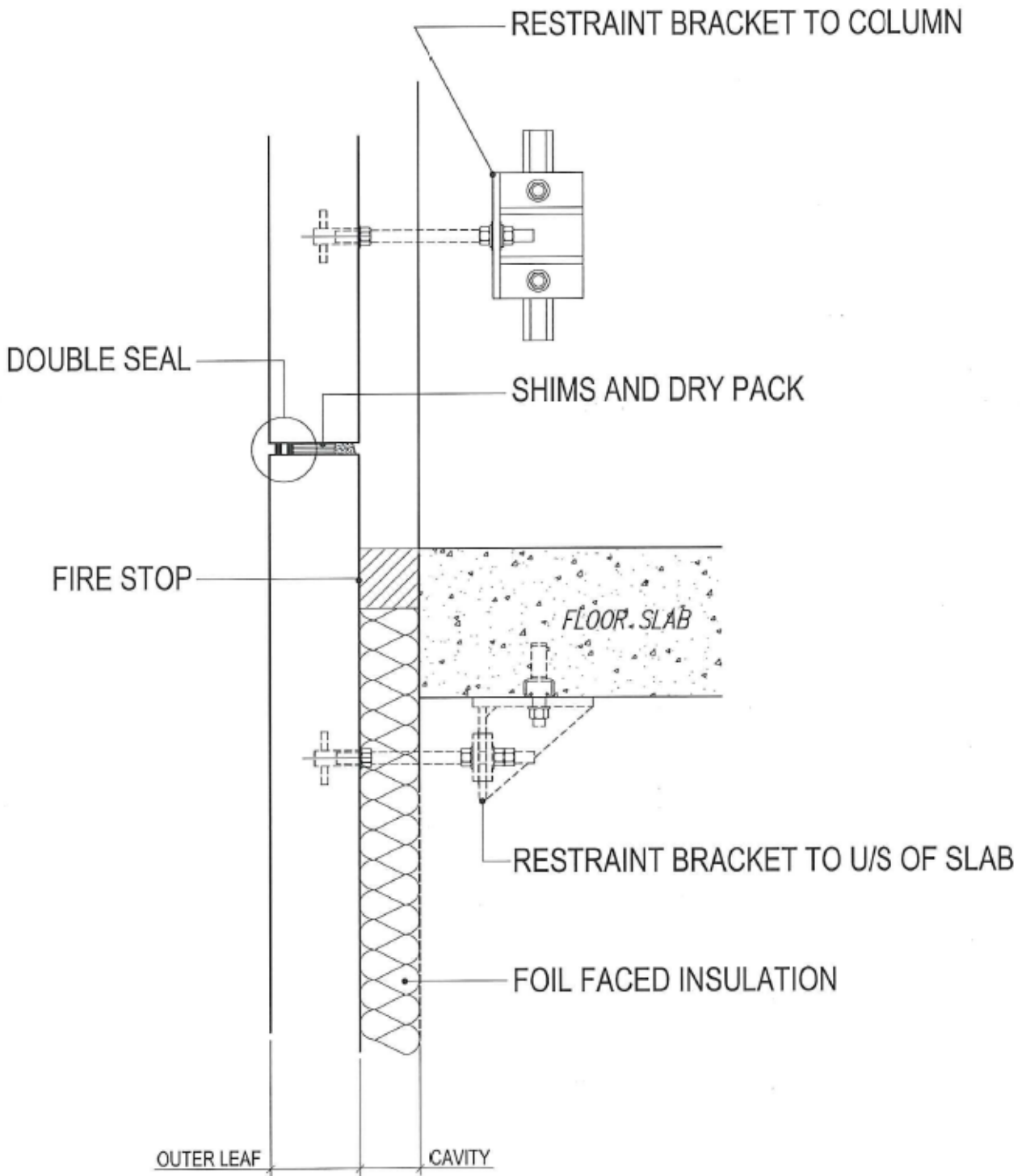


Figure 5: Typical Stacked Panel System

3.1 STRENGTH AND STABILITY

3.1.1 General

The Techrete Architectural Cladding System is intended for use where Architect's drawings are available and satisfy the Building Regulations 1997 to 2017. The clients architect and engineer are responsible for the architectural drawings and overall building design to comply with the Building Regulations. Techrete Chartered Structural Engineer is responsible for the project specific structural design of the Techrete Architectural Cladding System.

3.1.2 Structural Principles

The Techrete Architectural Cladding System is designed in accordance with Eurocode 2 and will, when assembled on site in conjunction with concrete floor panels, supplied and erected by others, and a structural screed incorporating ties, fixings and connections, form the vertical element of a concrete structural frame.

Vertical dead and imposed loads are carried by external and internal load bearing wall panels; horizontal wind loading and other racking forces are distributed to shear stiff wall panels by the floor/roof system, acting as a diaphragm at each floor/storey level. Load transfer from the roof is directly through wall members.

3.1.3. Design Loads

Typical designs carried out by Techrete Ireland Ltd and Techrete (UK) Ltd have been examined by NSAI Agrément and comply with the relevant codes of practice.

3.1.4 Robustness and Ties/Connections

Where applicable, and in particular for loadbearing panels, anchorage of floors and roof members, internal horizontal ties, peripheral ties, external wall ties and vertical ties are designed in accordance with the principles and requirements of Eurocode 2.

3.1.5 Design Against Disproportionate Collapse

In respect of the design of structural joints, the system is well conditioned for the avoidance of disproportionate structural collapse.

3.2 STRUCTURAL FIRE SAFETY

The fire resistance of wall constructions has been determined in accordance with Eurocode 2. Firestopping can be incorporated to achieve the performance outlined TGD to Part B of the Building Regulations 1997 to 2017, if required.

3.3 IMPACT RESISTANCE

The wall panels are reinforced concrete and are suitable for all categories in Table 2 of BS 8200:1995 *Code of practice for design of non-loadbearing external vertical enclosures of buildings (No longer current but cited in Building Regulations)*.

3.4 WEATHERTIGHTNESS

The external walls will prevent transfer of water through the concrete or brick/concrete fabric.

The vertical and horizontal joint seals will prevent water ingress. The vertical joint design allows for vertical drainage to the base of the building.

4.1 BEHAVIOUR IN RELATION TO FIRE

4.1.1 Fire Resistance

Technical Guidance Document B of the Building Regulations 1997 to 2017 states that the panels should be designed to remain intact and operational for varying periods of time in the event of fire depending on their function and location.

Reference should be made to TGD to Part B to determine adequate periods of fire resistance for the panels and their fixings.

4.1.2 Surface Spread of Flame

The concrete in the Techrete wall panels has a Class O rating and is non-combustible.

4.1.3 Cavity Barriers

There are no cavities in the Techrete single skin wall panels. In the case of the air cavity sandwich panels, there are cavity barriers at each floor.

4.2 THERMAL INSULATION AND CONDENSATION RISK

Calculated U-value and condensation analyses are carried out by the insulation suppliers on the basis of the Techrete panels providing a dry cavity. These are carried out to IS EN ISO 6946:2017, IS EN ISO 10456:2007+COR:2009, BS 5250:2011+A1:2016, Standards for Systemised Building Envelopes by the Centre for Window and Cladding Technology, and Part L of the Building Regulations 1997 to 2017.

The panels can be incorporated into a design that will meet the requirements of Part L of the Building Regulations 1997 to 2017, i.e. U-value for the external wall of 0.27W/mK.

Building details must be in compliance with the DHPLG publication *Limiting Thermal Bridging & Air Infiltration – Acceptable Construction Details*, IS EN ISO 13788:2012, IS EN ISO 6946:2017, IS EN ISO 10211-1:2017 and BR 497. 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 DEAP building energy rating calculation. Alternatively if all junctions can be shown to be equivalent or better than the Acceptable Construction Details, published by the DHPLG then the improved 'y' factor of 0.08 can be used i.e. R value = $0.6\text{m}^2\text{K/W}$ for window/door reveals.

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.

Effective joint seals must be provided, and their integrity must be protected and maintained for the design life.

Consideration should be given to provision for removal of condensation in window design.

4.3 SOUND

The Techrete Architectural Cladding System allows for buildings to be designed to meet the requirements of Part E of the Building Regulations 1997 to 2017. The client's design team addresses this on each project.

TGD to Part E of the Building Regulations 1997 to 2017 gives the following recommendations for types of construction:

1. External Walls:

External walls should be 120kg/m^2 . This equates to a concrete wall thickness of approximately 55mm, which gives a sound insulating reduction of approximately 41dB.

2. Internal Walls:

A concrete wall 190mm thick with a mass of 420kg/m^2 gives a sound insulating reduction of 48dB.

3. Concrete Floors:

A concrete floor with a thickness of 170mm and a weight of 365kg/m^2 will give a sound insulating reduction of 46dB.

Flanking sound reduction is achieved by numerous methods which meet the specification such as dense mineral wool fill, metal plates, acoustic barriers etc.

4.4 DURABILITY & MAINTENANCE

The wall panels in the system are designed in accordance with Eurocode 2 and BS 8297:2017. In the case of cover to steel reinforcement, 30mm cover ensures adequate cover, and a 60-year design life.

In the case of joint sealants, double seals are used as shown in Figure 2 of BS 8297:2017. The external sealant will require maintenance because of exposure, and would be expected to last 60 years with maintenance.

Apart from cleaning the concrete and inspecting the seals, the architectural wall panel system is maintenance free. It is recommended that this inspection be carried out at least every 5 years.

4.5 TESTS AND ASSESSMENTS WERE CARRIED OUT TO DETERMINE THE FOLLOWING

The following is a summary of the tests and assessments which have been carried out on the Techrete Architectural Cladding System:

- Structural strength and stability.
- Behaviour in relation to fire.
- Acoustic performance, resistance to airborne and impact sound transmission.
- Thermal insulation performance.
- Compatibility with other materials.
- CWCT weather testing.

4.6 OTHER INVESTIGATIONS

- (i) Existing data on product properties in relation to fire, toxicity, environmental impact and the effect on mechanical strength/stability and durability 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.
- (iii) Site visits were conducted to assess the practicability of installation and the history of performance in use of the product.

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 latest revision 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 IAB 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.

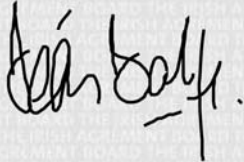
5.7 Where reference is made in this Certificate to any Act of the Oireachtas, Regulation made thereunder, Statutory Instrument, Code of Practice, National Standards, manufacturer's instructions, or similar publication, it shall be construed as reference to such publication in the form in which it is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

NSAI Agrément

This Certificate No. **10/0346** is accordingly granted by the NSAI to **Techrete Ireland Ltd.** on behalf of NSAI Agrément.

Date of Issue: **December 2013**

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.n Sai.ie

Revisions:

September 2018 *exact date once published*: Reference to Building Regulations and standards updated.