

General construction technique permit

Zulassungsstelle für Bauprodukte und Bauarten Bautechnisches Prüfamt

Eine vom Bund und den Ländern
gemeinsam getragene Anstalt des öffentlichen Rechts

Mitglied der EOTA, der UEAtc und der WFTAO

Date: 26 Nov 2018 Reference: I 36.1-1.14.4-113/18

Number:
Z-14.4-818

Applicant:

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Validity

from: **26 November 2018**
to: **6 July 2018**

Subject of decision:

Screw nail RoofLoc SCRAIL

The subject named above is herewith granted a general construction technique permit (*allgemeine Bauartzulassung*). This decision contains six pages.

This general construction technique permit replaces general construction technique permit no. Z-14.4-818 of 6 July 2018. The subject concerned was granted the first general construction technique permit on 6 July 2018.

Translation authorised by DIBt

DIBt

I GENERAL PROVISIONS

- 1 The general construction technique permit (*allgemeine Bauartgenehmigung*) confirms the fitness for application of the subject concerned within the meaning of the Building Codes of the federal states (*Landesbauordnungen*).
- 2 This decision does not replace the permits, approvals and certificates required by law for carrying out building projects.
- 3 This decision is granted without prejudice to the rights of third parties, in particular private property rights.
- 4 Notwithstanding further provisions in the 'Special Provisions', copies of this decision shall be made available to the installer of the subject concerned. Furthermore, the installer of the subject concerned shall be made aware of the fact that this decision has to be made available at the place of application. Upon request, copies of the decision shall be provided to the authorities involved.
- 5 This decision may be reproduced in full only. Partial publication requires the consent of Deutsches Institut für Bautechnik. Texts and drawings in promotional material shall not contradict this decision. In the event of a discrepancy between the German original and this authorised translation, the German version shall prevail.
- 6 This decision may be revoked. The provisions may subsequently be supplemented and amended, in particular if this is required by new technical findings.
- 7 This decision is based on the information and documents provided by the applicant on the subject concerned during the permit process. Alterations to the information on which this general construction technique permit was based are not covered by this decision and shall be reported to Deutsches Institut für Bautechnik without delay.
- 8 The general construction technique permit covered by this decision also serves as a national technical approval (*allgemeine bauaufsichtliche Zulassung*) for the construction technique.

II SPECIAL PROVISIONS

1 Subject concerned and field of application

The subject concerned is the connection of thin-walled cold-formed or hot-rolled steel sheets and supporting structures made of timber construction materials using 'RoofLoc Scrail' screw nails. The screw nails are driven directly through the sheet positioned for installation with air nailers without pre-drilling.

The field of application is general timber construction. The connections serve to fasten sheet steel cladding such as roofing or siding.

The connections are intended for application in structures subjected to static or quasi-static actions (wind). Fatigue-relevant loads shall be excluded. The forces can act both in the direction of and at a right angle to the nail axis.

2 Provisions for planning, design and execution

2.1 Planning

2.1.1 Components and fasteners

The requirements for the timber components shall be governed by the provisions of EN 1995-1-1¹ and National Annex EN 1995-1-1/NA². The timber supporting structure on which the screw nails are used shall at least correspond to strength class C24 in accordance with EN 338³.

The core thickness of the steel sheets shall lie between 0.5 and 1.0 mm. The sheets may be smooth or profiled. Steel grades S280GD, S320GD and S350GD in accordance with EN 10346⁴ shall be used. Other steel grades with nominal minimum values of yield point (R_e or $R_{p0.2}$) and ultimate tensile strength (R_m) lying in the same range may also be used provided that they have a comparable ductility. The applied corrosion protection systems may contain an additional organic coating (duplex) or consist solely of an organic coating. The actual ultimate tensile strength (R_m) of the sheet used shall not exceed 500 MPa.

RoofLoc Scrail screw nails are dowel-type fasteners in accordance with EN 14592⁵. They are composed either of stainless steel with material number 1.4301 in accordance with EN 10088-5⁶ or of non-alloy steel in accordance with ISO 16120-2⁷. The ultimate tensile stress determined in accordance with EN 10218-1⁸ for the wire shall be at least 600 MPa.

The RoofLoc Scrail screw nails have a hexagon head with flange (wrench size 6 mm, $d_h = 9.95$ mm, $h_f = 4.0$ mm). The total nail length lies between 40 and 100 mm. The nail shank has a profile with a right-hand thread. The nominal shank diameter is $d = 3.85$ mm. The complete geometry data and the permissible tolerances are deposited with Deutsches Institut für Bautechnik.

| | | |
|---|----------------------------|--|
| 1 | DIN EN 1995-1-1:2010-12 | Eurocode 5: Design of timber structures – Part 1-1: General – Common rules and rules for buildings [taking into account the amendments set out in DIN EN 1995-1-1/A2:2014-07] |
| 2 | DIN EN 1995-1-1/NA:2013-08 | National Annex – Nationally determined parameters – Eurocode 5: Design of timber structures – Part 1-1: General – Common rules and rules for buildings |
| 3 | DIN EN 338:2016-07 | Structural timber – Strength classes |
| 4 | DIN EN 10346:2015-10 | Continuous hot-dip coated steel flat products for cold forming – Technical delivery conditions |
| 5 | DIN EN 14592:2012-07 | Timber structures – Dowel-type fasteners – Requirements [hEN] |
| 6 | DIN EN 10088-5:2009-07 | Stainless steels – Part 5: Technical delivery conditions for bars, rods, wire, sections and bright products of corrosion resisting steels for construction purposes |
| 7 | DIN EN ISO 16120-2:2017-06 | Non-alloy steel wire rod for conversion to wire – Part 2: Specific requirements for general purpose wire rod |
| 8 | DIN EN ISO 10218-1:2012-03 | Steel wire and wire products – General – Part 1: Test methods |

The non-alloy steel screw nails shall be coated with "FasCoat" corrosion protection. The coating thickness shall be about 25 µm. Details on the type and composition of the protective system are deposited with Deutsches Institut für Bautechnik. The stainless steel screw nails do not have any additional corrosion protection.

A gasket made of ethylene propylene diene monomer rubber (EPDM) with a hardness of about 80 Shore A shall be positioned under the nail head. The outer diameter of the gasket shall be $D = 10$ mm and the thickness shall be $t = 3$ mm.

2.1.2 Design of the connections

The nail head and the EPDM gasket shall always be positioned on the sheet side. The sheet must rest directly against the wood and the nail axis shall be at a right angle to the sheet.

The minimum values defined in EN 1995-1-1¹ and in National Annex EN 1995-1-1/NA² for the timber dimensions, the embedment depth and the nail spacing shall be adhered to.

In the case of an off-centre arrangement of the screw nails in profiled cross sections, reductions in the resistance values shall be considered, where relevant (see Section 2.2.1).

2.1.3 Durability of the connection

For determination of the corrosion protection for the steel sheets, the planned installation situation and the expected environmental conditions with regard to corrosion shall be taken into account.

For the selection of the nail material, EN 1995-1-1¹, Section 4.2 in conjunction with the relevant provisions of National Annex EN 1995-1-1/NA² shall be observed.

Professional installation and an intact EPDM gasket should ensure sufficient sealing of the nail penetration area. However, there shall not be any stagnant water above the connection point.

The measures for protection of the wood supporting structure shall be planned in consideration of the relevant Technical Building Rules for timber construction.

2.2 Design

2.2.1 Verification

Unless otherwise specified below, verifications for the nail connections shall be performed in accordance with EN 1995-1-1¹ and EN 1995-1-1/NA².

The characteristic withdrawal parameter $f_{ax,k}$ determined in accordance with EN 1382⁹ is not affected by the insertion directly through the sheets described in 2.1.1.

Calculation of the characteristic load-carrying capacity per shear plane shall be carried out in accordance with EN 1995-1-1¹, equation 8.9 for a thin steel sheet in single shear. The design value of the load-carrying capacity per nail $F_{v,Rd}$ thus determined shall be compared with the design value of the bearing resistance per nail $F_{b,Rd}$ in accordance with Table 1. The smaller value shall be relevant for the further verifications.

Table 1

| Bearing resistance [N] $F_{b,Rd} (= F_{b,Rk} / \gamma_{M2})$ | Sheet thickness [mm] | | |
|---|----------------------|------------|------------|
| | 0.50 | 0.75 | 1.00 |
| Steel grade S280GD, S320GD, S350GD | 730 | 790 | 880 |

Calculation of the characteristic axial withdrawal capacity shall be carried out in accordance with EN 1995-1-1¹, equation 8.23a. The design value of the withdrawal capacity $F_{ax,Rd}$ thus determined shall be compared with the design value of the pull-through resistance of the steel sheet $F_{p,Rd}$ in accordance with Table 2. The smaller value shall be relevant for the further verifications.

Table 2

| Pull-through resistance [N] $F_{p,Rd} (= F_{p,Rk} / \gamma_{M2})$ | Sheet thickness [mm] | | |
|--|----------------------|-------------|-------------|
| | 0.50 | 0.75 | 1.00 |
| Steel grade S280GD, S320GD, S350GD | 1180 | 1820 | 2190 |

For profiled sheet cross sections, the pull-through resistance shall be reduced in accordance with the provisions set out in EN 1993-1-3¹⁰, Section 8.3(7) if the screw nails are arranged eccentrically in the valleys.

2.2.2 Design values and combined loads

For the determination of the design values for the timber structure, the provisions of EN 1995-1-1¹ and National Annex 1995-1-1/NA² shall apply. This leads to the following calculation approach for the resistance design values:

$$R_d = k_{mod} \times \frac{R_k}{\gamma_M} \quad (\text{with } \gamma_M = 1,3 \text{ in accordance with EN 1995-1-1/NA}^2)$$

For the determination of the design values for the steel sheets, the provisions of EN 1993-1-3¹⁰ and National Annex 1993-1-3/NA¹¹ shall apply. This leads to the following calculation approach for the resistance design values:

$$R_d = \frac{R_k}{\gamma_{M2}} \quad (\text{with } \gamma_{M2} = 1,25 \text{ in accordance with EN 1993-1-3/NA}^{11})$$

For connections subjected to a combination of loads in the direction of and at a right angle to the nail axis, the following condition shall be met:

$$\frac{F_{ax,Ed}}{F_{ax,Rd}} + \frac{F_{v,Ed}}{F_{v,Rd}} \leq 1 \quad (\text{with } F_{p,Rd} \text{ for } F_{ax,Rd} \text{ or } F_{b,Rd} \text{ for } F_{v,Rd})$$

¹⁰ DIN EN 1993-1-3:2010-12 Eurocode 3: Design of steel structures – Part 1-3: General rules – Supplementary rules for cold-formed members and sheeting

¹¹ DIN EN 1993-1-3/NA:2017-05 National Annex – Nationally determined parameters – Eurocode 3: Design of steel structures – Part 1-3: General rules – Supplementary rules for cold-formed members and sheeting

2.3 Execution

Unless otherwise specified below, EN 1995-1-1¹ and EN 1995-1-1/NA² shall apply for the execution of the timber structures and the nailed steel-to-timber connections.

When executing the nail connections, the provisions for execution and recommendations of the manufacturer shall be observed. Only manufacturer-approved air nailers with the appropriate settings shall be used for installation. The EPDM gaskets shall be obtained from the manufacturer.

The steel sheet shall rest directly and flat on the timber member at the fastening point (valley in the case of profiled sheets) and the screw nails shall be driven in at a right angle to the sheet surface. After each nail is inserted, the correct position and the intactness of the EPDM gasket shall be checked.

The executing company shall confirm the conformity of the steel sheet/timber connections with this general construction technique permit in the form of a declaration of conformity following §§ 16a (5) and 21 (2) of the Model Building Code.

3 Provisions for use, maintenance and repair

Regular maintenance to ensure the serviceability of the structure shall include periodic inspection of the EPDM gaskets for weathering.

For maintenance measures, the provisions set out in Section 2 shall apply analogously. If fasteners are replaced, it shall be noted that the specifications for resistance and tightness generally apply to new connections (sheets, screw nail and supporting structure intact).

Andreas Schult
Head of Section

Drawn up by