

SINTEF Building and Infrastructure confirms that

Guardian Fastening System

meets the provisions regarding product documentation given in Norwegian building regulations, with properties, fields of application and conditions as stated in this document

1. Holder of the approval

Afast BV
Postbus 6991
6503 GL NIJMEGEN
The Netherlands
www.afast.nl

2. Manufacturer

Afast BV and manufacturers according to product control description.

3. Product description

Guardian Fastening System is a system for mechanical fastening of roof membranes and thermal insulation in external roof constructions. Guardian Fastening System consists of the following components, see fig 1-28:

- Tube washers made of polypropylene, used together with screws and concrete nails, fig. 1-4.
- Centric system washer, fig. 5.
- Steel washer, made of Senzimir zink coated or stainless steel, fig. 6 - 10.
- Concrete nails and screws made of Enduroguard coated steel or stainless steel according to SIS 2333, fig. 11-15.
- Plastic plugs for fastening in concrete, fig. 16 -17.
- Screws for fixing in light weight concrete, fig. 18 – 20.
- Screws for fixing in metal sheets made of Enduroguard coated steel, fig. 21-27.
- Screws for fixing in wood, fig. 28.

4. Fields of application

Guardian Fastening System is used as mechanical fastening of thermal insulation for flat roofing, bitumen based multi layer or single ply roof coverings, or plastic based single ply roof coverings, to roof constructions made of profiled steel decks, concrete, light weight concrete and wood.

5. Properties

Anchor load capacities

Design load capacities for tube washers used with various types of roofing membranes are shown in Table 1. Table 2 and 3 shows the pullout capacity of screws and nails from the substructure.

Corrosion protection

All steel components in the Guardian Fastening System have a corrosion protection corresponding to application category KLA as defined in SINTEF Byggforsk Design Sheet No. 544.206, and which also corresponds to corrosion protection according to ETAG 006-5.3.7 Annex D, 15 kesterlich-cycles.

All screws in the Guardian Fastening System are made of carbon steel coated with Enduroguard 15 which has a zinc rich base and a multilayer top coat.

Safety against selfunwinding

Guardian BS-4.8, BSHD-4.8, PS-4.8, DBT-4.8, BS-5.5, BS-6.1 have been tested for safety against selfunwinding, and are considered safe in use together with Guardian tube washers.

Application properties

Guardian Fastening System has been evaluated as being acceptable for use under the following conditions:

- Installation at temperatures down to -20°C .
- Oblique loading when fastened at the edge of membrane sheets or at flaps.
- Strength against loads caused by dynamic wind loads.
- Ageing together with PVC roofing sheet and bitumenous roof coverings.

Environmental declaration

No environmental declaration according to ISO 21930 has been worked out for Guardian Fastening System. The product contains no chemical substances listed on the Norwegian environmental authorities' observation list of compounds hazardous to human health or the environment.

Waste treatment/recycling

The components of the roofing system may be delivered to ordinary public waste disposal sites after the end of their working life.

6. Special conditions for use and installation

Anchor load design capacities

The number of fixing points is calculated according to SINTEF Byggforsk Design Sheet No. 544.206 or “TPF informs No. 5”, using the design capacities shown in Table 1 and 2. Capacities in Table 1 based on testing according to NT Build 306 are usually applied in Norway and in the other Nordic countries. Capacities based on testing according to EOTA procedure ETAG 006 may also be used. Where a value in Table 2 is lower than the corresponding value in Table 1, the lowest value must be used.

Fastening in concrete

The drill hole diameter shall be 5,0 mm when fixing concrete screw CS-6,1 or nails BNRF, BN 5.6 and ACS-6,1 to a concrete substrate. The drill hole depth should be

30 mm, unless special precautions are taken regarding inspection. Minimum anchorage depth shall be 20 mm. Fixings in 50mm thick concrete without penetration requires precise length/depth control.

Fastening in light weight concrete

The anchorage depth must be minimum 75 mm when installing the Guardian light weight concrete screws LBS-8.0, LBS 6.0 and HD 6.1. When installing the lightweight concrete expander WS 8 L a hole with a diameter of 8 mm and a depth of 90 mm should be pre-drilled. The anchorage depth must be minimum 75 mm.

Fastening in metal sheets

Loadbearing profiled sheets made of steel shall have a minimum thickness of 0.7 mm. In particularly exposed areas the recommended minimum thickness is 0.8 mm for fixing roofing membranes to the steel sheets.

Fastening with Centrix-system

The Centrix electro-bonding system must be applied according to the manufacturer’s user manual.

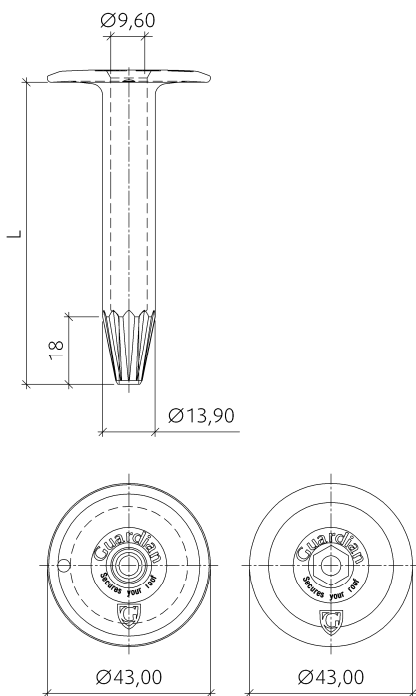


Fig.1
 Tube washer R(P) 45
 Tube washer HR45 with hexagonal internal tube shape (used together with ACS- 6.1).

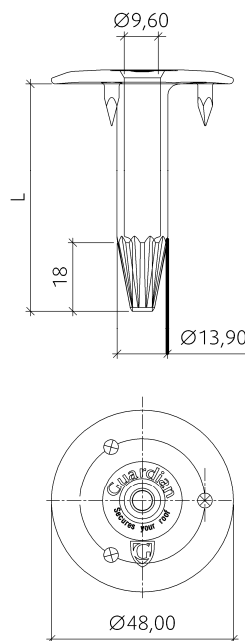


Fig. 2
 Tube washer RB(P) 48 with studs

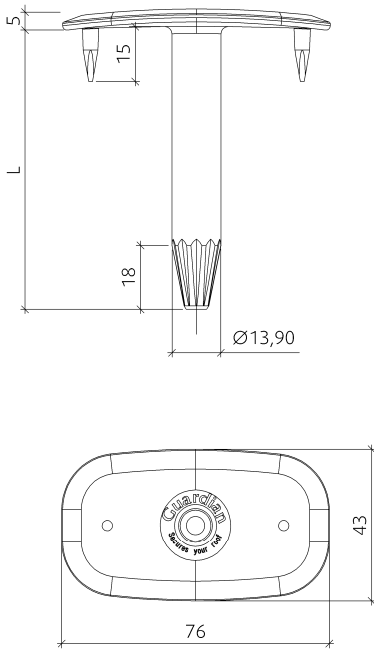


Fig. 3
Tube washer TB(P) 8040 with studs

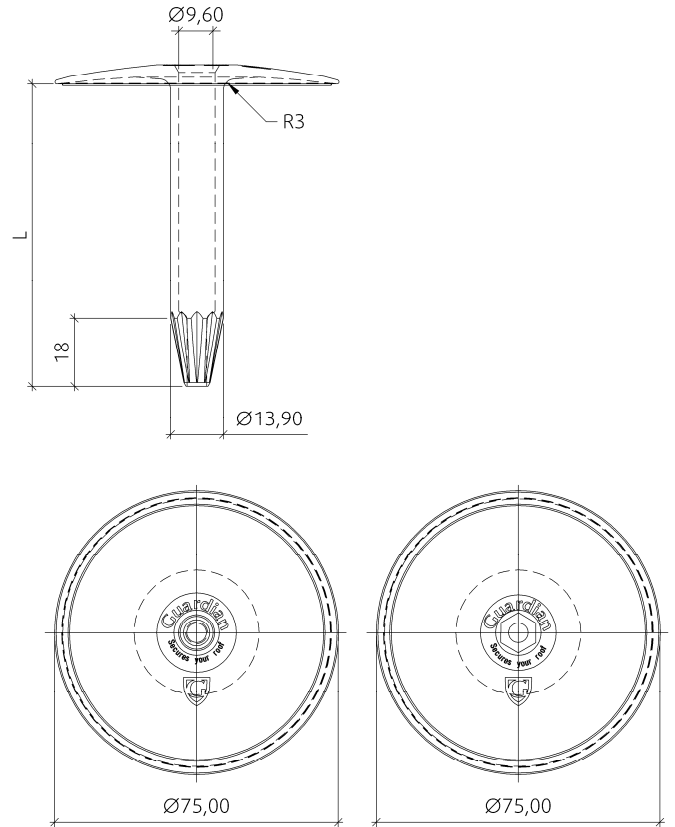


Fig. 4
Tube washer R(P) 75 for fixation of insulation. Tube washer HR75 with hexagonal internal tube shape (used together with ACS- 6.1).

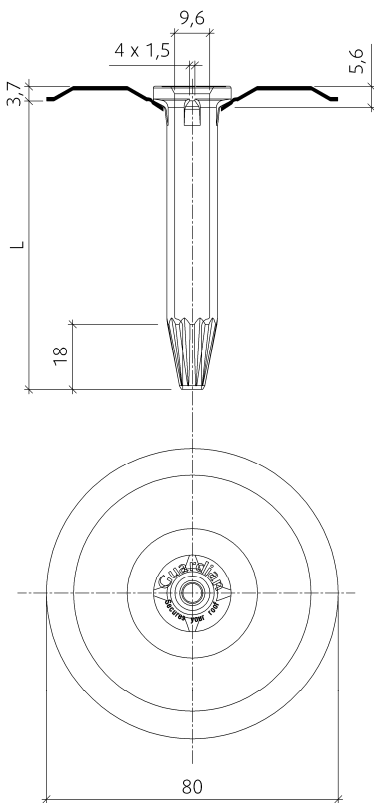


Fig. 5
Centrix plate SPC-80-F 2&4

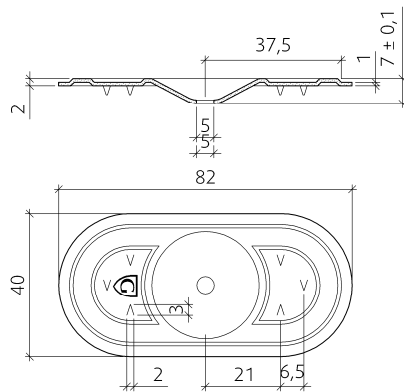


Fig. 6
SPBA 8240
Steel washer

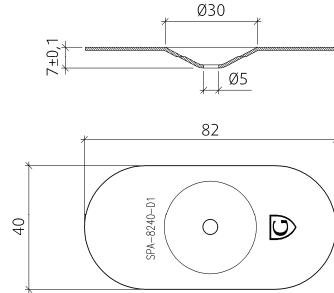


Fig. 7
SPA 8240-D
Steel washer

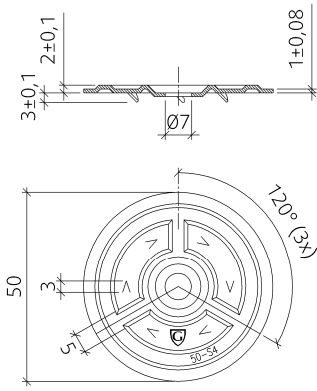


Fig. 8
SPB 50-S
Steel washer

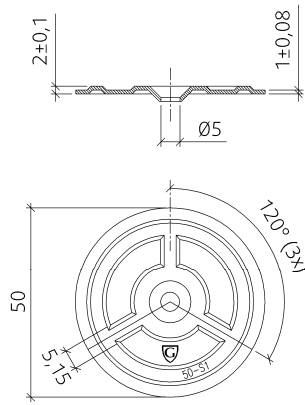


Fig. 9
SP 50-S
Steel washer

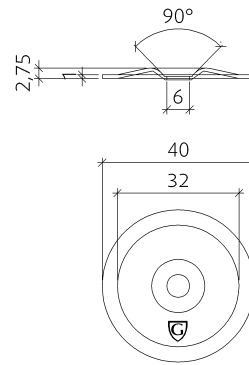


Fig. 10
SP 40-F
Steel washer

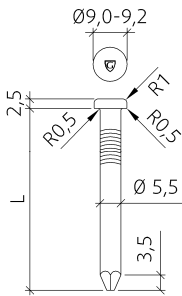


Fig. 11
BNRF
Concrete nail

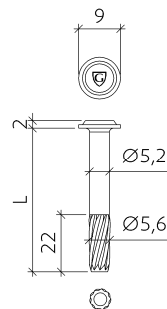


Fig.12
BN 5.6
Concrete nail

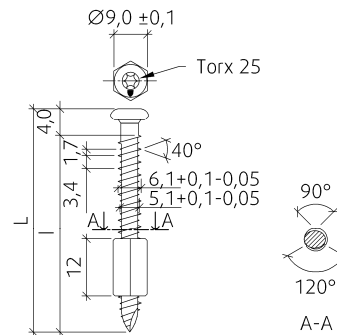


Fig. 13
ACS-6.1
Adjustable concrete screw (used
together with tube washer HR-45
or HR-75)

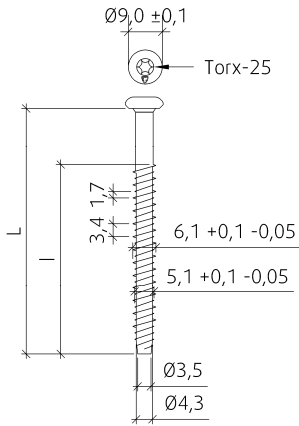


Fig. 14
CS 6.1
Concrete screw

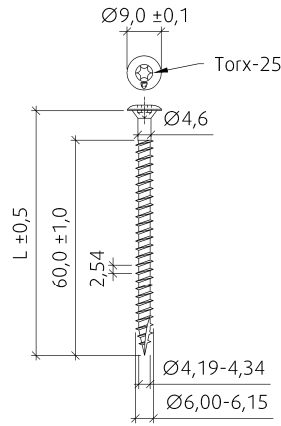


Fig. 15
HD 6.1
Screw for fixing in concrete and light weight concrete

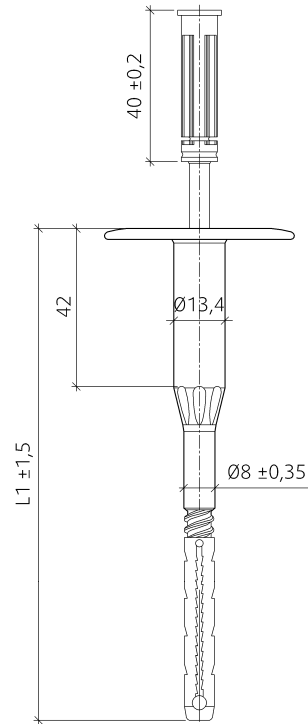


Fig. 16
CBF concrete plug

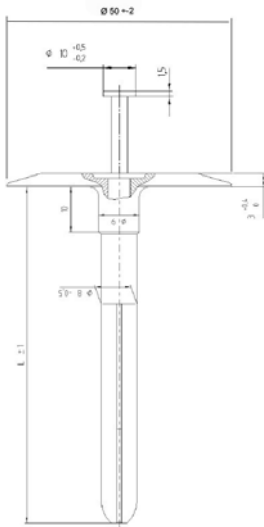


Fig. 17
CP concrete-plug

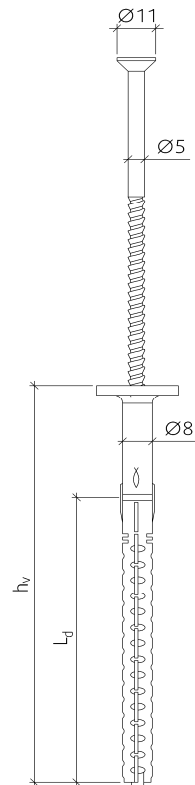


Fig. 18
WS-8L
Light weight concrete screw-plug

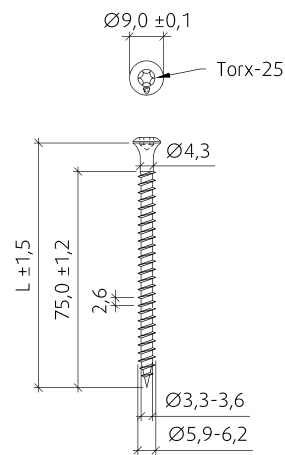


Fig. 19
LBS 6.0
Light weight concrete screw

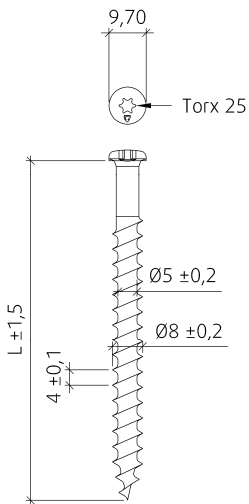


Fig. 20
LBS 8.0
Light weight concrete screw

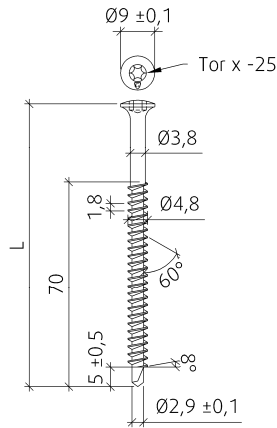


Fig. 21:
BS 4.8
Screw for fixing in metal sheets

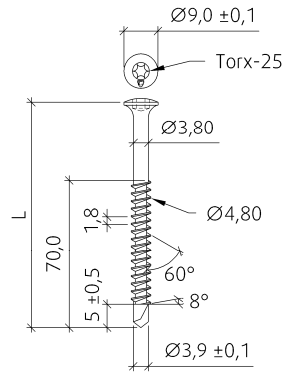


Fig. 22:
BSHD 4.8
Screw for fixing in metal sheets

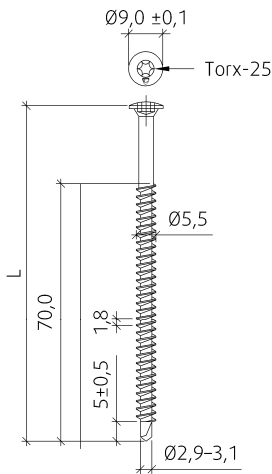


Fig. 23:
BS 5.5
Screw for fixing in metal sheets

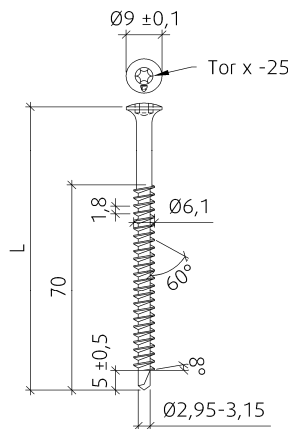


Fig. 24:
BS 6.1
Screw for fixing in metal sheets

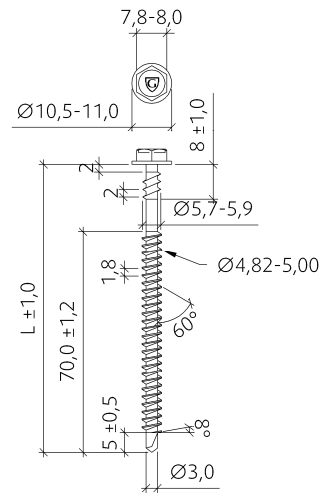


Fig. 25:
DBT 4.8
Screw for fixing in metal sheets

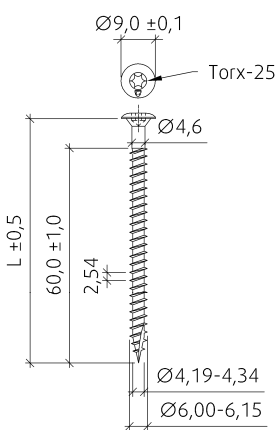


Fig. 26:
HD 6.1
Screw for fixing in metal sheets

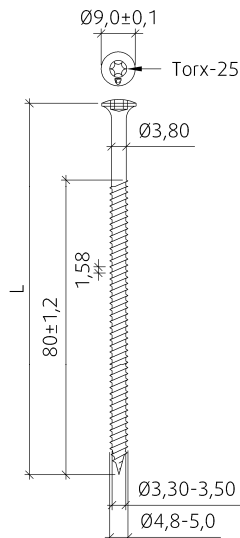


Fig. 27:
PS 4.8
Screw for fixing in metal sheets

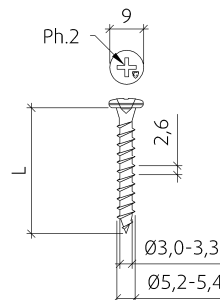


Fig. 28:
TS 5.2
Screw for fixing in wood

Table 1

Design capacities at ultimate limit state for Guardian Fastening System washers, fixing various roofing membranes. The values to be used must not exceed the design fastening capacities of the substructure fastening shown in Table 2 and 3.

| Roofing material | Capacity in N/fastener ¹⁾ | | | | | | | | | | Centrix |
|---|--------------------------------------|--------------------|---------------|-------------------------|------------------------|--------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| | Plastic washers/plugs | | | | | Steel washers | | | | | |
| | ²⁾ R(P) 45 | RB(P) 48 | TB(P) 8040 | CBF concrete plug | CP concrete plug | SPBA 8240 | SPA 8240-D | SPB 50-S | SP 50-S | SP 40-F | |
| <i>Polymeric membranes fastened along membrane edge</i> | | | | | | | | | | | |
| Protan SE 1.2 mm | 700 600 | 900 780 | 800 | 800 700 | 800 700 | 1000 800 | 700 600 | | | 650 550 | |
| Sika Plan PVC 12 VGWG | 700 600 | 900 810 | | | | | 700 600 | | | | 850 730 |
| Trocal S PVC 1,5 mm | | | | | | | 650 570 | | | | 700 600 |
| Alkorplan F 35076 1.2 mm | | 900 810 | | | | | | 750 650 | | | 850 730 |
| Cosmoplan F 1.2 mm | | | | | | | | 750 650 | | | |
| Icopal Monarplan PVC 1,2 mm | 800 700 | 1000 860 | 920 | | | | | | | | |
| <i>Single layer bituminous membranes</i> | | | | | | | | | | | |
| Trelleborg Elastofol MB 2000 | | | | | | | | | 750 660 | | |
| Icopal Mono PC | 1000 800 | | | | | | | | | | |
| Icopal Monolight NXT | 750 640 | | | | | | | | | | |
| <i>Double layer bituminous membranes</i> | | | | | | | | | | | |
| Phønix double layer (PF 3500 SBS/PF-GF 500 SBS) | 750 600 | | | | | | | | | | |
| Icopal double layer | 900 730 | | | | | | | | | | |

¹⁾ Upper, bold value determined according to Nordtest method NT Build 307

Lower value determined according to EOTA procedure ETAG 006

²⁾ Capacities are also valid for tube washer HR45

Table 2

Design capacities at ultimate limit state for fixings with Guardian Fastening System to concrete- and wood- substructures, based on tests according to Nordtest method NT Build 306.

| Fastener | Substructure | Design capacity N/fastener |
|--|--|-------------------------------|
| ACS 6.1 | Concrete B 25 | 1300 |
| BNRF 5,5 | Concrete B 25 | 1300 |
| BN 5.6 | Concrete B 25 | 1050 |
| CS 6.1 | Concrete B 25 | 1300 |
| HD 6.1 | Concrete B 25 | 1300 |
| CBF Concrete plug | Concrete B 25 | 900 |
| CP Concrete plug | Concrete B 25 | 1000 |
| WS 8L Light weight concrete screw (minimum anchorage depth 75 mm) | Cellular concrete 400 kg/m ³ | 350 |
| | 450 kg/m ³ | 500 |
| | 500 kg/m ³ | 700 |
| | 550 kg/m ³ | 800 |
| LBS 6.0 (minimum anchorage depth 75 mm) | Cellular concrete 600 kg/m ³ | 800 |
| LBS 8.0 (minimum anchorage depth 75 mm) | Cellular concrete 600 kg/m ³ | 800 |
| HD 6.1 (minimum anchorage depth 75 mm) | Cellular concrete 600 kg/m ³ | 800 |
| TS 5.2 | Multilayer wood 18 mm | 1000 |
| TS 5.2 | Chipboard 18 mm | 700 |
| TS 5.2 | Plywood 18 mm | 1200 |
| TS 5.2 | OSB 18 mm | 1000 |

Table 3

Design capacities at ultimate limit state for fixings with Guardian Fastening System to metal sheets substructures, based on tests according to Nordtest method NT Build 306.

| Fastener | Substructure | Design capacity N/fastener |
|----------|--------------------|----------------------------|
| BS 4.8 | Steel deck 0,65 mm | 850 |
| | Steel deck 0,70 mm | 950 |
| | Steel deck 0,75 mm | 1000 |
| | Steel deck 0,80 mm | 1100 |
| | Steel deck 0,90 mm | 1250 |
| | Steel deck 1,00 mm | 1400 |
| BSHD 4.8 | Steel deck 1,00 mm | 1200 |
| | Steel deck 1,25 mm | 1500 |
| BS 5.5 | Steel deck 0,65 mm | 900 |
| | Steel deck 0,70 mm | 1000 |
| | Steel deck 0,75 mm | 1050 |
| | Steel deck 0,80 mm | 1150 |
| | Steel deck 0,90 mm | 1300 |
| | Steel deck 1,00 mm | 1500 |
| BS 6.1 | Steel deck 0,65 mm | 950 |
| | Steel deck 0,70 mm | 1100 |
| | Steel deck 0,75 mm | 1200 |
| | Steel deck 0,80 mm | 1300 |
| | Steel deck 0,90 mm | 1600 |
| | Steel deck 1,00 mm | 1850 |
| DBT 4.8 | Steel deck 0,65 mm | 850 |
| | Steel deck 0,70 mm | 950 |
| | Steel deck 0,75 mm | 1000 |
| | Steel deck 0,80 mm | 1100 |
| | Steel deck 0,90 mm | 1250 |
| | Steel deck 1,00 mm | 1400 |
| PS 4.8 | Steel deck 0,65 mm | 900 |
| | Steel deck 0,70 mm | 1000 |
| | Steel deck 0,75 mm | 1050 |
| | Steel deck 0,80 mm | 1150 |
| | Steel deck 0,90 mm | 1300 |
| | Steel deck 1,00 mm | 1500 |
| HD 6.1 | Steel deck 0,75 mm | 1000 |

7. Factory production control

Guardian Fastening System is subject to supervisory production control according to contract for SINTEF Byggforsk Technical Approval.

8. Basis for the approval

Fastening capacities in roofing membranes

Fastening capacities in membranes are based on system tests according to NT Build 307 or ETAG 006, documented in the following test reports:

- SINTEF Building and Infrastructure report O-21802-D dated 24.10.2007.
- SINTEF Building and Infrastructure report B21802F dated 08.05.2008.

- SINTEF Building and Infrastructure report B21802G dated 08.05.2008.
- SINTEF Building and Infrastructure report 3D0537, dated 02.04.2009.
- SINTEF Building and Infrastructure report B 21802 K, dated 29.04.2010.
- BDA Keuringsinstituut BV, report 0024-L-04/5 dated 27.02.2007.
- BDA Keuringsinstituut BV, report 0024-L-04/7 dated 27.02.2007.
- BDA Keuringsinstituut BV, report 0147-L-04/2 dated 27.02.2007.
- BDA Keuringsinstituut BV, report 0275-L-06/1 dated 11.12.2006.
- BDA Keuringsinstituut BV, report 0275-L-06/5 dated 08.01.2007.
- BDA Keuringsinstituut BV, report 0275-L-06/7 dated 05.10.2006.
- BDA Keuringsinstituut BV, report 0180-L-02/10 dated 01.03.2007.
- BDA Keuringsinstituut BV, report 0180-L-02/9 dated 01.03.2007.
- BDA Keuringsinstituut BV, report 0072-L-06/5 dated 01.03.2007.
- BDA Keuringsinstituut BV, report 0065-L-07/1 dated 10.03.2008.
- BDA Keuringsinstituut BV, report 0066-L-07/1 dated 10.03.2008.
- BDA Keuringsinstituut BV, report 0065-L-07/2 dated 10.03.2008.
- BDA Keuringsinstituut BV, report 0066-L-07/2 dated 10.03.2008.
- BDA Keuringsinstituut BV, report 0066-L-07/3 dated 10.03.2008.
- CSTC report DE 651 XE 973, dated 14.10.2005.
- Constructech Sweden AB, report 200810031212330001-11, dated 10.11.2008.
- Constructech Sweden AB, report 200810031212330001-21, dated 17.11.2008.
- Construtech Sweden AB, report 200806030837540001-6, dated 03.09.2008.
- Construtech Sweden AB, report 200810031212330001-31, dated 21.11.2008.

Pullout resistance from the substructure

Pullout resistance from different substructures is documented in the following test reports:

- SINTEF Building and Infrastructure report O-21802-C dated 23.10.2007.
- SINTEF Building and Infrastructure report O-21802-E dated 02.11.2007.
- SINTEF Building and Infrastructure report B21802H dated 08.05.2008.
- SINTEF Building and Infrastructure report B21802J dated 20.03.2009.
- BDA Keuringsinstituut BV, report 0062-L-07/1 dated 13.06.2007.

- BDA Keuringsinstituut BV, report 0339-L-04/2 dated 01.03.2007.
- BDA Keuringsinstituut BV, report 0171-L-03/3 dated 01.03.2007.
- BDA Keuringsinstituut BV, report 0171-L-03/4 dated 01.03.2007.
- BDA Keuringsinstituut BV, report 0065-L-04/2 dated 02.03.2007.

Pull over strength between fasteners and tube washers

- Constructech Sweden AB, report 200909030850290001, dated 03.09.2009
- Constructech Sweden AB, report 201008301116400001-1, dated 31.08.2010
- Constructech Sweden AB, report 201008301116400001-2, dated 31.08.2010

Unwinding

Safety against self unwinding is documented in the following test reports:

- Report 0063-L-07/1 dated 24.03.2007.
- Report 0081-L-04/2 dated 01.03.2007.
- SINTEF Building and Infrastructure report B21802J dated 20.03.2009.

Durability

Corrosion resistance of washers and screws has been tested in Kesternich chamber with 2.0 litres of SO₂ in accordance with ETAG 006 and DIN 50018. The test results are documented in the following reports:

- BDA Keuringsinstituut BV, report 006-L-07/1 dated 13.06.2007.
- BDA Keuringsinstituut BV report 0277-L-06 dated 05.12.2006.
- BDA Keuringsinstituut BV report 0345-L-02/2 dated 01.03.2007.
- BDA Keuringsinstituut BV report 0303-L-02/2 dated 27.02.2007.

- BDA Keuringsinstituut BV report 0005-L-04/2 dated 27.02.2007.

The durability of Guardian Fastening Plugs used together with bituminous and polymer membranes has been tested by SINTEF Building and Infrastructure, report O-21802-B dated 12.10.2007.

9. Marking

All fasteners, steel washers and tube washers are marked with the Guardian "G" mark. The marking of tube washers may be combined with the Guardian name or another brand name for products produced under private label. All packaging is to be marked with product type and time of production. SINTEF's approval mark for SINTEF Technical Approval No. 2516 may also be applied.



Approval mark

10. Liability

The holder/manufacturer has sole product responsibility according to existing law. Claims resulting from the use of the product cannot be brought against SINTEF beyond the provisions of Norwegian Standard NS 8402

11. Technical management

Project manager for this approval is Noralf Bakken, SINTEF Building and Infrastructure, dep. Building Materials and Constructions, Trondheim.

for SINTEF Building and Infrastructure

A handwritten signature in blue ink, appearing to read "Tore H. Erichsen".

Tore H. Erichsen
Approval Manager