

I. GENERAL PROVISIONS

The general constructional authorization establishes the use and application of the subject matter of the permit within the meaning of the federal building regulations.

- 1 The general constructional authorization does not replace the approvals, agreements and certifications prescribed by law for the implementation of building projects.
- 2 The general constructional authorization is granted without prejudice to third party rights, in particular personal (property) rights.
- 3 Manufacturers and distributors of the subject matter of the permit must provide copies of the general constructional authorization to the user and or operator of the subject matter of the permit, without prejudice to the continuing regulations in the "Special Provisions" , and must point out that the general constructional authorization must be available at the application site. Upon request, copies of the general constructional authorization shall be made available to the authorities concerned.
- 4 The general constructional authorization may only be duplicated in full. An abridged publication requires the consent of the German Institute for Structural Engineering. Texts and drawings of advertising leaflets may not contradict the general constructional authorization. Translations of the general constructional authorization must include the note "Translation of the original version not checked by the German Institute for Structural Engineering"
- 5 The general constructional authorization is granted revocably. The provisions of the general constructional authorization may be supplemented and amended subsequently, in particular if required by new engineering knowledge.

SPECIAL PROVISIONS

1 Subject matter of the permit and field of application

The permitted building products are dowelled joining elements (Box Bolts) with bolts of sizes M8, M10, M12, M16 and M20 in accordance with Appendix 1 for joints to hollow sections and other constructions difficult to access from the rear. The joining elements fabricated from unalloyed steel or -noncorrosive steel are suspended upon a hexagon bolt, a countersunk nut (cone) and a bifurcated sleeve (expansion ring) together with a hexagon collar. The joint is produced by tightening the bolt and the resultant expansion of the sleeve.

The general constructional authorization applies to joints in the application field of DIN 18800-1:1990-11 and DIN 18808:1984-10 for constructions made of steel of quality classes S235, S275 and S355. This general constructional authorization applies only to joints having predominantly static stress and to joints for which the fatigue limit verification in accordance with DIN 18800-1:1990-11, Element (741) may be inapplicable.

This general constructional authorization regulates the manufacture of the joining elements and the applicability of the resulting designed joints.

2 Provisions for the building product

2.1 Properties and composition

2.1.1 Dimensions

The bolts for the joining elements are hexagonal bolts with threads up to the head in accordance with DIN EN ISO 4017:2001-03.

The information in Appendices 1 and 2 apply to the dimensions of the joining elements and also for the permitted grip lengths. Information about the dimensions and tolerances not specified in Appendix 2 are stored with the German Institute for Structural Engineering.

2.1.2 Properties of materials

All joining element components are manufactured either from unalloyed steel or from noncorrosive steel.

The mechanical material properties of the bolts must conform to quality class 8.8 in accordance with DIN EN ISO 898-1:1999-11 and quality class 70 in accordance with DIN EN ISO 3506-1:1998-03.

Information about the mechanical material properties of the respective source material for the sleeves with collar and the conical nuts are stored with the German Institute for Structural Engineering

2.1.3 Corrosion protection

All joining element components are either electro-galvanised, hot-dipped galvanised or produced from noncorrosive steel. Electro-galvanised joining elements shall be coated additionally as necessary depending upon the duration of protection and the intensity of corrosion.

Moreover, the provisions according to DIN 18800-7:2002-09 and the provisions in the general constructional authorization Z-30.3-6 apply to the steel grade with the material number 1.4401.

2.2 Identification

The manufacturer must identify the packaging of joining elements with the mark of conformity (Ü-Mark) in accordance with regulations for conformity of the (relevant) countries. The identification may only be implemented, if the preconditions in accordance with section 2.3 have been fulfilled.

Each packaging must also be provided with a label which includes the details of the manufacturing site (factory code) and description of the building products.

The joining element bolts must also be identified in accordance with DIN EN ISO 898-1:1999-11.

2.3 Certificate of conformity

2.3.1 General

Confirmation that the joining elements conform to the provisions of this general constructional authorization must be done for each manufacturing site with a conformity certificate on the basis of in-house production control and a regular independent inspection including an initial test of the joining elements in accordance with the following provisions.

For the granting of the conformity certificates and the independent inspection including the product tests to be implemented, the manufacturer of the joining elements must use the services of an inspection office and a certification office which are approved for these respective activities.

The certification office shall notify the German Institute for Structural Engineering by giving them a copy of the granted conformity certificate.

2.3.2 In-house production control

An in-house production control system shall be organised and implemented at each manufacturing site. By in-house production control it is understood that the manufacturer will undertake continuous inspection of production, to ensure that the building products manufactured by him conform to the provisions of this general constructional authorization.

The in-house production control system shall include at least the measures listed as follows.

The dimensions required in section 2.1 shall be checked for each production lot.

The material properties required in section 2.1 for the source material of the joining element components shall be demonstrated for each production lot by an inspection certificate 3.1 in accordance with DIN EN 10204:2005-01. Conformity of the details in the inspection certificate 3.1 with the requirements in section 2.1 shall be checked.

Furthermore, the following tests on the joining elements shall be conducted for each diameter and production lot:

- Inspection of the zinc thickness for the galvanised joining elements,
- A tensile load test on an assembled joining element.

When assembling a joining element utilised for the tensile load test. the tightening torque specified in Appendix 1 must be considered.

In the tensile load test, at least the 1.375-fold values for the limiting tensile load N_{Rtd} specified in Appendix 5 and in Appendix 6 must be reached in each case.

The results of in-house production control shall be recorded and evaluated. The records must include at least the following data:

- Description of building products along with the source materials and the constituents
- Type of inspection or testing
- Date of manufacture and examination of the building products and the source material or constituents.

- Result of inspections and testing and comparison with the requirements
- Signature of the person responsible for the in-house production control.

The records shall be kept for at least five years and must be submitted to the inspection office engaged for the independent inspection. They shall be submitted to the German Institute for Structural Engineering and to the most senior responsible buildings inspectorate upon request.

In case of an unsatisfactory test result, the manufacturer must take steps without delay to rectify the shortcomings. Building products which do not meet the requirements shall be handled so that confusion with conforming (products) is excluded. Following rectification of the shortcomings the test concerned shall be repeated immediately – so long as it is technically feasible and is necessary as proof that the shortcomings have been rectified.

2.3.3 Independent inspection

The in-house production control is to be checked regularly by an independent inspection at each manufacturing site, at a minimum of at least twice per year.

An initial test of the joining elements shall be conducted as part of the independent inspection, and sampling checks shall be carried out in accordance with section 2.3.2. The sampling and testing are the responsibility of the approved inspection office each time. The independent inspection must demonstrate on each occasion that the requirements are fulfilled.

The results of the certification and independent inspection shall be kept for at least five years. They will be submitted to the German Institute for Structural Engineering and the highest responsible inspectorate by the certification office and the inspection office respectively upon request.

3 Provisions for design and dimensioning of the joints

3.1 General

The provisions in accordance with DIN 18800-1:1990-11 in combination with the adjustment directive for steel structures apply unless other stipulations are made.

3.2 Design

The limiting values of the grip length in accordance with appendix 1 are to be met.

Deviating from the rules for bolted joints specified in DIN 18800-1:1990-11, Element (805), the details in appendices 1 and 2 are to be observed for the distances from edges and hole pitches in joining elements.

3.3 Dimensioning

3.3.1 General

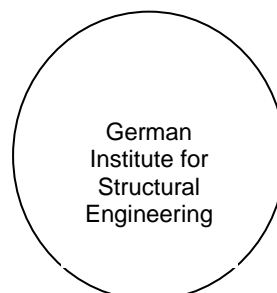
DIN 18800-1:1990-11, section 8.2 applies in principle for the dimensioning of joining elements. Provided that deviations are necessary, these are stipulated as follows with reference to the relevant standard elements and equations.

3.3.2 Shearing off in accordance with DIN 18800-1:1990-11, Element (804)

The value of the limiting shear force $V_{aR,d}$ according to equation (47) is substituted by the corresponding value in appendix 5 or appendix 6.

In the case of single-shear joints V_{atRid} with $t_{min} < d_{Hü}$ is to be reduced as follows:

$$V_{aR,d}^1 = \left[\frac{2}{3} + \frac{t_{min}}{3 * d_{Hü}} \right] * V_{aR,d}$$



3.3.3 Bearing stress in accordance with DIN 18800-1:1990-11, Element (805)

In equation (49) the shank diameter d_{Sch} shall be substituted by the outer sleeve diameter $d_{Hü}$ conforming to Appendix 2.

Equations (50 a) to (50 d) will be substituted by the following relation:

$$a_s = 1.1 * s - 0.30 < \begin{cases} 2.0; & \text{for exterior components} \\ 3.0; & \text{for interior components in the case of multiple shear joints} \end{cases}$$

with:

$$s = \min \left(\frac{L}{ncN}, \frac{L}{(e/d_L - 0.5)} \right); \text{ the lesser value}^1 \text{ is authoritative.}$$

In this matter, the limiting values of the edge and hole pitches specified in Appendices 3 and 4 must be met.

The edge and hole pitches which achieve the greatest possible stress on the bearing, are specified in Appendix 3.

3.3.4 Single shear unsupported joints in accordance with DIN 18800-1:1990-11, Element (807)

A reduction of the limiting force upon the bearing according to equation (53) is not required.

3.3.5 Additional condition for the plastic-plastic calculation process in accordance with DIN 18800-1:1990-11, Element (808)

The rules in accordance with DIN 18800-1:1990-11, Element (808), are not relevant and are omitted.

The plastic-plastic verification process may not be applied to joints with tensile loaded joining elements.

3.3.6 Tensile force in accordance with DIN 18800-1:1990-11, Element (809)

The value of the limiting tensile force $N_{R,d}$ according to equation (55) is replaced by the corresponding value in Appendix 5 or Appendix 6.

The (load) bearing capacity verification (Punch-through verification) for the component adjacent to the conical nut of the joining elements is yielded when this possesses a thickness of at least

$$t = 1.65 * \sqrt{\frac{N}{f_{y,d}}}$$

Meaning:

N Rated value of the tensile force of the joining element in the joint under greatest tension,

$f_{y,d}$ Rated value of the apparent yield point of the component on the side of the conical nut of the joining element ($f_{y,d} = f_{y,k}/1.1$)

The (load) bearing capacity verification for the component on the bolt head side must be rendered as for the bolted joints in accordance with DIN 18800-1:1990-11.

3.3.7 Tensile force and shearing in accordance with DIN 18800-1:1990-11, Element (810)

DIN 18800-1:1990-11, Element (810) applies, whereby in the condition (58) the value of the limiting force in accordance with Appendix 5 or Appendix 6 shall be employed for $N_{R,d}$ and the value of the limiting shear force in accordance with Appendix 5 or Appendix 6 for $V_{a>R,d}$

3.3.8 Fatigue strength in accordance with DIN 18800-1:1990-11, Element (811)

The application field of the joining elements not enduring predominantly static stress is limited to the cases wherein the fatigue strength verification in accordance with DIN 18800-1:1990-11, section 7.5.1, Element (741) may be omitted.

In the case of joining elements under tensile load the range of stress in the stressed cross section A_{Sp} of the bolts is employed for A_o in the conditions (25) and (26)

¹ Ich weiss nicht ob „der kleiner Wert“ als „der kleinere Wert“ oder „der kleine Wert“ zu verstehen sollen hätte

For joining elements which are stressed up to shear-off, the rules specified in DIN 18800-1:1990-11, Element (811) apply, wherein the shear stress range in the stressed cross section A_{Sp} of the bolts in the joining elements is utilised for A_{xa}

For joining elements made from noncorrosive steel, section 3.3.5 in the general building site supervision permit Z-30.3-6 shall be observed in addition.

3.3.9 Verification of the performance capability in accordance with DIN 18800-1:1990-11, Element (812)

The rules are not relevant and are omitted.

3.3.10 Deformation in accordance with DIN 18800-1:1990-11, Element (813)

The joints are to be treated as shear bearing joints (SL). Applicable to Ad:

$0.3 < Ad < 2.0$ for bolt diameters M 8 to M 12 and

$0.3 < Ad < 3.0$ for bolt diameters M 16 and M 20.

4 Provisions for design of the joints

Refer to Appendix 1 for the hole diameters including the tolerances to be maintained in the components designed to be joined.

The tightening torques to be applied when assembling the systematic joining elements over the bolt head of the joining elements are likewise specified in Appendix 1.

The tightening torques shall be applied with the aid of a torque limiting spanner. During the tightening process the joining elements collar shall be secured by a spanner.

The joining elements may not be re-used after disassembly. The manufacturer of the joining elements must hand over an assembly instruction manual to the companies that implement the assembly.

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