

CI/SfB		28.3	H2	J3
--------	--	------	----	----

BRE CERTIFICATION LIMITED  
 CERTIFICATE OF ASSESSMENT

CERTIFICATE NUMBER: 136/07  
 DATE OF FIRST ISSUE: November 2007  
 REISSUE 2 : February 2010  
 REVISED October 2010

PRODUCT  
 Shearail - Punching Shear Reinforcement

SUPPLIED BY  
 MAX FRANK LIMITED  
 WHITTLE ROAD  
 MEIR  
 STOKE-ON-TRENT  
 STAFFORDSHIRE  
 ST3 7HF

Tel: 01782 598041  
 Fax: 01782 315056  
 email [info@maxfrank.co.uk](mailto:info@maxfrank.co.uk)  
 website: [www.maxfrank.co.uk](http://www.maxfrank.co.uk)

SUMMARY

Shearail punching shear reinforcement has been assessed to confirm its suitability, within limitations, for use as a punching shear reinforcement in reinforced concrete floor and roof slabs in buildings. The product comprises a set of forged steel studs (smooth or ribbed) connected at one end to a steel rail which is used to position them in the construction prior to placement of structural concrete. The product is available in a range of stud sizes. Studs are welded to the rails at predetermined spacing. Shearails are produced to meet specific project requirements. The minimum number of studs on a rail is two.

Characteristics of the product and method of application have been reviewed with respect to the current Building Regulations, British and European Standards and other publications in the United Kingdom in February 2010.

The performance characteristics covered by this certificate are:

Structural performance Durability Fire resistance	Site installation Factory production
---	---

The assessment is described in the following pages, which form integral parts of this certificate which should be read in its entirety.

CONDITIONS OF USE

- 0.1 Shearail punching shear reinforcement is certified for use in correctly detailed and designed concrete floor and roof slabs. Design of the slab must be undertaken by a competent structural engineer.
- 0.2 Design will include the selection of suitable sizes and numbers of shear rails and positioning them within the structure to resist punching shear stresses at junctions to columns or other supports.
- 0.3 Shearails may be used in reinforced concrete slabs in conjunction with conventional steel rod reinforcement. Concrete shall be supplied by a QSRMC or BSI Kitemarked supplier and steel reinforcement shall be supplied by a CARES Accredited supplier.
- 0.4 The required depth of cover to the Shearails by the structural concrete will be the same as for conventional steel reinforcement.

- 0.5 Shearail punching shear reinforcement must be installed in accordance with either: the Shearail Detailers Manual (for designs to BS 8110), or the Shearail design manual to Eurocode 2, and the requirements of this certificate.
- 0.6 The Shearails must be correctly positioned in accordance with the specific design for each project and must be supported and restrained in position while concrete is placed.
- 0.7 The performance of the system depends on correct installation. Shearails shall be installed strictly in accordance with the Certificate holder's installation instructions and the requirements of this certificate. The quality of installation achieved on site is not covered by this certificate. It is therefore recommended that the quality of installation and workmanship is subject to appropriate checks by a competent person for each installation.

#### STATEMENT

Shearail punching shear reinforcement is satisfactory for use within the stated conditions provided that it is used in accordance with the certificate holder's instructions and the requirements of this certificate.

#### CONFIRMATION

For and on behalf of BRE Certification



Date: 22 October 2010

## 1. TECHNICAL SPECIFICATION

### 1.1 Description of Product

- 1.1.1 Shearail punching shear reinforcement consists of a set of forged steel studs (smooth or ribbed) connected at one end to a steel rail which is used to position them in the construction prior to placement of structural concrete. The product is available in a range of stud sizes. Studs are welded to the rails at predetermined spacing. The minimum number of studs on a rail is two. The steel rail acts only as a carrier to assist in the correct positioning of the shear studs. See Fig 1 below.
- 1.1.2 Shearails are manufactured to the required design for individual applications. Table 1 indicates the available diameters of studs and the sizes of rails to which they are attached. Studs can be produced to any required length in 10mm increments and the rails can include any required number of studs at any required spacing along the rail.

**Fig 1 Typical Shearails**



**Table 1 Stud and rail sizes**

Stud Diameters available	10mm	12mm	14mm	16mm	20mm
Head Diameters (3 x stud dia)	30mm	36mm	42mm	48mm	60mm
Rail width	2x16mm m	2x16mm	2x16mm m	2x16mm m	3x16mm
Rail thickness 3mm or 5mm Stud lengths available in increments of 10mm Overhangs of twin rails are the same at either end to eliminate site fixing errors					

## 2 Product performance

### 2.1 General

2.1.1 Shearail punching shear reinforcement can provide a method of enhancing the punching shear resistance of concrete floor and roof slabs in new buildings and in new structural concrete slabs within existing buildings.

### 2.2 Mechanical resistance/strength

2.2.1 Shearail punching shear reinforcement is manufactured from 500 N/mm<sup>2</sup> minimum yield stress steel weldable bar. Studs are for use in reinforced concrete floors and roofs designed in accordance with either a) BS 8110: Part1 *Structural use of concrete. Code of practice for design and construction* with particular reference to clause 3.7.7.5 Provision for shear reinforcement. or; b) *NA to BS EN 1992-1-1:2004 UK National Annex to Eurocode 2: Design of concrete structures — Part 1-1: General rules and rules for buildings* Where the application is outside of the scope of BS 8110 or Eurocode 2 designers shall ensure that the structural design is suitable for the particular circumstances. The steel carrier rail provides no structural function after concrete is placed.

2.2.2 When designed and installed in accordance with the Shearail Detailer's Manual, or Shearail design manual to Eurocode 2, the shear rails will resist punching shear and contribute to the strength of the reinforced concrete structure.

## 2.3 Fire

2.3.1 The design fire resistance period for reinforced concrete structures, incorporating Shearail punching shear reinforcement, designed and constructed in accordance with BS 8110: Part 1 is determined from Table 3.4 of that document.

2.3.2 The design fire resistance period for reinforced concrete structures, incorporating Shearail punching shear reinforcement, designed and constructed in accordance with BS EN 1992-1-2: 2004 is determined from, Eurocode 2: Design of concrete structures Part 1-2: General rules — Structural fire Design

## 2.4 Thermal Insulation

2.4.1 No claim is made with regard to thermal performance of the material.

2.4.2 Shearail punching shear reinforcement has a high thermal transmittance and is not therefore suitable to use in locations that bridge the thermal envelope of the building.

## 2.5 Weather resistance

2.5.1 Shearail punching shear reinforcement must be provided with protective cover by the surrounding structural concrete as required by either a) BS 8110 and BS 8500: Part 1 *Concrete. Complementary British Standard to BS EN 206-1. Method of specifying and guidance for the specifier*, or b) NA to BS EN 1992-1-1:2004

## 2.6 Maintenance

2.6.1 Shearail punching shear reinforcement requires no maintenance in normal use provided that the surrounding concrete structure is maintained.

## 2.7 Durability

2.7.1 Shearail punching shear reinforcement should remain effective for the life of the construction for which it is specified provided that it is installed in accordance with the manufacturer's instructions and the requirements of this certificate.

2.7.2 Shearail punching shear reinforcement may be used in any building location including below ground and in externally exposed structures provided that concrete cover and mix design are selected in accordance with the relevant requirements of BS 8110, or Eurocode 2, to suit the exposure conditions.

## 3. BUILDING REGULATIONS

3.1 Shearail punching shear reinforcement, when used in accordance with this certificate and the certificate holder's installation instructions, can assist in demonstrating that the works within which they are installed will meet the stated Requirements of the following building regulations and standards:

### Building Regulations (England and Wales) 2000 (as amended)

Part	
A	Structure
B	Fire Safety Regulation 7 Materials and workmanship

### The Building (Scotland) Regulations 2004

Sec.	
1	Structure
2	Fire
3	Environment
	Regulation 8(1) Fitness and durability of materials and workmanship

The Building Regulations (Northern Ireland) 2000.

Part	
B	Materials and Workmanship
D	Structure
E	Fire Safety

3.2 Justification for compliance with defined building regulations.

3.2.1. **Structure:** Resistance to punching shear at supports

Country	Req.	Opinion
E & W	A1	Concrete floor and roof slabs with Shearail punching shear reinforcement installed in accordance with the requirements of this certificate and BS 8110:Part 1, or NA to BS EN 1992-1-1:2004 can be designed and constructed to be sufficiently resistant to shear adjacent to supports to sustain and transmit to the ground the combined dead and imposed load. A suitably qualified and experienced structural engineer must determine the appropriate design for each application.
S	1.1	
NI	D1 and D2	

3.2.2 **Fire:** Fire resistance

Country	Req.	Opinion
E & W	B3(1)	Concrete floor slabs with Shearail punching shear reinforcement installed in accordance with the requirements of this certificate and BS 8110:Part 1, or Eurocode 2 Part 1-2, can be designed and constructed to have fire resistance as required by building regulations. The period of fire resistance will depend upon the thickness of the floor slab and the depth of cover provided to the Shearails by the concrete.
S	2.3	
NI	E4(1)	

3.2.3 **Materials and workmanship**

Country	Req.	Opinion
E & W	Regulation 7	Shearail punching shear reinforcement is manufactured from suitably safe and durable materials resistant to deterioration under normal service conditions for its application.
S	Regulation 8	
NI	B2, B3	

3.3 CDM Regulations

Construction (Design and Management) Regulations 2007

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

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

4. INSTALLATION / PRACTICAL APPLICATION

4.1 General

4.1.1 The performance of Shearail punching shear reinforcement depends on correct installation. It shall be installed strictly in accordance with the Shearail Detailer's Manual, or Shearail Design Manual to Eurocode 2, taking account of the delivery, storage and handling requirements and the design laid down by the structural engineer. The quality of installation actually achieved on specific sites 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.

## 4.2 Delivery Storage and Handling

- 4.2.1 Shearail punching shear reinforcement is delivered to site with each rail identified by a label that indicates the size and spacing of studs, length of rail, and the location in which the component is to be used in the structure.
- 4.2.2 Individual shear rails are easily handled on site. Larger packs of Shearails will require the use of mechanical lifting for offloading and movement on site.

## 4.3 Installation (Informative)

- 4.3.1 Shearails must be installed in the designed locations as indicated on engineers design drawings for each application.
- 4.3.2 Installation may be either: top down when the studs hang below the rails which are fixed to the top layer of slab reinforcement or; bottom up with the studs standing up above the rail with the rail fixed to the formwork deck. Fixing to the deck is always above spacers that ensure the required concrete cover to the steel is achieved.
- 4.3.3 It is essential that the studs are correctly located in accordance with the design and that they are vertical. Shearails need to be securely fixed to ensure that they are not displaced when the concrete is placed around them.
- 4.3.4 Site operations shall be undertaken in accordance with BS 8000:Part 2: *Workmanship on building sites: code of practice for concrete work*. It is important that installers follow the Certificate holder's installation instructions paying particular attention to the following:
  - Correct location within the structure.
  - Depth of cover to both ends of studs.
  - Avoidance of displacement when concrete is placed.
  - Full compaction of surrounding concrete

## 5. TECHNICAL INVESTIGATIONS

- 5.1 An assessment was made of the product's mechanical resistance, behaviour in relation to fire, practicability of installation and durability.
- 5.2 An assessment was made of published guidance on the use of shear studs for resisting punching shear in reinforced concrete slabs.
- 5.3 Quality Control
  - 5.3.1 Traceable quality records are maintained by the manufacturer. The manufacturer carries out checks at regular intervals to ensure that the quality of Shearail punching shear reinforcement is maintained within the defined product specification. BRE Certification undertakes regular monitoring of the factory production audits on the manufacture of the product against an agreed Quality Plan for the product.
- 5.4 Standards
  - 5.4.1 The following Standards and other publications have been referred to for this assessment;

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:Part 1:1996	Loadings for buildings: code of practice for dead and imposed loads.
BS 8000:Part 2: 1990	Workmanship on building sites: code of practice for concrete work.
BS 8000:Part 4:1989	Workmanship on building sites: code of practice for waterproofing.

BS 8102:2009	Code of practice for protection of below ground structures against water from the ground.
BS EN 1992-1-2: 2004	Eurocode 2: Design of concrete structures. General rules — Structural fire Design
NA to BS EN 1992-1-1: 2004	UK National Annex to Eurocode 2: Design of concrete structures. General rules and rules for buildings
BS 8110: Part 1:1997	Structural use of concrete. Code of practice for design and construction
BS 8500: Part 1:2006	Concrete. Complementary British Standard to BS EN 206-1. Method of specifying and guidance for the specifier
BS EN 10080:2005	Steel for the reinforcement of concrete. Weldable reinforcing steel. General
CP 102:1973	Code of practice for protection of buildings against water from the ground.

## 6. CONDITIONS OF CERTIFICATE USE

### 6.1 Validity

This certificate will be valid for three years from the date of reissue. It will remain valid in so far as:

- (a) The materials and method 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) Certificate holder continues to have the product checked by BRE Certification.

### 6.2 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.

### 6.3 References 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 issue of the certificate.

### 6.4 Patents

BRE Certification make 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 product in whole or in part is not an infringement of any patent or industrial property right not owned by the certificate holder.

### 6.5 Confirmation of validity

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