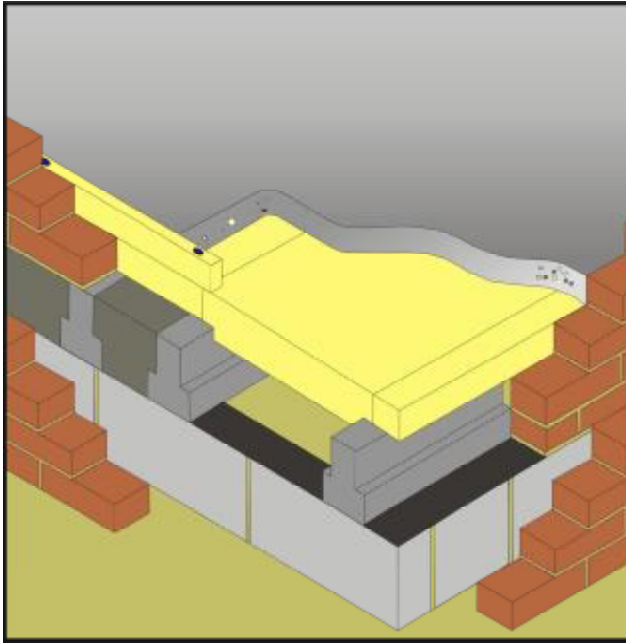


BRE CERTIFICATION

CERTIFICATE NO. 093/02
ISSUED SEPTEMBER 2002
REISSUED JANUARY 2007

PRODUCT

Tetris Flooring Insulation System



SUPPLIED BY

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SUMMARY

Tetris Flooring Insulation System has been assessed to confirm its suitability for use as thermal insulation in ground floor applications in dwellings, schools, nursing homes and hospitals. Tetris Flooring Insulation consists of extruded polystyrene (XPS) insulation panels with overall thickness from 80 mm in increments up to 120 mm.

The characteristics of the insulation panels and the method of application have been reviewed with respect to the Building Regulations current in the United Kingdom. The certificate has referred to British Standards and other publications current in January 2007.

The assessment is described in the following pages, which form integral parts of this certificate.

This revised version includes reference to additional concrete toppings.

LIMITATIONS OF USE

Tetris Flooring Insulation panels are intended for use as thermal insulation in suspended ground floors for dwellings, schools, nursing homes and hospitals. The panels are for use with 60 mm minimum upper width beams and must be supported at no greater than 600 mm centres with minimum bearing of 30 mm. They are finished with a structural topping complying with one of the specifications given in 1.1.4 and 1.1.5. The concrete should be obtained from a Quality Scheme for Ready Mixed Concrete (QSRMC) approved supplier.

RC25 steel reinforced concrete topping for 50 and 75 mm upper section Tetris panels:

The intensity of any uniformly distributed load imposed on the floor must not exceed 1.5 kN/m² and concentrated loads must be no greater than 1.4 kN over an area not less than 50x50 mm.

Concrete toppings other than RC25 concrete (see Table 1) for 75 mm upper section Tetris panels:

The intensity of any uniformly distributed load imposed on the floor must not exceed 4.0 kN/m² and

concentrated loads, must be no greater than 2.7 kN over an area not less than 50x50 mm.

For allowable partition loading see clause 1.2.1 of this Certificate.

The insulation must not come into contact with solvents and hot applied materials, such as asphalt.

The performance of the system depends on correct installation. Tetris Flooring Insulation System must be installed strictly in accordance with the Certificate Holder's instructions, as inspected by BRE Certification, and the requirements of this certificate. The Certificate Holder must continue to provide a technical consulting service for the product. The quality of installation achieved on site is not covered by this Certificate. Therefore it is recommended that the quality of installation and workmanship is subject to appropriate checks by a competent person for each installation.

STATEMENT

It is the opinion of BRE Certification that Tetris Flooring Insulation System is satisfactory for use within the stated limitations provided that it is used in accordance with the supplier's instructions and the requirements of this certificate.

CONFIRMATION

For and on behalf of BRE Certification



Director:

Date: January 2007



1. TECHNICAL SPECIFICATION

1.1 Description of Product

1.1.1 Tetris Flooring Insulation panels are intended to reduce the U value (thermal transmittance) of new precast concrete beam construction floors

1.1.2 Tetris Flooring Insulation comprises extruded polystyrene (XPS) insulation panels formed with HCFC free blowing agents in accordance with BS EN 13164:2001 *Thermal insulation products for buildings. Factory made products of extruded polystyrene (XPS). Specification*. The panels have a T shaped profile to provide a minimum 30 mm bearing on each edge of the supporting concrete floor beams. A 50 mm or 75 mm thick section remains above the beam at all times.

1.1.3 Vertical strips of insulation are used to eliminate cold bridging around the perimeter of the floor and are 2500 mm long by 30 mm thick by 65 or 75 mm deep. Fixing pins are supplied to secure the vertical insulation strip in position. See Figure 1.

Structural toppings

1.1.4 RC25, RC30 and RC35(CEM1 slump Class 3) 65 or 75 mm thick concrete complying with BS 8500-1:2002 *Concrete. Complementary British Standard to BS EN 206-1. Method of specifying and guidance for the specifier, -2:2002 Concrete. Complementary British Standard to BS EN 206-1. Specification for constituent materials and concrete*, BS EN 206-1:2001 *Concrete. Specification, performance, production placing and conformity*, BS 8204-1:2003 *Screeds, bases and in situ floorings. Code of practice for concrete bases and cement sand levelling screeds to receive floorings and/or BS 8204-2:2003 Screeds, bases and in situ floorings. Code of practice for concrete wearing surfaces*. The maximum aggregate size of the concrete is to be 10 mm.

1.1.5 Lafarge Agilia Horizontal self compacting concrete 75mm thick with admixtures to BS EN 934-2:2001 *Admixtures for concrete, mortar and grout. Concrete admixtures. Definitions, requirements, conformity, marking and labelling*.

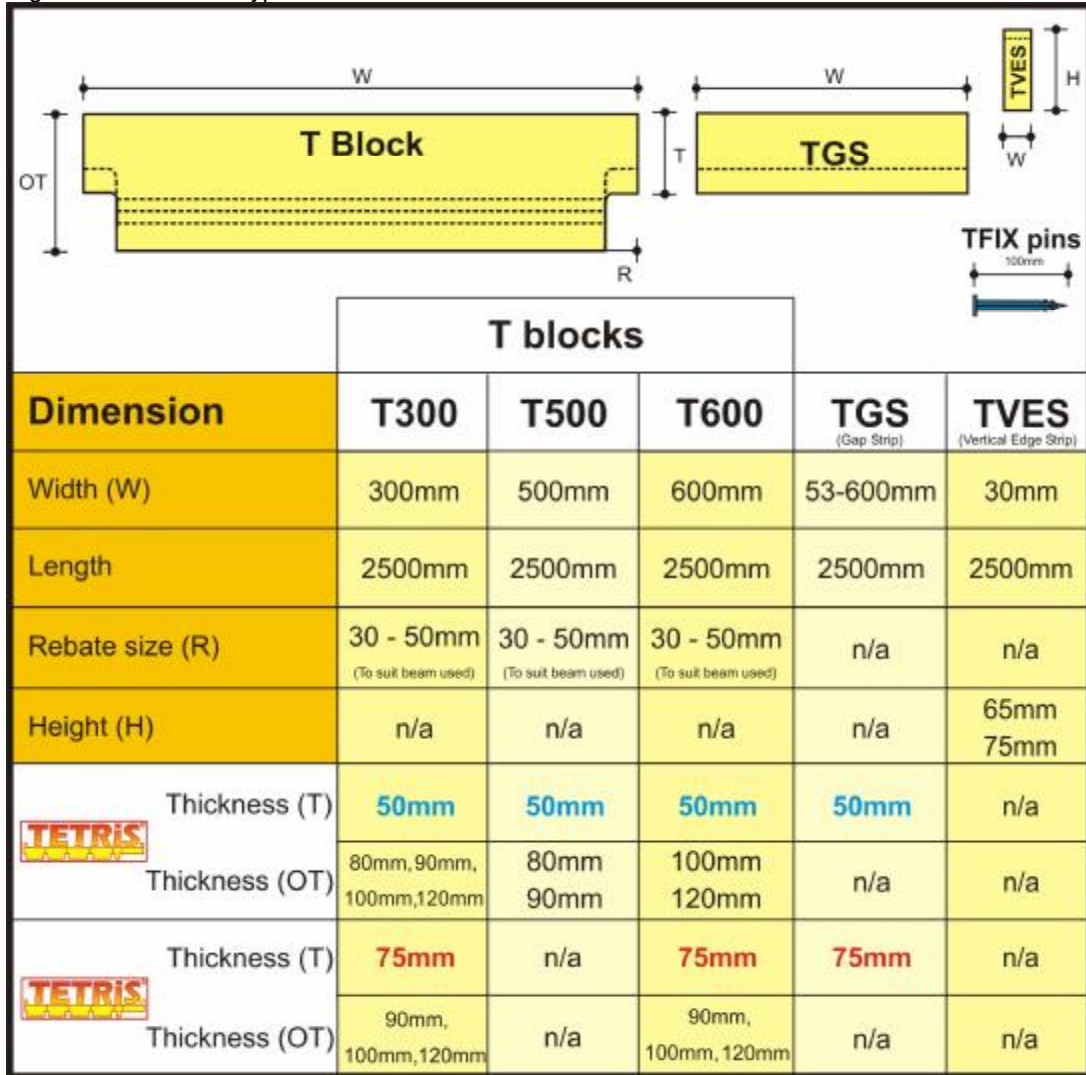
Topping reinforcement

1.1.6 The RC25 topping is reinforced with a minimum D49 steel reinforcement mesh to BS 4449:2005 *Steel for the reinforcement of concrete. Weldable reinforcing steel. Bar, coil and decoiled product. Specification*, BS 4483:2005 *Steel fabric for the reinforcement of concrete. Specification* or DD ENV 10080:1996 *Steel for the reinforcement of concrete. Weldable ribbed reinforcement steel B500. Technical delivery conditions for bars, coils and welded fabric*, at mid-height in the topping.

1.1.7 The RC30 topping is reinforced with polypropylene monofilament fibres at a dose rate of 0.9 kg/m³.

1.1.8 The RC35 and Agilia Horizontal toppings are not reinforced.

Figure 1 Tetris block types and dimensions



1.1.9 All concrete should be obtained from a Quality Scheme for Ready Mixed Concrete (QSRMC) approved supplier.

Ancillary components:

1.1.10 The pre-stressed concrete joists used with the system must be designed to BS 8110-1:1997 or have appropriate third party certification.

1.1.11 Where radon barriers are required, appropriate third party certificated products should be used and installed in accordance with that Certificate and the manufacturers installation instructions.

1.2 Product Performance

Strength

1.2.1 Tetris Flooring Insulation is considered suitable for use as insulation on precast concrete floor beams, provided that the floor beams are designed to accept the total dead and imposed loads. The loadings on the floor must not exceed the values for which tests have confirmed that the panels have adequate strength to resist. This is for imposed uniformly distributed loads of up to 1.5 or 4.0 kN/m² (dependent on the topping, see Table 1) and concentrated loads up to 1.4 or 2.7 kN (over an area not less than 50x50 mm). Tests have shown that these levels of load will not cause excessive deflection, permanent deformation or structural failure of the flooring insulation and finish. See Table 1. The specifier should confirm the suitability of the construction for a given application by reference to BS 6399-1:1996 *Loadings for buildings. Code of practice for dead and imposed loads*.

1.2.2 Lightweight non-load bearing timber stud partitions can be located anywhere on the floor. These may be assumed to impose a uniformly distributed load of one third of the load per metre run of the finished partitions. For floors of offices this uniform load should not be less than 1.0 kN/m². Note that the presence of such partitions will reduce the level of additional imposed load that can be applied, as the max. imposed UDL values given in Table 1 need to include any allowance for partitions.

1.2.3 Permanent non-load bearing blockwork partitions can only be situated along the lines of primary concrete beams or orthogonal to those lines and can impose a maximum load of 4.4 kN/m. This will allow a wall height of 2.4 m with a density of 1400 kg/m³. The concrete beams must be capable of supporting these partition loads without excessive deflection.

1.2.4 Table 1 Permissible loads

Tetris panel Table thickness 'T' (see Figure 1) mm	Concrete Topping (see section 1.1.4 and 1.1.5)	Topping Reinforcement (see section 1.1.6 and 1.1.7)	Topping thickness (see section 1.1.4 and 1.1.5) mm	Max. imposed UDL (see section 1.2.1) kN/m ²	Max. Conc. load (see section 1.2.1) kN	Max. Heavy weight partition (see section 1.2.3) kN/m
50	RC25	D49 steel mesh	65	1.5	1.4	4.4
75	RC25	D49 steel mesh	65	1.5	1.4	4.4
75	RC30	Polypropylene fibres	75	4.0	2.7	4.4
75	RC35	None	75	4.0	2.7	4.4
75	Agilia Self compacting	None	75	4.0	2.7	4.4

Fire

1.2.4 The insulation panels are combustible, however as they are covered by concrete they will not affect the fire resistance of the suspended ground floor.

1.2.5 Electrical cables running within the polystyrene should be enclosed in a suitable conduit. The panels must be adequately separated from: heat-producing appliances, incinerators, hearths, fire backs, ash pit surrounds, ductwork for high temperature gases, flues, chimneys and fire places or recesses.

Condensation

1.2.6 When installed in accordance with BS 5250:2002 *Code of practice for control of condensation in buildings*, Section 8.5 and Appendix D and BRE document BR 262:2002 *Thermal insulation: avoiding risks*, Tetris Flooring Insulation System will not promote surface or interstitial condensation. Condensation is considered to be unlikely to occur with the constructions specified in this certificate. However, condensation risk calculations should be undertaken to indicate that it will not occur for the intended application. The panels have a typical water vapour resistivity of greater than 100 MNs/gm and should not be considered as providing a water vapour control layer or damp-proof barrier.

1.2.7 The beam floors incorporating the panels must include suitable ventilation of the sub-floor void.

Thermal insulation

1.2.8 The thermal conductivity of Tetris Flooring Insulation determined by test to BS EN 12667:2001 *Thermal performance of building materials and products. Determination of thermal resistance by means of guarded hot plate and heat flow meter methods. Products of high and medium thermal resistance* is 0.029 W/mK. Floors incorporating the panels can be constructed to give a U-value of better than 0.25 W/m²K, depending on the thickness of the product, on the dimensions of the floor and on the particular application. U-values should be calculated in accordance with Approved Document L1, BS EN ISO 13370:1998 *Thermal performance of buildings. Heat transfer via the ground. Calculation methods*, CIBSE Guide: Part A3:1999 *Thermal properties of building structures*, BS EN ISO 6946:1997 *Building components and building elements. Thermal resistance and thermal transmittance. Calculation method* and BRE Information Paper IP 3/90 *The U-value of ground floors: application to Building Regulations*.

1.2.9 Cold/thermal bridging should be minimised at external floor/wall junctions by the use of Tetris vertical edge strips of insulation supplied, interposed at the periphery between the subsequent floating screed and the wall element

Durability

1.2.10 Tetris Flooring Insulation System should remain effective for an assumed design life of 60 years, provided it is installed in accordance with the Certificate Holder's instructions and the requirements of this certificate.

2. BUILDING REGULATIONS

The relevant Building Regulations Requirements and Standards for the system are:-

2.1 Mechanical resistance and stability - loading

Country	Requirement	Reference	Opinion
E & W	A1(1)(2) Loading	App. Doc. A, Section 2A	The floor system can meet appropriate loading requirements by transmitting the combined dead and imposed loads safely without excessive deflection or deformation. See section 1.2.3.
S	1.1 Structure	Tech. Handbook 1.1(a)(b)	
NI	D1 Stability	Tech. Booklet D	

2.2 Resistance to moisture - condensation

Country	Requirement	Reference	Opinion
E & W	C2(c) Interstitial and surface condensation	App. Doc. C, Section 4.19, 4.21, 4.22	The floor system can be designed such that condensation should not occur. See section 1.2.6 and 1.2.7.
S	3.15 Condensation (Domestic only)	Tech. Handbook	
NI	C5 Condensation	Tech. Booklet C Section 1.5 (c)	

2.3 Conservation of fuel and power in building fabric - new dwellings

Country	Requirement	Reference	Opinion
E & W	L1A Conservation of fuel and power in new dwellings L2A Conservation of fuel and power in new buildings other than dwellings	App. Doc. L1A, Table 2 L2A, Table	The concrete floor formed using the panels can meet this requirement. See section 1.2.8 to 1.2.9.
S	6.2 Building insulation envelope	Tech. Handbook 6.2.1, 6.2.4 6.2.5	The concrete floor using the panels can satisfy this Standard. See section 1.2.8 to 1.2.9.
NI	F2 Building envelope	Tech. Booklet F Section 1 Appendix A, C	The concrete floor incorporating the insulation can meet this Regulation. See section 1.2.8 to 1.2.9.

2.4 Fitness and durability of materials and workmanship

Country	Requirement	Reference	Opinion
E & W	Regulation 7	App. Doc.	The floor system is manufactured from suitable materials and can be installed to give a satisfactory performance. See section 1.2.10.
S	8(1)	Tech. Handbook	
NI	B2 Fitness of materials and workmanship	Tech. Booklet B	

2.5 CDM Regulations

Construction (Design and Management) Regulations 1994 (as amended)

Construction (Design and Management) Regulations (Northern Ireland) 1995 (as amended)

The Certificate should form part of the information used by the client, planning supervisor, designer and contractors to discharge their responsibilities under these Regulations.

3. INSTALLATION/PRACTICAL APPLICATION

3.1 Identification

Tetris Flooring Insulation panels are delivered to site in packs wrapped in polythene. The number of panels in each pack depends on the thickness of individual panels. Each pack is supplied with a label marked Tetris Flooring Insulation, with batch code and product dimensions.

3.2 Storage and Handling

3.2.1 The Tetris Flooring Insulation panels must be stored on a firm, level and dry base, and be fully supported so that the panels do not distort by twisting or bowing.

3.2.2 For additional weather protection, black polyethylene sheeting or similar opaque material should be used.

3.2.3 The panels are easily handled on site and they may be readily cut or trimmed with a fine toothed saw or sharp knife. Reasonable precautions should be taken to prevent damage before, during or subsequent to installation. In particular, they should not be exposed to an open flame, or other ignition sources, in accordance with the recommendations of BS 6203:2003 *Guide to fire characteristics and fire performance of expanded polystyrene materials (EPS and XPS) used in building applications*. They must be handled with care and be secured if outside in windy

conditions. They must not be punctured, split, deformed or unduly compressed before use. They must not be exposed to any plastics material incorporating plasticizers, solvents or hot asphalt.

3.3 Installation

3.3.1 Tetris Flooring Insulation panels must be installed in accordance with the Certificate holder's installation instructions and the requirements of this Certificate. These instructions are informative and based on current guidance. Installation will be specific to each site and is outside the scope of the Certificate.

3.3.2 The finished surface of the pre-cast concrete beams must be smooth, flat and level. Further treatment of the beams may be required, such as the physical removal of surface irregularities, or the levelling of the surface with a thin screed.

3.3.3 The panels are placed on the beams with the joints closely butted and staggered between adjacent beams by at least 300 mm. Overlay any concrete floor blocks used with 50 mm or 75 mm gap strips and trim to fit snugly. Where a beam is close to a wall, cover the top of the beam with a section of gap strip. The work should be so programmed that the panels are left exposed for the minimum time before laying the concrete. They must not be directly trafficked. Spreader boards, or similar, should be used during subsequent operations.

3.3.4 Vertical upstand strips of insulation are pinned around the floor perimeter. However, this must not bridge any damp-proof course. If required cover the panels with a 1200 gauge dpm or gas membrane.

3.3.5 If using RC25 concrete, cover the whole floor with a steel mesh on suitable spacers. Carefully pour and rake the concrete. Care must be taken when pouring the concrete to ensure the panels are not over-loaded. The screed must be well compacted, of minimum 65 mm thickness and comply with BS 8204. Just before the screed has set, the concrete may be power floated to a smooth finish if required.

3.3.6 The panels must not be exposed to continuous working temperatures in-situ of in excess of 80°C, such as in direct contact with hot pipes or electric heating cables.

4. TECHNICAL APPRAISAL

4.1 Performance Tests

Tests were carried out to determine:

- compressive properties under uniformly distributed and point load
- impact resistance
- creep
- fatigue

4.2 Investigations

An assessment was made of:

- crush resistance of the XPS panels
- resistance to line loads from blockwork partition walls parallel and perpendicular to the concrete joists.

Typical properties for the Tetris Flooring Insulation are given in Table 2.

Table 2 Typical Properties of Tetris Flooring Insulation

Property	Test method	Result
Thermal conductivity	BS EN 12667	0.029 W/mK
Dimensional tolerances	Direct measurement	Maximum deviation of +2,-2 mm width
Weight of 600mm wide, 120mm thick panel	Direct measurement	< 7kg
Dimensional stability	BS EN 1604	+ 2 - 2 %
Compressive strength at 10% strain	BS EN 826	Minimum 320 kPa
Water absorption (by immersion after 28 days)	BS EN 12087	<0.7%

4.3 A site installation was witnessed to assess practicability of installation.

4.4 Quality Control

The manufacturer carries out quality control tests and inspections at regular intervals to ensure that the quality of Tetris Flooring Insulation is maintained within the product specification. The quality control checks include an inspection and measurement of physical properties of the panels. Quality records are maintained on file by the manufacturer.

In the opinion of BRE Certification the specification of the materials used and the quality control procedures of the manufacturer are suitable for the product.

4.5 British Standards and other Documentation

The following British Standard, Codes of Practice and other standards have been referred to for this assessment:-

BS 4449:2005	Steel for the reinforcement of concrete. Weldable reinforcing steel. Bar, coil and decoiled product. Specification
BS 4483:2005	Steel fabric for the reinforcement of concrete. Specification
BS 5250:2002	Code of practice for control of condensation in buildings.
BS 6399-1:1996	Loadings for buildings. Code of practice for dead and imposed loads
BS 8000-9:2003	Workmanship on building sites. Code of practice for Cementitious levelling screeds and wearing screeds
BS 8110-1:1997	Structural use of concrete. Code of practice for design and construction
BS 8204-1:2003	Screeds, bases and in situ floorings. Code of practice for concrete bases and cement sand levelling screeds to receive floorings
BS 8204-2:2003	Screeds, bases and in situ floorings. Code of practice for concrete wearing surfaces
BS 8215:1991	Code of practice for design and installation of damp-proof courses in masonry construction

BS 8500-1:2002	Concrete. Complementary British Standard to BS EN 206-1. Method of specifying and guidance for the specifier
BS 8500-2:2002	Concrete. Complementary British Standard to BS EN 206-1. Specification for constituent materials and concrete
BS EN 206-1:2001	Concrete. Specification, performance, production placing and conformity
BS EN 826:1996	Thermal insulating products for building applications. Determination of compression properties
BS EN 934-2:2001	Admixtures for concrete, mortar and grout. Concrete admixtures. Definitions, requirements, conformity, marking and labelling
BS EN 1604:1997	Thermal insulating products for building applications. Determination of compression behaviour
BS EN 12087:1997	Thermal insulating products for building applications. Determination of long term water absorption by immersion
BS EN 12667:2001	Thermal performance of building materials and products. Determination of thermal resistance by means of guarded hot plate and heat flow meter methods. Products of high and medium thermal resistance
BS EN 13164:2001	Thermal insulation products for buildings. Factory made products of extruded polystyrene (XPS). Specification
BS EN ISO 6946:1997	Building components and building elements. Thermal resistance and thermal transmittance. Calculation method
BS EN ISO 13370:1998	Thermal performance of buildings. Heat transfer via the ground. Calculation methods
DD ENV 10080 :1996	Steel for the reinforcement of concrete. Weldable ribbed reinforcement steel B500. Technical delivery conditions for bars, coils and welded fabric
BR 262:2002	BRE Report Thermal Insulation : Avoiding risks
CIBSE Guide: Part A3:1999	Thermal properties of building structures
BRE Information Paper IP 3/90	The U-value of ground floors: application to Building Regulations

5. CONDITIONS OF CERTIFICATE ISSUE

5.1 Validity

This certificate will be valid for a period of three years. It will remain valid in so far as:

- a) The materials and methods of manufacture are unchanged or BRE Certification has assessed any changes and found them to be satisfactory.
- b) The designs and specifications are unaltered from those examined by BRE Certification.
- c) Collecta Ltd continues to have the product checked by BRE Certification.

5.2 Health and Safety

This certificate and the recommendations herein do not purport in any way to restate the requirements of the Health and Safety at Work Act 1974 or any statutory or common law duty of care which exists now or in the future; nor is compliance with these recommendations to be assumed as satisfying the requirements of the said Act or any existing or future statutory or common law duty of care.

5.3 Reference to Other Documentation

Where reference is made in this certificate to any Act of Parliament, Regulation, Code of Practice, British or other Standard or other publications, it shall be construed as reference to such publication in the form in which it is in force at the date of the certificate.

5.4 Patents

BRE Certification makes no representational warranty that any patent or similar industrial property right is valid or that the manufacture, use, sale, lease or any other dealing or disposition of the products in whole or in part is not an infringement of any patent or industrial property right not owned by Collecta Ltd.

Confirmation that a certificate is current may be obtained from the BRE Certification website (www.redbooklive.com)

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