

# DEUTSCHES INSTITUT FÜR BAUTECHNIK

Anstalt des Öffentlichen Rechts

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Ref1 36-1.14.4-36/04

## General construction supervision authority permit

Permit number: Z-1 4.4-493  
Applicant: MTH Befestigungstechnik GmbH  
Weinleite 1  
91522 Ansbach  
Approved item: MTH - beam clamps  
Valid until: 28 February 2011

The aforementioned item is herewith approved by general building supervision authority.

This approval consists of six pages plus four appendices.

## I. GENERAL TERMS AND CONDITIONS

1. The general building authority approval is proof that the item concerned can be used and/or applied within the meaning of the provincial building regulations.
2. This approval does not replace the legally prescribed approvals, agreements and/or certifications necessary in carrying out any building project.
3. The general building supervision authority's approval being granted does not affect the rights of third parties, particularly private industrial property rights.
4. Makes and sellers of the item approved must, regardless of any provisions in the "Special Regulations", make copies of this approval available to users of the item approved and point out to them that said approval must be available at the location at which the item it concerns is used. Such copies are to be made available to the authorities involved on request.
5. This approval may only be copied in its entirety. Any partial publication requires the prior approval of the Deutschen Instituts for Bautechnik. Advertising texts and drawings may not contradict the general building authority approval. Translations must include the statement that "This is a translation of the German original not approved by the Deutschen Institut for Bautechnik".
6. General building authority approval is granted subject to withdrawal. The terms and conditions of said approval may be retroactively amended and/or supplemented should new technical knowledge require it.

## II. SPECIAL TERMS AND CONDITIONS

### 1 Items approved and scope of applicability

The items approved are beam clamps serving as working joints of beams of differing shapes and sizes crossing one another (see Appendix 1). Given equal flange widths the connection of beams atop one another is also possible. A connecting plate is installed between the beams to be clamped together that projects beyond the beam flange and that has drill holes on the four projecting corners. Screws pre-tensioned to a set torque are inserted in these holes that press the beam flange against the connecting plate via a clamping plate on the screw head side and another on the nut side.

This approval affects the beam clamps both for mainly static and for mainly non-static stress.

### 2 Construction product standards

#### 2.1 Characteristics and composition

##### 2.1.1 Dimensions

The main clamping plate dimensions are given in Appendix 2. Precise dimensional details are filed with the Deutschen Institut for Bautechnik. The clamping plate dimensions are given in Appendix 4. The dimensions of the screws, nuts and washers can be extrapolated from the data in the Appendices and that in sections 2.1.2.2 and 4.2.

##### 2.1.2 Materials

###### 2.1.2.1 Clamping and connecting plates

The clamping plates are made of C45+N tempered steel to DIN EN 10083-2 standards. The connecting plates are to be made of structural steel to DIN EN 10025-1 standards of rigidity class S235 or higher.

###### 2.1.2.2 Screws, nuts and washers

Only hexagonal screws of rigidity class 10.9 per DIN 6914, nuts of rigidity class 10 per DIN 6915 and round washers for HV joints per DIN 6916 or fittings per DIN EN 14399-1 consisting of hexagonal screws of rigidity class 10.9, nuts of rigidity class 10 and appropriate washers are to be used.

###### 2.1.2.3 Corrosion protection

The clamping plates are galvanised. In all other respects DIN 18800-7 applies to beam clamp corrosion protection

### 3 Design and dimensioning standards

#### 3.1 Dimensioning

##### 3.1.1 General

The concept of proof in DIN 18 800-1: 1990-11 applies.  
Fatigue testing must be to DIN EN 1993-1-9 standards.

##### 3.1.2 Axial stress of screws (tensile forces)

###### 3.1.2.1 Mainly static stress

The metrology values for tensile force limit  $N_{R,d}$  per clamped joint (4 screws) are given in Appendix 3, Table 2.

###### 3.1.2.2 Mainly non-static stress

For fatigue testing the graph in DIN EN 1993-1-9 for stress concentration case 50 may be used.

##### 3.1.3 Stress at right angles to the screw axis (shear)

Only brief shear stress such as in crane travel beams due to crane starting and stopping, mass forces due to drives or the angled movement of a crane is permissible.

The shear stress capacity  $V_{R,d}$  per clamp joint (4 screws) is as below:

$$V_{R,d} = It' (N_{R,d} - N_0) \text{ with}$$

$\mu=0.2$  friction coefficient

$N_{R,d}$  metrology value of tensile capacity per Appendix 3, Table 2.

$N_d$  metrology value of tensile forces exerted

If shear is exerted longitudinally and laterally simultaneously then the resultant value applies.

Shear capacities for selected tensile force/s exerted are given in Appendix 3, Table 3.

##### 3.1.4 Bending moment stress

If the clamp joints have to transmit bending moments e.g. in crane track beams due to vertical crane wheel loading with torsion-resistant support beams or horizontal lateral stress crosswise to the crane track beam then the moment may be allowed for applying equivalent tensile force. The tensile force must be so determined that it leads to the same stress as the bending moment in the most heavily stressed screws and clamping plate pairs.

For pre-tensioned clamp joints equivalent tensile force may be approximated using the following formula:

$$N_m = \frac{3M}{b}$$

M here is the bending moment, NM the equivalent tensile force and b the flange width of the support beam.

### 3.1.5 Local bending stress in the support flanges

Exertion of additional bending stress on the support flanges due to forces exerted by the clamp joint perpendicular to the flanges is to be proven. The force exerted by each clamping plate is to be assumed to be a quarter of the longitudinal force exerted on the clamp joint. The line of application of force is to be assumed to be the support flange edge.

The calculation methods envisaged in [1] and [2] may be used as the basis for calculating local bending stress in the support flanges.

## 4 Performance rules

### 4.1 General

The standard beam clamp case is that of two I-sections crossing at right angles (see Appendix 1, example 1).

When using combined cross-sections as in examples 3 and 4 in Appendix 1 make sure that the joint between the cross-sections is adequately rigid and stress-resistant and that mechanical effect equivalent to that of the I-section exists.

Joining beams crossing at an angle with deviations from a right angle of up to  $10^\circ$  is permissible.

The contact surfaces of the components to be joined using the intermediate plate must be level and parallel to one another by design.

To transmit differing forces screws of sizes M 12, M 16, M 20 and M 24 may be used with the appropriate clamping plates. The four screws in a clamp joint must all be of identical size, however.

### 4.2 Assembly design

In choosing clamping plate sizes note the clamping thickness range per Appendix 2, Table 1.

Joining beams with angled flanges is only permissible if the stress is mainly static and no crosswise forces will be exerted by design.

Screw length must be such that at least one thread projects out of the nut.

### 4.3 Installation rules

The components mentioned in section 2.1 may only be installed if the packaging or accompanying literature bears the U-symbol (see construction rules list A, Part 1, sequential nos. 04/08/55 and 04/10/02) or CE symbol.

Beam clamps may only be installed by companies with the requisite experience. Other companies may only do so if provision has been made for personnel from such an experienced company to familiarise the personnel involved.

Deviant to normal HV joints two washers are to be used under the nut subject to the torque involved.

The prescribed torques are given in Appendix 3, Table 2.

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I [1] P. Sahmel

To calculate the bending stress exerted by crane trolleys in support flanges, conveyors and lifting equipment 19 (1969) no. 14, pages 866-868

[2] British Standard B.S. 2853: 1957

Amendment No. 3, published 3rd August, 1967

The design and testing of overhead runway beams

If clamp joints are used on coated parts then the torque must be checked after 24 hours at the least and corrected if necessary. This procedure is to be repeated until the torque ceases to fall.

Beam clamps must be accessible enough when installed that the torque can be checked at any time.

Each clamping plate and set of fixtures and fittings must be checked for condition before use. Do not use damaged parts. The screws in particular must not be deformed or have thread damage or corrosion traces.

Screws and clamping plates that have been subjected to stress other than mainly static may not be reused. Joint friction surfaces must not be contaminated with oil, grease or other substances if that reduces friction.

The construction company must certify that the joint has been properly executed according to the rules and requirements herein.

## **5 Use, maintenance and servicing rules**

The person responsible for the state of any construction or system using beam clamps or someone authorised by them must check the condition of the clamping joint every 2 years if it is subject to stress other than predominantly static per DIN 1055-3.

The joints are to be examined for corrosion and cracks in the screws in the process. Screw torque and any deformation/twisting that may have occurred in the joint/s must also be checked in the process. Should there be crosswise stress mainly in one direction and movement not be excluded by design then regular inspection must be employed to ensure that no impermissible crosswise movement occurs.

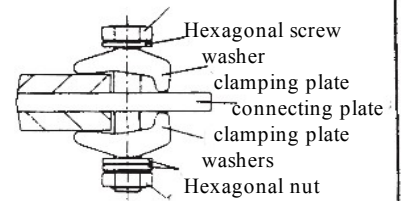
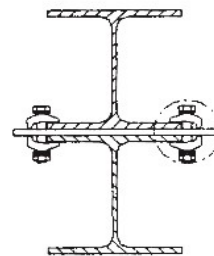
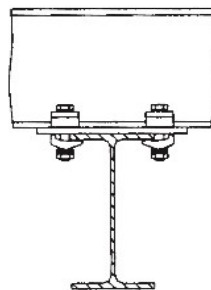
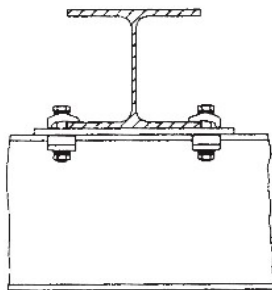
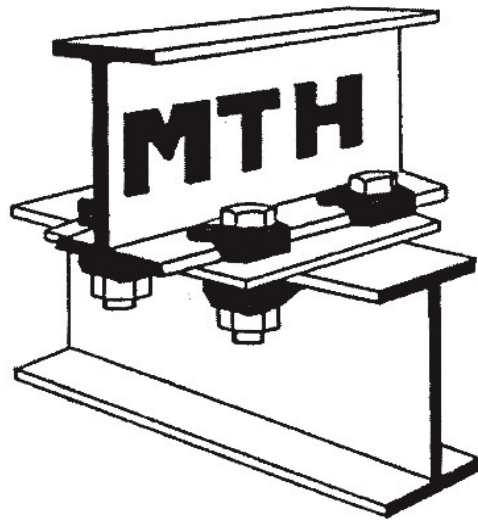
Renew corrosion protection if there's any corrosion damage (see section 2.1.3).

Damaged parts must be immediately replaced with new ones.

Inspection results are to be documented. This must include details of whether any remedial measures are needed and, if so, which. It is to be retained for at least 5 years.

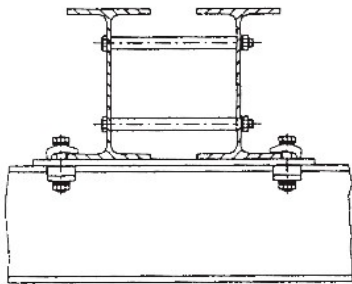
The interval between inspections may be increased if the results permit.

The company entrusted with installing beam clamps must advise the person responsible for the construction in writing of this obligation and include a copy of that written advice in the construction files.

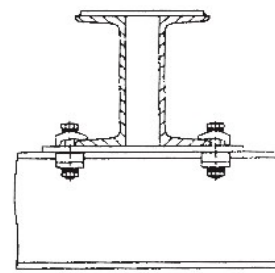


Example 1

Example 2



Example 3



Example 4



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**Examples of use of  
MTH beam clamp joints**

**Appendix 1**  
to general construction  
supervision authority permit  
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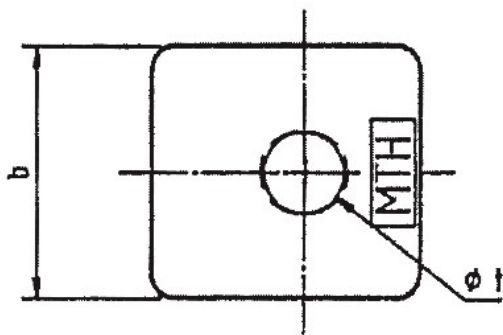
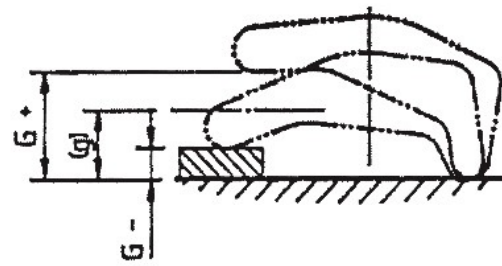
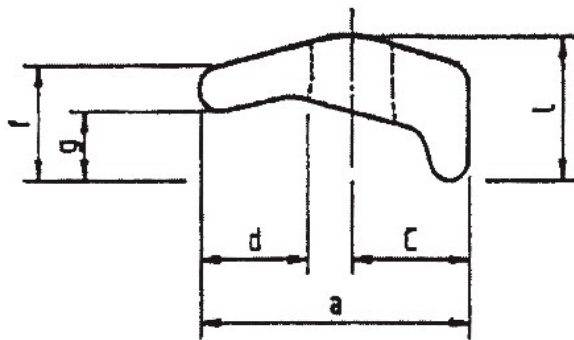
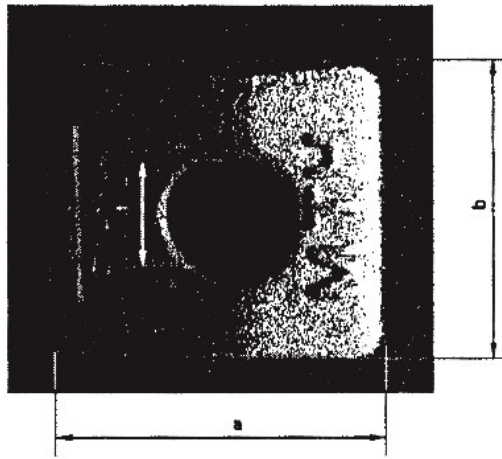


Table 1

Screw	a	b	c	d	f	g	l	Øt	G* -/+	Weight kg/100 each
M 12	43	38	22	17	18	10	23	13	6-14	Approx. 12
M 14	57	50	25	20	23	12	30	17	7-17	Approx. 30
M 20	71	63	31	25	30	16	38	21	11-23	Approx. 55
M 24	86	76	38	30	34	17	43	25	10-23	Approx. 100

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**Table 1**  
**Clamping plate dimensions**

**Appendix 2**  
to the general  
construction supervision  
authority permit  
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**Table 2**

Screw	Torque moment <sup>1)</sup> M <sub>A</sub> [Nm]	N <sub>R,d</sub> [kN] Limiting tensile force per clamp joint (4 clamps)
M 12	85	33,6
M 16	160	75,2
M 20	350	95,5
M 24	500	134,8

<sup>1)</sup> The torque moment required applies to fixtures and fittings using MoS2 lubrication

**Table 3**

M 12	N <sub>d</sub>	33,6	20,2	10,1	0
	V <sub>R,d</sub>	0	2,7	4,7	6,7
M 16	N <sub>d</sub>	75,2	45,1	22,6	0
	V <sub>R,d</sub>	0	6,0	10,5	15,0
M 20	N <sub>d</sub>	95,5	57,3	28,6	0
	V <sub>R,d</sub>	0	7,6	13,4	19,1
M 24	N <sub>d</sub>	134,8	80,9	40,4	0
	V <sub>R,d</sub>	0	10,8	18,9	27,0

Interim values may be interpolated

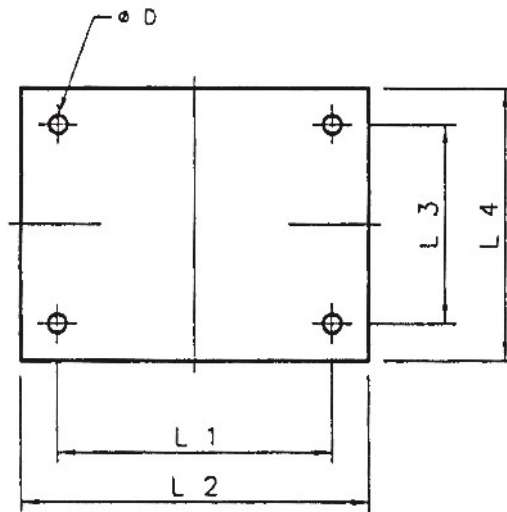
N<sub>d</sub> Metrology value for the clamp joint tensile forces exerted  
V<sub>R,d</sub> Crosswise force resistance (limiting crosswise force) per clamp joint

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**Table 2**  
**Torque moments and metrology values for the tensile force resistance capacity (limiting tensile force)**

**Table 3**  
**Metrology values for the crosswise force resistance capacity (limiting crosswise tensile force)**

**Appendix 3**  
to the general construction supervision authority permit  
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### Connecting plate dimensions

$L1 = \text{Flange width} + 0 \text{ screw} + \text{approximately } 4 \text{ mm roll tolerance}$

$L2 = L1 + \text{approximately } 2 \times 50 \text{ mm}$

$L3 = L1$  if identical beam profiles are crossed, otherwise recalculate as for  $L1$

$L4 = L3 + \text{approximately } 2 \times 50 \text{ mm}$

$D = 0 \text{ screw} + 1 - 2 \text{ mm}$

minimum panel thickness 10 mm

The panels serve only to adjust screw intervals

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**Connecting plate dimensions  
for beam clamp joints**

**Appendix 4**  
to the general  
construction supervision  
authority permit  
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**Legal basis for granting  
general construction supervision authority permits  
in the provincial building regulations of**

- Baden-Württemberg: § 18 and § 21 of the provincial building regulations for Baden-Württemberg (LBO) in the version dated 08 August 1995 (Provincial Law Gazette page 617), last amended by a law passed on 19 October 2004 (Provincial Law Gazette. page 771)
- Bavaria: Article 20 and Article 23 of the Bavarian Building Regulations (BayBO) of 04 August 1997 (Provincial Law Gazette page 434) amended 1998 page 270), last amended by § 7 of the law of 27 December 1999 (Provincial Law Gazette page 532)
- Berlin: § 19 and § 21 of the Berlin building regulations (Bauble) dated 03 September 1997 (Provincial Law Gazette page 421), last amended by Article XLV of the law of 16 July 2001 (Provincial Law Gazette pages 260, 271)
- Brandenburg: § 15 and § 18 of the Brandenburg building regulations (Bagboy) of 16 July 2003 (Provincial Law Gazette I page 210)
- Bremen: § 21 and § 24 of the Bremen building regulations (Bramble) of 27 March 1995 (Brim. Provincial Law Gazette Page 211), last amended by Articles 1 and 15 of the laws of 08 April 2003 (Brim. Provincial Law Gazette pages 159, 147 and 151)
- Hamburg: § 20a and § 21 of Hamburg's building regulations (Haul) of 01 July 1986 (Hob Provincial Law Gazette page 183), last amended by the law of 05 October 2004 (Hob Provincial Law Gazette page. 375) in association with clause 3 of the decree on the assignment of building supervision authority decision powers to the Deutsche Institut für Bautechnik (Debt VO) of 29 November 1994 (Hob Provincial Law Gazette pages 301 and 310)
- Hesse: § 17 and § 20 of the Hessian building regulations (HBO) of 18 June 2002 (Provincial Law Gazette I page 274)
- Mecklenburg-Western Pomerania:  
§ 18 and § 21 of the provincial building regulations for Mecklenburg-Western Pomerania (LBauO M-V) in the ordinance of 06 May 1998 (Provincial Law Gazette M-V page 468 ber. page 612), last amended by the law of 16 December 2003 (Provincial Law Gazette. M-V page 690 ber.
- Lower Saxony: § 25 and § 27 pf the Lower Saxony building regulations (NBauO) in the ordinance of 10 February 2003 (Nds. Provincial Law Gazette page 89)
- North Rhine Westphalia:  
§ 21 and § 24 of the North Rhine Westphalia provincial building regulations (BauO NRW) of 01 March 2000 (Provincial Law Gazette NRW page 256), last amended by article 9 of the law of 04 May 2004 (GV. NRW. page 259)
- Rhineland Palatinate: § 19 and § 22 of the Rhineland Palatinate provincial building regulations (LBauO) of 24 November 1998 (Provincial Law Gazette page 365) last amended by Article 3 of the law of 18 December 2001 (Provincial Law

Gazette pages 303 and 304)

- Saarland: § 19 and § 22 of the Saarland (LBO) provincial building regulations of 18 February 2004 (Provincial Law Gazette. page 822), in association with § 1 paragraph 2 clause 1 of the ordinance assigning the decision-making power of the highest building supervision authority to the Deutsche Institut für Bautechnik of 20 June 1996 (Provincial Law Gazette page 750)
- Saxony: § 18 and § 21 of the Saxon building regulations (SachsBO) of 28 May 2004 (Provincial Law Gazette Page 86)
- Saxony-Anhalt: § 21 and § 24 of the Saxony-Anhalt building regulations (BauO LSA) of 09 February 2001 (Provincial Law Gazette LSA page 50), last amended by Article 5 of the law of 19 July 2004 (Provincial Law Gazette LSA page 408)
- Schleswig-Holstein: § 24 and § 27 of the provincial building regulations for Schleswig-Holstein (LBO) in the version dated 10 January 2000 (Provincial Law Gazette Schl.-H. pages 47, ber. and 213), last amended by a law passed on 20 December 2004 (Provincial Law Gazette. Schl.-H. page 1243)
- Thuringia: § 21 and § 23 of the Thuringia provincial building regulations (ThOrBO) of 16 March 2004 (Provincial Law Gazette TH page 349).