

1. TECHNICAL SPECIFICATION

1.1 Description of Product

1.1.1 MiTek M20 Punched Metal Plate Timber Fasteners are made from 1.0 mm thick steel sheet complying with BS EN 10326 Grade S 250 GD, hot-dipped galvanized to designation Z275. An array of integral nails is formed from the steel sheet, to protrude normally from the plate, by a punching and bending operation, during which a permanent 'twist' is imparted to the nails so formed. A typical MiTek M20 Punched Metal Plate Timber Fasteners is illustrated in Figure 1. The maximum length of each integral nail is 8.0 mm.

1.1.2 MiTek M20 Punched Metal Plate Timber Fasteners are produced in the range of sizes shown in Table 1 and are embossed on their outer surface by an identification marking M20. They are packed in cardboard boxes each carrying a label bearing the product name, plate size designation and quantity.

1.1.3 In the manufacture of timber structural components the MiTek M20 Punched Metal Plate Timber Fasteners must be embedded in both faces of each abutting member using special equipment supplied or approved by the manufacturer.

1.2 Product Performance

1.2.1 The maximum lateral loading sustainable by the MiTek M20 Punched Metal Plate Timber Fasteners nails is dependent on the following:-

- the number of effective nails for each joint
- the species of timber and its moisture content
- the density of timber and its strength class
- the angle between the load axis and the grain of timber
- the angle between the load axis and the connector plate
- the duration of loading.

1.2.2 In determining the number of effective nails for any joint, nails must be disregarded as not contributing to the overall lateral strength of the joint when closer than 5 mm to an edge, or 10mm to an end, when measured respectively either normal or parallel to the axis of the timber member.

1.2.3 The values of permissible loads per effective nail listed in Table 2 are for long term loading conditions for the use of the MiTek M20 Punched Metal Plate Timber Fasteners with European Whitewood (characteristic density of 370kg/m^3 at $20\text{ }^\circ\text{C}$ and 65% relative humidity), and have been corrected for a moisture content of the timber of 16%. For medium term loading these values may be multiplied by a factor of 1.12. For short term and very short term loading the values may be multiplied by a factor of 1.25. The periods of loading are described in BS 5268:Part 2 and are reproduced in Table 3.

1.2.4 The strength of a joint subject to tensile forces is primarily dependent on the lateral resistance of the nails, but it must also be ensured that the tensile, compressive, and shear strengths of the parent steel in the plate are not exceeded.

1.2.5 The permissible service loads on the MiTek M20 Punched Metal Plate Timber Fasteners for all four loading durations referred to in clause 1.2.3 above, must remain within both the elastic strain region of the steel net section, and within the maximum permissible design loadings. The tensile and compressive service loadings in the MiTek M20 Punched Metal Plate Timber Fasteners must not exceed those listed in Table 4.

- 1.2.6 The maximum permissible shear loads for angles (α) between the connector plate axis and the axis of loading in the range between 0° and 180° , are given in Table 5.
- 1.2.7 The galvanized coating specified for the connector plates (275 g/m^2) has adequate corrosion resistance for use in Service Classes 1 or 2 as defined by prEN 1995-1-1:2003 so long the moisture of the timber content is not greater than 18% for any period of time. These situations may be expected to exist, for example, within enclosed roof spaces of habitable buildings provided adequate design to BS 5250 is carried out to ensure condensation is prevented. The MiTek M20 Punched Metal Plate Timber Fasteners are not to be used or installed in damp internal conditions.
- 1.2.8 The performance in fire is not considered to be a functional requirement of the connector plates themselves, but rather of the structural component considered as part of the complete structure, and is thus outside the scope of this assessment. Where there is a requirement for fire resistance, appropriate test reports or assessments, carried out on the structure in question by a suitably accredited body, must be obtained in accordance with the regulatory requirements. In normal usage there are no such regulatory requirements, other than where a means of escape is to be routed across a roof so formed.
- 1.2.9 If the MiTek M20 Punched Metal Plate Timber Fasteners are to be used for joining timber treated with preservatives based on copper/chromium/arsenic salt formulations (CCA) the treated wood must be allowed sufficient time (at least 14 days) for the fixation reactions to be completed before insertion of the connector plates into the dried wood. Re-wetting of the CCA treated timber must be avoided.

Manufacturers of timber structural components are advised to consult the preservative treatment manufacturer on curing times required prior to installation of the plates.

The risk of corrosion of MiTek M20 Punched Metal Plate Timber Fasteners when used with timber coated with other commonly used preservative treatments has not been assessed by BRE Certification. In all cases, the risk must be quantified and managed by a competent person, in consultation with the preservative manufacturer prior to use. The choice of preservation treatment is not covered by this certificate, reference should be made to BS 8417:2003 *Preservation of Timber – Recommendations*.

- 1.2.10 Inorganic salt based flame retardant timber treatments should not be used in conjunction with MiTek M20 Punched Metal Plate Timber Fasteners, as the potential corrosion risk is high.

2. BUILDING REGULATIONS

The relevant Building Regulation requirements for the product are:-

2.1 The Building Regulations (England and Wales) 2000 (as amended)

Requirement

- A1 Loading - MiTek M20 Punched Metal Plate Timber Fasteners will sustain and transmit dead and imposed loads to the timbers which they join to form structural components provided that they are selected using the permissible loads presented in this certificate, and that the method of insertion and a suitable design of structural component approved by MiTek Industries Limited are used.

Regulation

- 7 **Materials and workmanship - MiTek M20 Punched Metal Plate Timber Fasteners** are manufactured from suitable materials that are durable for their intended application and which perform satisfactorily when correctly installed.

2.2 The Building Standards (Scotland) Regulation 1990 (as amended)

Regulation

- B2 **Selection and use of materials, fittings, components and components, and workmanship - MiTek M20 Punched Metal Plate Timber Fasteners** are manufactured from safe and acceptable materials and are considered to be adequately resistant to deterioration and wear under normal service conditions provided that they are installed in accordance with the requirements of this certificate.
- C2 **Structure - structural components designed and constructed using MiTek M20 Punched Metal Plate Timber Fasteners in accordance with the requirements of this certificate, will comply with these Standards.**

2.3 The Building Regulations (Northern Ireland) 2000 (as amended)

Regulation

- B2 **Fitness of materials and workmanship - MiTek M20 Punched Metal Plate Timber Fasteners** are manufactured from safe and acceptable materials and are considered to be adequately resistant to deterioration and wear under normal service conditions, provided that they are installed in accordance with the requirements of this certificate.
- C2 **Stability - structural components designed and constructed using MiTek M20 Punched Metal Plate Timber Fasteners in accordance with the requirements of this certificate, will comply with these Regulations.**

3. INSTALLATION/PRACTICAL APPLICATION

3.1 Storage and Handling

- 3.1.1 **MiTek M20 Punched Metal Plate Timber Fasteners** are supplied exclusively to structural timber component manufacturers. They are supplied in boxes with labels giving full traceability to production. Suitable precautions must be taken to keep the connector plates dry and to prevent the formation of white rust if they are stored for any length of time.
- 3.1.2 **If stored MiTek M20 Punched Metal Plate Timber Fasteners** should be kept dry and free of condensation in their labelled boxes to aid the correct selection for each joint location.

3.2 Installation

- 3.2.1 **MiTek M20 Punched Metal Plate Timber Fasteners** must be factory inserted using a hydraulic press approved by MiTek Industries Limited so that the nails are fully pressed into position with no more than one quarter of the depth of the bed-plate pressed into the timber. There must be no significant air gaps present under the bed-plate.

- 3.2.2 The thickness of each timber member must be at least 35 mm and difference in thickness between adjoining timbers should vary by no more than 1 mm; these dimension measurements relating to a moisture content of 20%.
- 3.2.3 Only dry strength graded timber, complying with BS 5268 Part 2, and marked 'DRY' or 'KD' must be used. The moisture content of the timber during fabrication must not exceed 22%.
- 3.2.4 The precautions stipulated in Section 1.2.9 must be observed when treated timber is to be used.
- 3.2.5 Fabricated structural components must be handled and transported with care so as to avoid imposing forces of a magnitude that may cause loosening of the joints.
- 3.2.6 A technical consultancy service is provided by MiTek Industries Limited to manufacturers using their products and must continue to be provided for the duration of this certificate.

The size of connector plate for each joint application must be determined by the design department of MiTek Industries Limited or by a suitably qualified and competent Structural Engineer to ensure that the maximum permissible loadings are not exceeded.

4. TECHNICAL APPRAISAL

- 4.1 Mechanical tests have been carried out to BS EN 1075 on full size joints made in accordance with the manufacturer's assembly procedures and joint designs. The test pieces were made using planed European Whitewood (species; *Picea abies* - Norway spruce) having a moisture content of 13-17% and a characteristic density of 370kg/m³ at 20 °C and 65% relative humidity.

The results of these tests have been reviewed by BRE Certification with regard to the requirements of prEN 14545 (September 2002 edition) *Timber structures – connectors – requirements*. The following properties and performance characteristics were determined by inspection of the above test data supplied for MiTek M20 Punched Metal Plate Timber Fastener:-

- Lateral strength of test joints with the timber at 16% moisture content
- Tensile and compressive strength of connector plates
- Shear strength of connector plates
- Nail root ductility
- Galvanized coating thickness.

For the derivation of permissible design loads for use with BS 5268 Part 2 due account was taken of the variations between the tensile properties of the steel used for the tested MiTek M20 Punched Metal Plate Timber Fasteners and the minimum tensile properties of the steel specified for their manufacture in the United Kingdom.

Assessment has been made of the product design, with reference to the application and practicality of installation of the product.

The application of MiTek M20 Punched Metal Plate Timber Fasteners has been witnessed at the premises of a trussed rafter manufacturer and was found to present no practical difficulties.

4.2 Quality Control

In the opinion of BRE Certification MiTek M20 Punched Metal Plate Timber Fasteners are manufactured from materials suitable for the application. Manufacture is carried out to a documented quality system independently certified to BS EN ISO 9001:2000 *Quality systems – specification for production and installation*, and regular tests and inspections are carried

out during manufacture. The quality control procedures include measurement of steel thickness and the dimensions and nail root ductility of the fastener.

4.3 British Standards

The following British and other Standards have been referred to for this assessment:

- BS 5268:Part 2:2002 Structural use of timber: code of practice for permissible stress design, materials and workmanship.
- BS 5268:Part 3:1998 Code of practice for trussed rafter roofs.
- BS 5250:2002 Control of condensation in buildings.
- BS 8417:2003 Preservation of timber – recommendations.
- BS EN ISO 9001:2000 Quality systems - specification for production and installation.
- BS EN 10326:2004 Continuously hot-dip coated strip and sheet of structural steels - Technical delivery conditions.
- BS EN 1075:2000 Timber structures - test methods, joints made of punched Metal Plate Timber Fasteners.
- BS EN 28970:1991 Timber structures-Connectors-Requirements
- BS EN 26891:1991 Timber structures-Joints made with mechanical fasteners-General principles for the determination of strength and deformation characteristics
- BS EN 338:2003 Structural timber – strength classes
- prEN 1995-1-1:2003 Eurocode 5 Design of timber structures Part 1.1 General, Common rules for buildings
- prEN 14250:2004 Timber structures – product requirements for prefabricated trusses using punched metal plate fasteners
- prEN 14545:2002 Timber structures – connectors - requirements

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) MiTek Limited 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 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 MiTek Limited.

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