

# WE ARE CONNECTORS





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# GUARDIAN WHO ARE WE

Guardian fastening systems are developed, manufactured and distributed by Guardian and are intended to fix roof systems efficiently and safely.



## Why choose Guardian?

No part of a building is as heavily burdened as the roof. Storms, rain and also the impact of traversing and working on top of the roof continuously expose the roof to external influences. It is therefore very important that a roof structure is built properly and safely. With Guardian fastening systems, you choose the certainty of optimal fastening of roof structures.

## Why take big risks?

The costs for properly fixing insulation and roof membranes is less than 2% of the total roof construction cost. The use of untested and uncertified products or incomplete fastening of roof structures carries great risks, sometimes even resulting in huge damage claims.

A lot of issues for roofers and contractors can be avoided by applying high quality fastening systems. Guardian is the specialist when it comes to fastening flat roofs. With our product range we offer you the security and assurance of top quality products and customized service, tested via official guidelines and certified by acknowledged and independent institutes.

## ISO 14001

Guardian is committed to sustainability. People, planet and profit are woven into our DNA. Our contribution to a better environment is expressed in dismountable, recyclable products and an ISO 14001 certified production site. Guardian B.V. attaches great value to sustainability. People, planet and profit are woven into our DNA. Our contribution to a better environment is expressed in dismountable, recyclable products and, from now on, an ISO 14001 certified production location.



## Top quality products and customized service

From Helmond (NL) the products and services are distributed throughout Europe and beyond by enthusiastic and skilled employees, via specialized dealers and system manufacturers. Thanks to top quality products and customized service, Guardian has acquired an important position in the roofing market. Guardian is based in Helmond and is a subsidiary of the SFS Group in Switzerland.



## Exceptionally high calculation values

Hundreds of test reports from official wind load tests (according to EN 16002) and wind load calculations (according to EN 1991-1-4) carried out by independent institutes are available for the various Guardian roof fastening systems. The unique design of the Guardian fastening systems guarantees exceptionally high calculation values, both on roofs with bituminous as well as plastic roof membranes and insulation.



## Maximum flexibility

Expert employees support customers with tailored advice and service. Short lines and just-in-time delivery ensure maximum flexibility. The assembly and packaging of finished products is also largely done in-house, which ensures cost savings and short delivery times.



## Protective topcoat with a future

The roof. Much more than the top, protective layer of our buildings. A top layer with endless possibilities, now and in the future. The roof plays an increasingly important role in our society. In generating renewable energy. For buffering rainwater, to relieve the sewer system. As a garden with plants and trees or for growing fruit and vegetables, or as a place to meet and relax.

## Connecting with smart solutions

Plenty of opportunities for the roof. Good partnerships turn these opportunities into successes. With our specialist knowledge and expertise, we are happy to guide you to the smartest solution for your flat roof. Guardian is more than a producer of fasteners for the flat roof: we are connectors! We don't only connect roof systems, customers, suppliers and users, we also use data to connect smartly and successfully.

***Make the most out of  
your roof with Guardian!***

## Sustainable and functional connecting

We love roofs. That much is clear. For a long time, this part of the building envelope remained unused and protected the contents from the weather. In addition to safety and quality, sustainability and functionality are becoming increasingly important. We are happy to contribute to this. The ideas and input of our partners are essential in this. We are open and challenge you to new initiatives. This is how we work on a bright future for the roof. Together. Together with our parent company SFS, we aspire to grow into a socially impactful market position, where sustainable connections between technology and people are central. Side by side.

## Specialists

Because of our professional, personal and informal way of working, our customers have known how to find us for years. Whether it is about advise on a complete roof system, a quotation, providing a wind load calculation, adequately solving problems or starting a local (European) project. Our expert staff is ready for you!

Guardian offers products and systems as well as service and advice. Our fastening systems are specially developed for the mechanical fastening of insulation, plastic and bituminous seals on flat roofs. We can tell you which products are best to use in various systems or offer you a complete solution with our large database of information regarding pull-out values for our fasteners and total roof systems.



# SERVICE CUSTOMIZED ADVICE

Guardian offers a wide range of services.  
Our expert staff are ready to support you with  
customized service and advice.



## Technical advice

Regarding products, systems and fixing  
various roof structures.



## Pull-out tests

On site, the pull-out value for each type of  
substrate is determined and the appropri-  
ate fastener selected.



## Demonstrations

For products and systems on site or at  
Guardian BV in Helmond.



## Wind load tests

Elaborate international test facilities to  
determine the wind resistance of a roof  
structure. More than 250 wind load tests  
with exceptionally high calculation values  
according to EN16002.



## Machines and tools

For optimal and ergonomic installation  
of Guardian fastening systems, machines  
and accessories are offered for rent or  
sale.



## Wind load calculations

Within 24 hours we provide a calculation  
for the number of fasteners per roof  
zone, according to the current guidelines  
per country. Our technical department  
provides wind load calculations and  
design a fastening pattern according to  
EN1991-1-4 or FM1-28.



## FM Approval

Guardian has FM approvals available on  
both individual products and complete  
systems.



## European certification

The entire Guardian® range has been  
tested according to the latest European  
regulation EAD:030351-00-0402.



## Customer Experience department

Our Customer Experience department  
can be reached on weekdays  
from 07:30am to 5:30pm at  
0031 (0)492-597416 and 24 hours  
at [info@guardian.nl](mailto:info@guardian.nl)



# PLASTIC TUBES


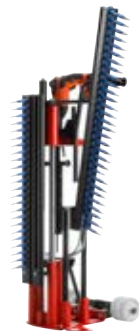


Guardian tubes can be used in combination with bituminous and synthetic roofing systems. High performance tube RB 48 is specially designed for synthetic roofing systems, with unique high design load values.



**R 48**



**RB 48**

<b>Product description</b>	Standard tube to fasten membranes in overlap	High performance tube (barbed) for fastening of synthetic membrane systems in the overlap
<b>Material</b>	Polypropylene (On request available in PA)	Polypropylene (On request available in PA)
<b>Size Ø</b>	48 mm	48 mm
<b>Length</b>	20 - 730 mm	20 - 330 mm
<b>Approvals</b> Sintef approval 2516 ETA approval 08/0285 FM approved	yes yes yes	yes yes yes
<b>Roofing system</b>	Bitumen, one and two-layer systems + synthetic (pvc/tpo/epdm)	Synthetic (pvc/tpo)
<b>Design load N*</b>	600/700 Newton	700/900 Newton
<b>Machinery and tools</b>	Bit-Extender  PP 260 	Bit-Extender  Hi-Per tool 



Pre-assembly possible

## The 5 major advantages of using tubes are:



1. Step-security
2. Thermal bridge reduction
3. Price
4. Circularity
5. Labour reduction



**R 75**



**GWT**

	Standard tube to fasten insulation or bitumen base layers	Special tube for the fastening of steel bars (STB) and metal pressure plates
	Polypropylene (On request available in PA)	Polypropylene (On request available in PA)
	75 mm	23 mm
	20 - 330 mm	60 - 430 mm
	yes yes yes	yes yes -
	Insulation and synthetic (glued) and bituminous systems (base layer)	Synthetic and bituminous systems
	450/700 Newton	Dependent on combination/application
	Bit-Extender 	Bit-Extender 

# PRESSURE PLATES & RAILS

Guardian supplies an extensive range of metal pressure plates for fastening single and multi-layer roof systems (field and overlap fastening / synthetic and bitumen roofing membranes).

Our metal pressure plates are also suitable for the attachment of insulation and bitumen base layers.



**SP 40**

Pre-assembly possible



**SP 50**

Pre-assembly possible



**SP 70**

<b>Product description</b>	Metal pressure plate for wooden and concrete substrates without insulation	Metal pressure plate for fastening single-layer roof membrane systems	Metal pressure plate for fastening insulation or bitumen base layers.
<b>Material</b>	Galvanised steel, 15 cycles Kesternich	Galvanised steel, 15 cycles Kesternich	Galvanised steel, 15 cycles Kesternich
<b>Thickness</b>	1,0 mm	1,0 mm	0,5 and 0,7 mm
<b>Pre-drill diameter</b>	6,5 mm	6,5 / 7,0 mm	5,0 / 6,5 mm
<b>Underside</b>	Flat and deep recess	Flat and with recess (shallow and deep).	Flat and with recess (shallow and deep)
<b>Approvals</b>			
Sintef approval 2516	yes	yes	-
ETA approval 08/0285	yes	yes	yes
FM approved	-	-	-
<b>Roof system</b>	Synthetic (pvc, tpo, epdm) Bitumen	Synthetic (pvc, tpo, epdm) Bitumen	Insulation and synthetic (glued) and bituminous systems (base layer)
<b>Machinery and tools</b>	Woodstick 500 / 750 (With TS 5,2 for pre-assembly)	Woodstick 500 / 750 (With BS 6,8 for pre-assembly)	



## SPA 7070

Metal pressure plate for use with automatic tools

Galvanised steel,  
15 cycles Kesternich

1,0 mm

4,85 mm

Deep recess

yes  
yes  
yes

Synthetic  
Bitumen

IF 240



## SP 8240

Metal pressure plate for fastening single-layer membrane systems. Automatic tool variant also possible with the SPA8240, in combination with the DBT-4,8-A fastener

Galvanised steel,  
15 cycles Kesternich

1,0 mm

SP 8240: 6,5 mm  
SPA 8240: 4,85 - 7,00 mm

Flat and with recess (shallow and deep).

yes  
yes  
-

Synthetic  
Bitumen

IF 240



## STB

Metal bar system for linear fastening, field fastening and fastening overlay roofing systems

Galvanised steel,  
15 cycles Kesternich

1,25 mm

7,0 / 10,0 / 15,0 mm

STBS/STBT/STBS7T15

-  
yes  
-

Synthetic and bituminous  
systems (base layer)

# FASTENERS FOR STEEL SUBSTRATES

Especially for fastening on steel substrate, Guardian offers a wide range of fasteners (in combination with pressure plates and/or tubes)



**PS 4,8**



**BS 4,8**



**BS 6,1**

<b>Product description</b>	S-Point screw Coating, 15 cycles	Drill-point screw Coating, 15 cycles Reduced drill-point also available in stainless A4	Drill-point screw, Coating, 30 cycles Reduced drill-point
<b>Application</b>	Steel deck from 0,70 to 0,88 mm	Steel deck from 0,70 mm to 2 x 125 mm	Steel-deck from 0,6 mm to 2 x 1,25 mm
<b>Head/tool</b>	Tx-25 head For use with BIT-T25	Tx-25 head For use with BIT-T25	Tx-25 head For use with BIT-T25
<b>Size Ø</b>	4,8 mm	4,8 mm	6,1 mm
<b>Length</b>	40 - 200 mm	BS 4,8 : 50 - 300 mm BSRF SS A4: 80 mm	60 - 200 mm
<b>Required length</b>	Build-up + 20 mm	Build-up + 20 mm	Build-up + 20 mm
<b>Approvals</b>			
Sintef approval 2516	yes	yes	yes
ETA approval 08/0285	yes	yes	yes
FM approved	yes	yes	yes





**BS 6,8**



**BSHD 4,8**



**DBTA**

Drill-point screw Coating, 30 cycles Reduced drill-point Length 80 mm combinable with tubes	Drill-point screw Coating, 15 cycles Larger drill-point	Belted drill-point screw Step-secure Coating, 15 cycles Reduced drill-point Stainless steel version available. Screw also available non-belted (DBT/DBT-S)
0,50 - 2 x 1,25	1,00 - 3,00	0,70 mm to 2x 1,25 mm
Tx-25 head For use with BIT-T25	Tx-25 head For use with BIT-T25	8 mm hexagonal head For use with fully automatic tool IF 240
6,8 mm	4,8 mm	4,8 mm
35 and 80 mm	90 mm	60 - 240 mm
Build-up + 20 mm	Build-up + 20 mm	Build-up + 20 mm
yes yes -	yes yes -	yes yes yes

# FASTENERS FOR CONCRETE AND LIGHTWEIGHT CONCRETE STRUCTURES

Especially for concrete and aerated concrete roof constructions Guardian offers a wide range of fasteners. Especially for fastening of insulation on concrete roofs Guardian has developed the

unique ASTL fastening system which covers up to 110 mm of tapered insulation on one length combination.



**ASTL**



**CP50**



**CS 6,1**

Also available in stainless steel

<b>Product description</b>	Tapered insulation fastener Pre-assembled R 48 or R 75 tube + concrete screw	Concrete plug with steel nail	Concrete screw Hi-Lo thread Coating, 15 cycles CS 6,1 is supplied with blunt point (length up to 100 mm) and with sharp point (length from 120 mm)  <b>Also available in stainless steel A2</b> <b>Ideal for renovation projects</b>
<b>Application</b>	Concrete Covers up to 110 mm Tapered insulation with one length combination	Concrete	Concrete
<b>Head/tool</b>	For use with special tool Bit-Extender for working in an upright position	For use with hammer	Tx-25 head For use with BIT-T25
<b>Pre-drilling</b>	Ø 5,0 mm drill with stopper	Ø 8,0 mm	Ø 5,0 mm / 5,2 mm
<b>Size Ø</b>	6,1 mm	50 mm / 8,00 mm	6,1 mm
<b>Length</b>	Suitable for insulation ranging from 70 mm till 860 mm	75 - 215 mm	28 - 280 mm SS: 40 / 80 mm
<b>Required length</b>	Depending on the thickness of the insulation. For more information, please check: <a href="http://www.guardian.nl/en/products/ASTL">www.guardian.nl/en/products/ASTL</a>	Build-up + 30 mm	Build-up + 25 mm, screw length <100 mm Build-up + 30 mm, screw length ≥120 mm
<b>Approvals</b>			
Sintef approval 2516	yes	yes	yes
ETA approval 08/0285	yes	yes	yes
FM approved	-	-	yes



## LBS 6,0

Also available in  
stainless steel



## LBS 8,0

Multi roofing-screw with S-point  
Coating, 15 cycles

**Also available in stainless steel A2**  
**Ideal for renovation projects**

Multi roofing-screw with S-point  
Coating, 15 cycles

**LBS 8,0 combinable with all Guardian**  
**LN version plastic tubes**

Lightweight concrete  
min. 600 kg/m<sup>3</sup>

Tx-25 head  
For use with BIT-T25

Installation without pre-drilling  
in lightweight concrete

6,0 mm

60 - 240 mm  
SS: 100 mm

Lightweight concrete: build-up + 60 mm  
Wood: build-up + 20 mm

yes  
yes  
-

Lightweight concrete  
min. 450 kg/m<sup>3</sup>

Tx-25 head  
For use with BIT-T25

Installation without pre-drilling  
in lightweight concrete

8,0 mm

65 - 125 mm

Build-up + 60 mm  
Wood: build-up + 20 mm

yes  
yes  
-

# FASTENERS FOR WOODEN SUBSTRATES

For fastening on wooden substrates, Guardian supplies roof screws with a wider diameter and coarser thread than the standard fasteners.



**TS 5,2**

Pré-assemblage possible



**LBS 6,0**

Pré-assemblage possible



**LBS 8,0**

<b>Product description</b>	Wood screw with S-point Coating, 15 cycles TS 5,2 - SP 40 combination, special for direct fastening of roof membranes to wooden roofs	Multi roofing-screw with S-point Coating, 15 cycles	Multi roofing-screw with S-point Coating, 15 cycles  <b>LBS 8,0 combinable with all Guardian LN version plastic tubes</b>
<b>Application</b>	Wood	Wood	Wood and lightweight concrete min. 450 kg/m <sup>3</sup>
<b>Head/tool</b>	Tx-25 head For use with BIT-T25/Woodstick	Tx-25 head For use with BIT-T25	Tx-25 head For use with BIT-T25
<b>Pre-drilling</b>	Installation without pre-drilling	Installation without pre-drilling	Installation without pre-drilling. Also in lightweight concrete
<b>Size</b>	5,2 mm	6,0 mm	8,0 mm
<b>Length</b>	20 - 120 mm	60 - 240 mm	65 - 125 mm
<b>Required length</b>	Build-up + 25 to 40 mm dependent on wood type	Build-up + 25 to 40 mm dependent on wood type	Build-up + 60 mm
<b>Approvals</b>			
Sintef approval 2516	yes	yes	yes
ETA approval 08/0285	yes	yes	yes
FM approval 3034551	-	-	-





## MTS 4,8

S-Point screw for fastening thin sheet metal (thickness up to 2 x 0,9 mm) to wood, such as roof trim. Flat screw head for flat finishing/Hi-Lo thread  
Coating, 15 cycles

Metal to wood

Tx-25 head

Installation without pre-drilling

4,8 mm

20 and 35 mm

-  
yes  
-



## DL

Wood fiber cement fastener (nylon)  
Pressure plates:  
SP-LDF 51, SP-LDF 71

Wood fiber cement boards

SD-4 head

Installation without pre-drilling

18 mm

76 - 203 mm

Build-up + 55 mm

-  
yes  
-



## TPR

Peel rivet  
Clamp range: 13-180 mm  
For pressure plates with hole diameter: min. 7,0 mm.  
Combinable with SP-50-TPR

Thin steel profile sheets min. 0,5 mm/Aluminium profile sheets min. 0,6 mm/  
Wooden substructures

For use with: GPR  
Riveting tool / Gesipa Accubird

Pre-drill in wooden and metal substrates: 7,0 mm

6,3 mm

38 - 229 mm

-  
yes  
-

# TOOLS

Guardian offers a wide variety of tools for fixing fasteners to your flat roof application



## Bit-extender

Bit-extension piece for fastening of screws in combination with tubes

- Accessory for working in an up-right position
- To be used with regular or battery powered screw gun
- Ergonomic
- Easy to use
- For use with all Guardian tubes over a length of 40 mm



## Drill-extender

HB-EXT-CON

- Accessory for working in an up-right position
- With SDS connection
- Lengths: 300, 500, 750 and 1000 mm
- To be used in combination with HB-CON drill



## Ergo-drill

Ergonomic extension piece for drills

- Drill accessory for drilling in an up-right position
- To be used with drill fitted Euroconus Ø 43 mm or DeWalt Ø 50 mm
- Ergonomic
- Depth setting



## Woodstick

Accessory for working up-right with TS 5,2 - SP 40 combination and SPA 50 - BS 6,8 combination

- Application with screw-gun
- 10 mm connection
- Ergonomic
- Easy to use
- Length 570 mm



## Bits

Complete range in various dimensions and connections for all Guardian fasteners.



## HB-CON

Conical hammer drill with or without stopper

- Ø: 5,0 mm
- Effective drill depth: 25, 35, 45 and 55 mm
- For use in combination with: HB-EXT-CON 300, 500, 750, 1000 mm



## HB-SDS plus

Hammer drill

- Ø: 5,0 / 5,2 / 5,5 / 6,0 / 8,0 mm
- Various lengths



## IT belt

Convenient bag for tubes and screws

- Ergonomic advantage
- Especially useful for TS-SP40 or SPA50 + BS 6,8

# MACHINES & RELATED ITEMS

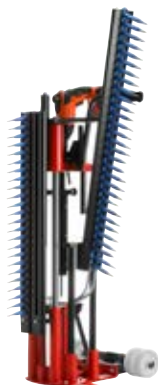
Guardian offers a wide variety of machines for fixing fasteners automatically to your flat roof application



## Hi-Per tool

Automatic tool for fastening RB48 tube-screw combinations in an up-right position

- Depth setting
- User friendly
- Ergonomic
- For use in combination with the Guardian RB48 tube-screw combinations
- Tube lengths 60, 90, 120, 150 mm
- For build-up 70 till 260 mm



## PP 260

Automatic tool for fastening tube-screw combinations in an up-right position

- Depth setting
- Easy to use
- Ergonomic
- To be used in combination with Guardian tube R 48, pre-assembled on strip
- Tube lengths 60, 90, 120, 150 mm
- For build-up 70 till 260 mm



## IF 240

Automatic tool for fastening screw-pressure plate combinations in an up-right position

- Depth setting
- Easy to use
- Ergonomic
- For use in combination with:
- Belted screws (DBTA 4,8), length 60 to 240 mm and SPA 8240 or SPA 7070
- For build-up 70 till 260 mm



## GuardianWeld™

Innovative induction welding device for fastening single-ply membranes without perforation

- Work ergonomic with GuardianWeld™
- Lightweight
- Robust and reliable machine
- Easy to handle



## 4WD

Innovative induction welding device for fastening single-ply membranes without perforation

- Ideal for upstands or hard-to-reach zones on the roof
- Lightweight
- Robust and reliable machine
- Easy to handle



## GWT™ Hand tool

Convenient induction welding device for welding by hand

- Add-on for GuardianWeld™
- Lightweight
- Easy to handle



## TPR

Tools for setting GPR Peel rivets

# FASTENING SYSTEMS HIGH PERFORMANCE GUARDIAN®



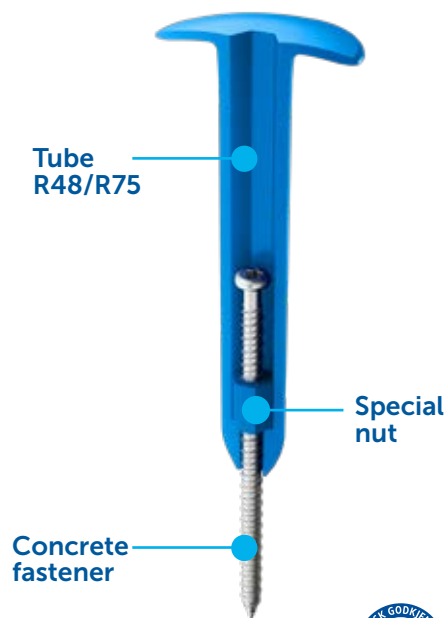


# ASTL

The variable slope fastener ASTL is the tube-screw combination for fixing slope insulation on concrete roof structures

Suitable for:

1. Sloped insulation
2. Fastening of roof systems on concrete floor slabs with height differences
3. Renovation projects with large differences in existing roof membrane and insulation thicknesses



Producer: Gouda B.V.  
www.gouda.nl  
EAK 0000148-0001  
010-1000000  
PFC-1071-02P-1000

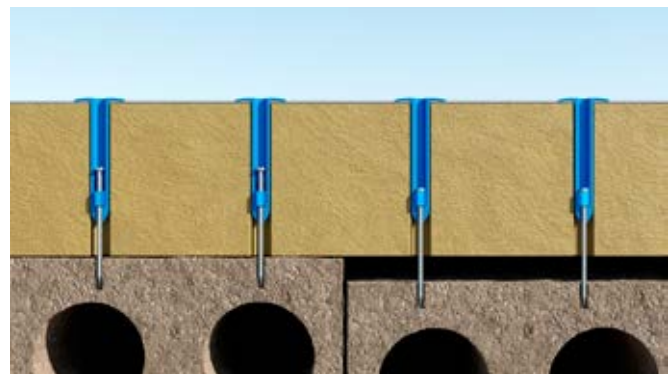
## Unique advantages!

- 100% step-safe
- Two work steps: (1) drilling and (2) fastening
- Bridge up to 110 mm of slope insulation with one length
- Fewer lengths required in stock
- Speeds up and facilitates work on roofs with large height differences and renovation roofs with large thickness differences in the existing roof membrane/insulation
- Calculated values of 600 - 800 Newton!
- For insulation packages of 70 to 860 mm
- Predrill with  $\varnothing 5.0$  mm drill bit with special stopper
- Can be used with bit extender for working upright
- No grit in the drilled hole
- Tube can be easily pushed through the insulation

## Application



- Fastener for slope insulation
- Integrated telescopic effect allows the insulation to be pressed in (e.g. when walked on) without damaging the roof membrane

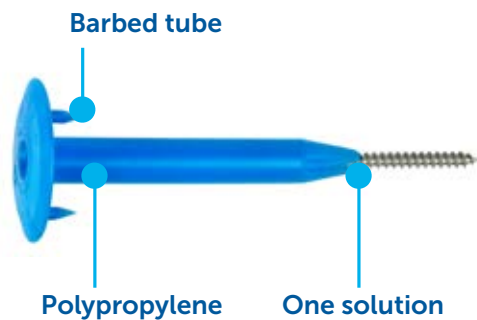


- Speeds up and facilitates work on roofs with large height differences in the concrete substrate
- Speeds up and facilitates work on renovation roofs with large thickness differences in the existing roofing membrane/insulation.

# RB 48 (FM APPROVAL)

High-performance tube for fixing single-ply membranes in the overlap for higher calculation values.

- FM approval
- Barbed tube for extra grip
- Uniquely high calculation values
- Specially designed for plastic roof membrane



- Made of high-quality polypropylene
- Calculation value up to 900 Newton!
- Up to 45% fewer fasteners compared to standard systems

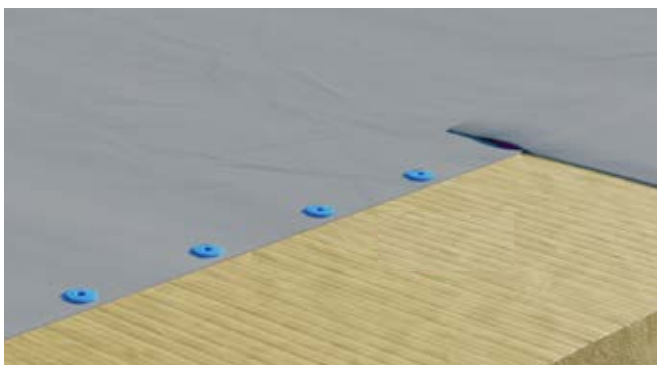
## Significant cost saving

- Savings in material costs  
Fewer fasteners per m2
- Savings in labour costs  
Wider roofing membranes, fewer overlaps, less time welding. See sample calculation on page 23.

Curious about the benefits for your project?  
Request a calculation!



## Application



- Fixing PVC roofing membranes in overlaps



- Fixing TPO roofing membranes in overlaps

# CALCULATIONS EXAMPLE

## HIGH PERFORMANCE GUARDIAN

**Guardian offers a diverse and complete range of uniquely performing pressure plates, tubes, and fasteners for the different roofing systems on the European market.**

Choosing the right high-performance Guardian fasteners will save up to 45% on the number of fasteners needed for a roof. This gives roofers and OEM's options to save on material and labour costs.

To benefit fully from the performance of Guardian fasteners, and to support customers by offering optimum fastening solutions, we recommend that you make a wind load calculation for your project, or request one.

For more information, please contact us by telephone at: +31 492 59 74 15 or at [support@guardian.nl](mailto:support@guardian.nl)

One sample calculation is given below, which clearly demonstrates that significant cost savings are possible by using high-performance Guardian fasteners.

### Sample calculation - RB 48



#### Shipping warehouse

- Roof area 8,000 m<sup>2</sup>
- Wind area II
- Terrain category II
- Steel roof 0.75 mm

### Single-layer PVC roofing system

#### RB 48 (high performance)

Design load: 864 N\*  
Number of fasteners per m<sup>2</sup>: 2,45

Number of fasteners required:  
**19.600**

**-49 %**

Savings in  
application costs: 49%  
Savings in material costs  
fasteners: 29%

#### Standard fastener

Design load: 450 N  
Number of fasteners per m<sup>2</sup>: 4,80

Number of fasteners required:  
**38.400**



\* Calculations on the basis of an official wind uplift test

Can also be processed with machine: the Hi-Per Tool

# GUARDIANWELD™

## Innovative induction welding system for fixing of single-ply membranes

Using induction technology, the underside of a roof membrane is welded to specially developed GuardianWeld pressure plates, making penetration of the roof membrane unnecessary.



### Up to 20% cost savings!

- The number of fastening points are significantly reduced compared with traditional mechanical fastening systems;
- Fewer thermal bridges and therefore less energy loss
- Fewer material and labour costs
- Fewer and smaller overlays of the roof membrane

### Other advantages

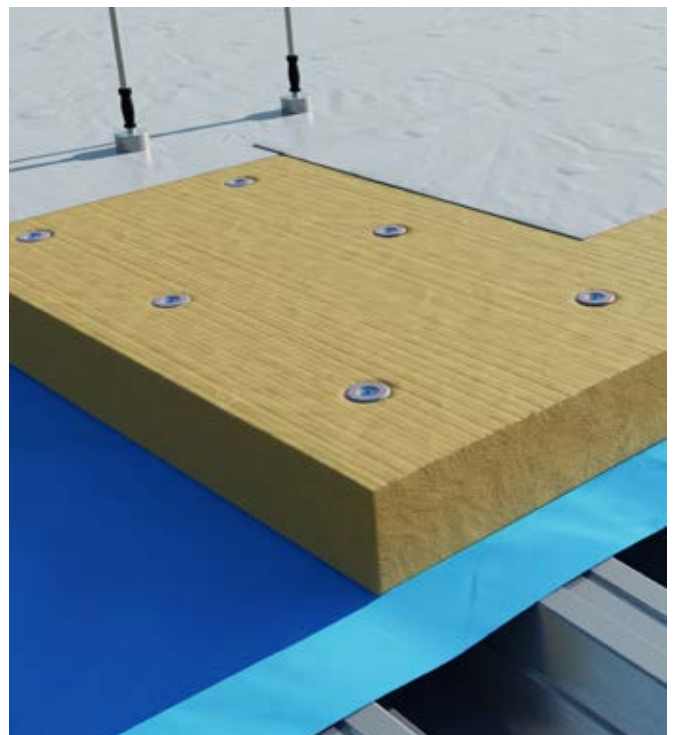
Fastening is independent of overlap. Only one (maximum) roof membrane width is required. The insulation layer does not have to be fastened separately.

The "sealing/closing" of the roof with a roof membrane is independent from the process of fixing the roof membrane.

In addition, roofs are waterproof much faster and the application is much less weather-dependent. If you work with the GuardianWeld system, you will be working ergonomically:

- Working standing upright with GuardianWeld
- Induction welder
- Lightweight
- Robust and solide machine
- Easy to handle

For more information, processing instructions and videos see:  
<https://guardian.nl/en/guardianweldtm-induction-system>





# WHAT IS A HYBRID SYSTEM

When mechanically fastening flat roofs it often happens that narrower membranes or centerline fixings are used, especially in the corners and perimeters.

By using the GuardianWeld™ induction system in these zones, a single membrane width can be used for the entire roof. Fasteners that are normally needed to accommodate for the narrower membrane width or centerline fixings are completely replaced by the GuardianWeld™ induction fasteners.

Suitable for pvc, tpo and epdm (European) membranes.

- Advantages at a glance:**
- Only a single membrane width needed per project
  - Corner and perimeter waterproof faster compared to traditional mechanical fastening
  - Combination of traditional and innovative system
  - Reducing the total amount of fasteners
  - Less and smaller overlaps needed for the membrane

## Project example

Building in the center of the Netherlands

- Height: 12,5m
- Surface area: 7000m<sup>2</sup>
- Corner and perimeter: 900m<sup>2</sup>

Index

Membrane

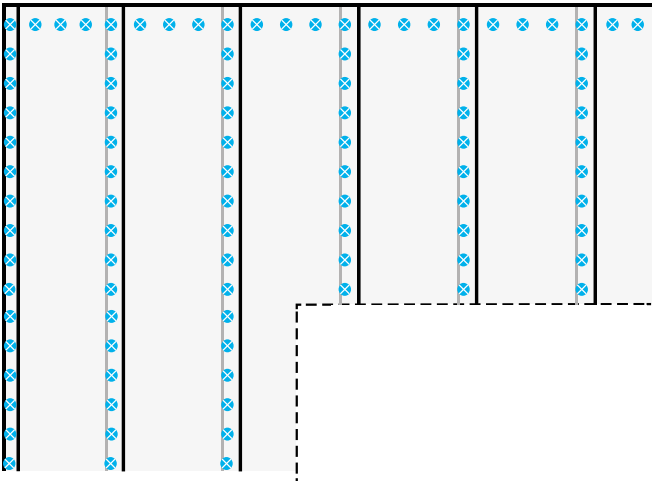
Regular fastener

Overlap

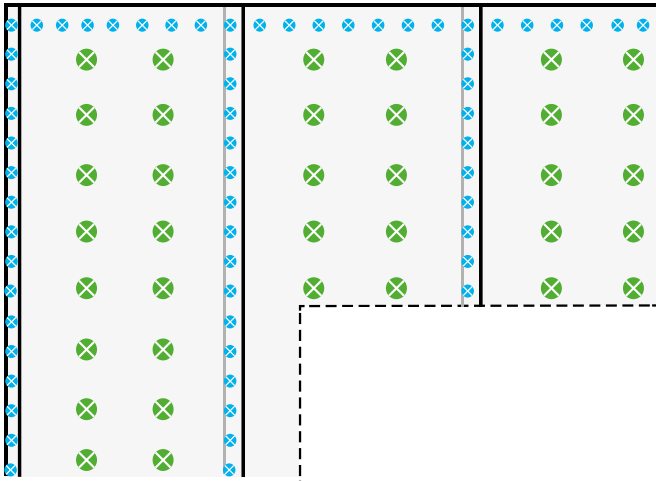
GuardianWeld™ induction fastener

System	Regular fastener	GuardianWeld™ induction fastener	Overlap meters	Membrane surface
Traditional mechanically fastened	4484 pcs	-	1390m	1070m <sup>2</sup>
Hybrid system	2064 pcs	1032 pcs	640m	980m <sup>2</sup>

Example corner and perimeter with narrow membrane width



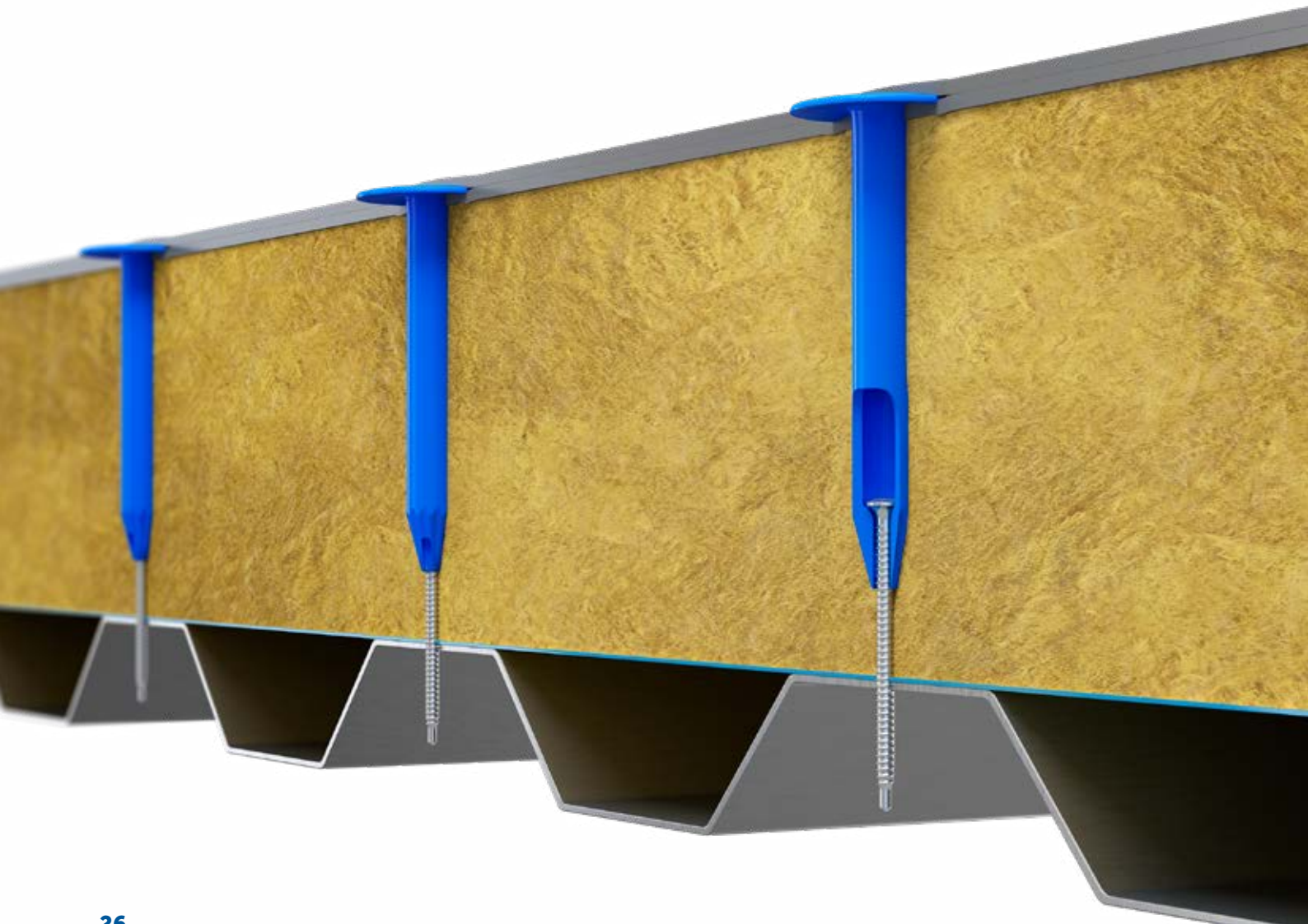
Example GuardianWeld™ hybrid system with wide membrane width



# ROOFING SYSTEMS & FASTENING SOLUTIONS

**This chapter describes the most common mechanically fastened flat-roof systems, together with an overview of the efficient and durable Guardian fastening solutions for each system.**

The European flat roof industry represents an annual volume of around 450 million m<sup>2</sup>. The ratio between synthetic and bitumen membranes varies from one country to the next. In many European countries, the market share of bitumen roof membranes still represents 60% or more of the total number of square meters. However, in most countries, a clear trend is visible towards a rising market share of synthetic roof membranes. Particularly involving large projects, such as distribution centres and warehouses, where synthetic materials are increasingly applied. The diverse Guardian product range offers solutions for every roof build-up.



## Mechanically attached single ply - synthetic roof membrane systems

### Material

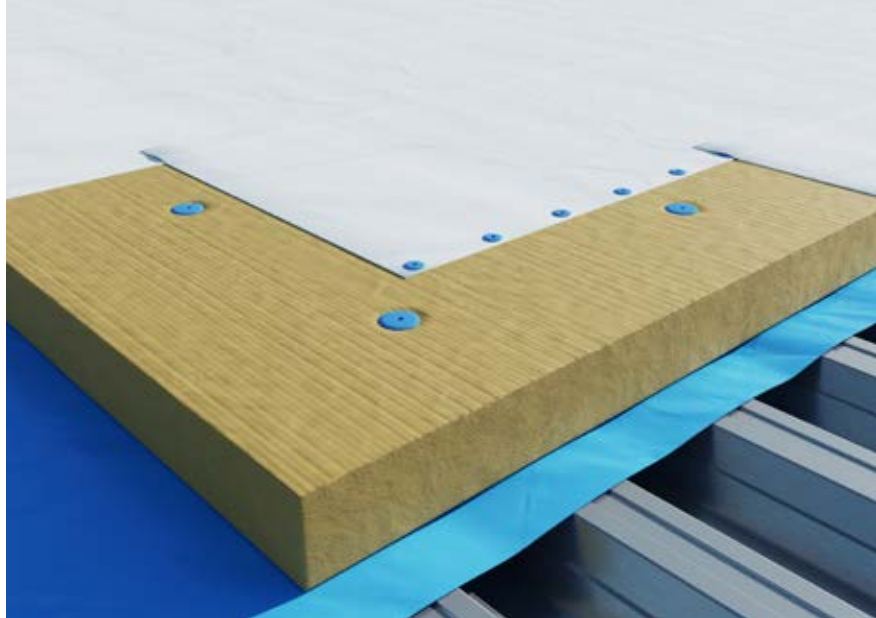
Reinforced PVC, thickness 1,2-2,0 mm

Reinforced TPO/FPO, thickness 1,2-2,0 mm

EPDM, thickness 1.1-2.1 mm

### Common roof membrane widths:

1,0/1,5/1,6/2,0/2,1 meters



Mechanically attached single ply roof systems are applied on various building types, such as shopping centres, logistic centres, schools, hospitals, etc. 'Warm roof' constructions with an assembly made up of a structural roof deck, vapour barrier, insulation material, and covered with a synthetic roof membrane are commonly used in the roofing market. The single ply reinforced synthetic roof membranes are applied with an overlap of approx 100/120 mm. The synthetic membranes are welded with hot air, with a 40-mm wide welding seam in the overlap. The remainder of the overlap, 60/80 mm, is used for the mechanical fastening of tubes that fasten the roof build-up to the roof structure. The producers of synthetic

roof membranes manufacture their membranes in different widths. Wide rolls of 2 meters or more are used for roof zones with the lowest wind load. In perimeter and corner zones, smaller membrane widths are used to resist the higher wind loads in these zones better. The number of fasteners per m<sup>2</sup> is determined by the actual wind load of the roof according to the European wind load standard EN 1991-1-4.

### Guardian standard overlap fasteners for synthetic roof membrane systems

Design load values of 500-700 N/fastener

SP 40 membrane plate, flat and recessed design

SP 8240 membrane plate, flat and recessed design

R 48 membrane tube, round

SP 50 membrane plate, flat and recessed design

SPA 8240 membrane plate, recessed design, for use with automatic setting tool

### Guardian high-performance overlap fasteners for synthetic roof membrane systems

Design load values of 700-900 N/fastener

RB 48 barbed tube; round

### Induction technology

GuardianWeld induction system for fastening of PVC, TPO/FPO and EPDM roof membrane systems

## Induction welding technology

An alternative to overlap fastening is the method with which the roof membrane is bonded to specially developed pressure plates using induction welding technology. In this case, the overlap width will be 60 mm. The pressure plates are not applied in the overlap but on the insulation material according to a predetermined pattern (field fastening) depending on the wind load.

The membrane is then rolled out across the roof. Each plate is bonded to the bottom of the membrane using induction welding equipment (GuardianWeld), without perforating the roof membrane.

### Guardian fastening solutions for synthetic roof membrane systems

Guardian offers a wide range of pressure plates and plastic tubes for the safe fastening of synthetic membrane systems, both on soft and hard substrates (insulation). The standard range of Guardian overlap fasteners has design load values of 500-700 N/fastener, depending on the type of membrane. The high-performance range from the Guardian range achieves design load values as high as 700-900 N/fastener. The design load values for each membrane - plate/tube combination has been determined on the basis of full-scale wind uplift tests according to EN 16002 testing method.

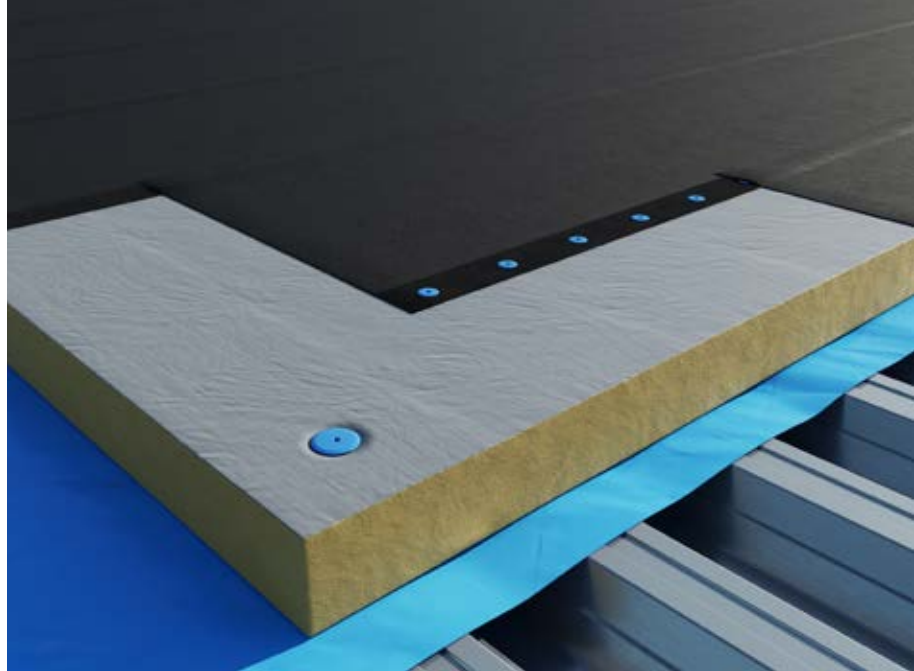
## Mechanically attached one layer - bitumen roof membrane systems

### Material

Reinforced SBS, thickness 3,5–5,5 mm

Reinforced APP, thickness 3,5–5,0 mm

Common membrane width: 1,0 m



Mechanically attached one layer bitumen roof systems are used on residential buildings as well as on commercial and non-commercial buildings. Cold-roof systems with a wooden roofing floor, but mostly warm-roof structures made up of a roofing floor, (vapour barrier) insulation and topped with a one layer bituminous roof membrane, are often used in the Northern European market. An important feature of modern one layer bituminous membranes is that these are manufactured with a reinforcement of high-quality polyester. These roof membranes are normally installed with an overlap of approx 100 mm. The complete overlap is welded using a torch or hot air. The mechanical fasteners that are used to fix the roof build-up to the roof structure are integrated in the welded overlap. The most common membrane width is 1,0 m. The required number of fasteners depends on the wind load of the roof according to the European wind load standard EN 1991-1-4

### Guardian fastening solutions for one layer bitumen based roof systems

Guardian offers a wide range of pressure plates, plastic tubes, and fasteners for the safe fastening of one layer bituminous roof membrane systems, both on soft and hard substrates (insulation). The standard range of Guardian overlap fasteners has design load values of 450-650 N/fastener, depending on the membrane type.

The high-performance range of the Guardian assortment achieves design values of 650-850 N/fastener. The design load for each membrane-plate/tube combination is determined on the basis of full scale wind uplift tests according to EN 16002 testing method.

#### Guardian standard overlap fasteners for one layer bituminous systems

Design values of 450-650 N/fastener

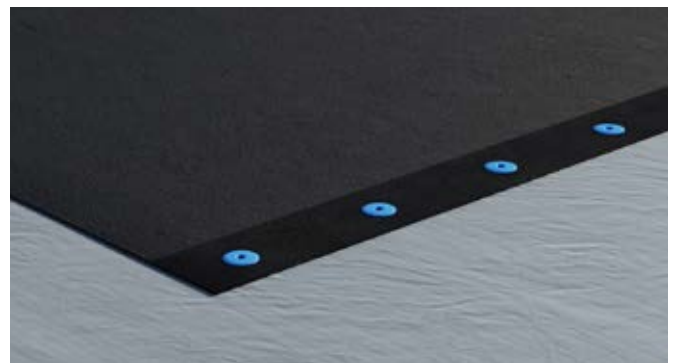
SP 40 pressure plate; round, bottom side flat or recessed

SP 50 pressure plate; round, bottom side flat or recessed

SP 8240 pressure plate; rectangular, bottom side flat or recessed

SPA 8240 pressure plate; rectangular, bottom side flat or recessed, for use with automatic setting tool

R 48 plastic tube; round





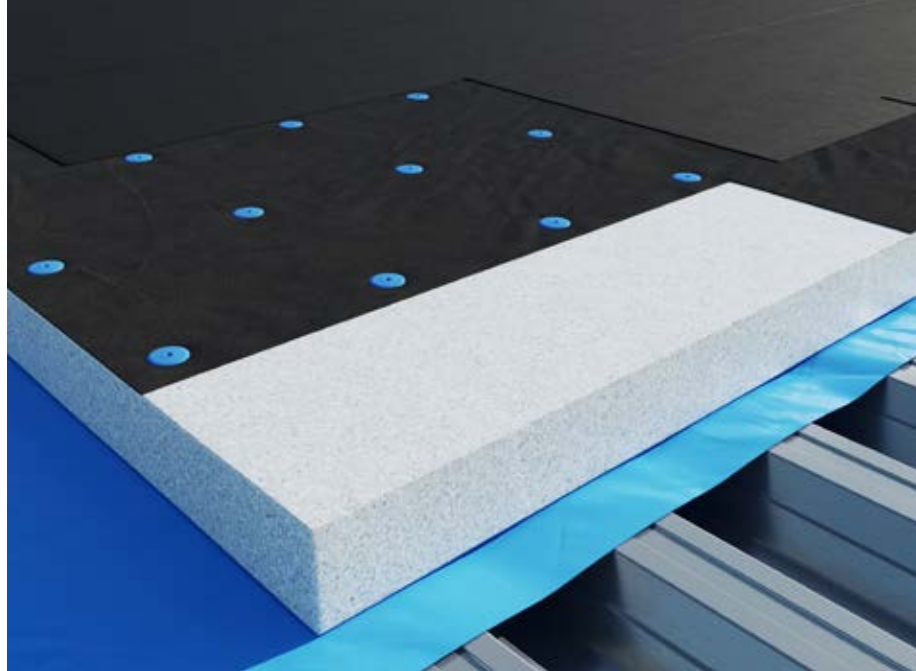
## Mechanically attached two layer - bitumen roof membrane systems

### Material

Basic layer: Polyester-reinforced SBS or APP, thickness 2,5-3,0 mm (2500-3500 g/m<sup>2</sup>)

Top layer: Glass/polyester-reinforced SBS or APP, thickness 3,5-5,0 mm (4000-5000 g/m<sup>2</sup>)

Common membrane width: 1,0 m



Mechanically attached bitumen two layer roof systems are applied on residential buildings as well as commercial and non-commercial buildings. Cold-roof systems with a wooden roofing floor, but mostly warm-roof structures with an assembly of roof structure-vapour barrier-insulation and the multi-layer bituminous roof membrane system above that, are very common in the market.

The European roof membrane market has a wide variety of multi-layer bituminous systems. A distinctive feature of these systems is their base layer, which often has an improved polyester reinforcement compared to the traditional torch-on and bonded systems. This gives the membrane the required strength when tubes and pressure plates are used to fasten the build-up of the membrane system to the roof structure.

### Guardian fasteners for multi-layer bituminous roof membrane systems

Design values of 700-900 N/fastener

#### Method 1

SP 70 membrane plate, flat and recessed design

R 75 standard tube

#### Method 2

SP-40

SP 50 pressure plate, flat and recessed design

R 48 standard tube

## There are 2 methods to mechanically fasten multi-layer bitumen roof systems

### Method 1 Field fastening

The pressure plates or tubes are fastened in the base layer according to a predetermined pattern, independent of the overlaps of the base layer (field fastening). This is done in symmetrical patterns or in patterns adapted to the specific roof structure. When the base layer has been applied/installed, the top layer is then torched, or bonded with hot bitumen on the base layer.

### Method 2 Overlap fastening

This method is widely used in Scandinavian countries. The plates or tubes are fastened in the 10-cm wide overlap of the base layer. The overlap is then torched in the same way as single-layer bituminous systems. The top layer is then burnt or bonded with hot bitumen on the base layer.

## Guardian fastening solutions for multi-layer bitumen based roof systems

Guardian offers a wide range of pressure plates and plastic tubes for the safe fastening of multi-layer bituminous roof membrane systems, both on soft and hard substrates (insulation). The standard range of Guardian overlap fasteners has design values of 450-650 N/fastener, depending on the membrane type. The high-performance range of Guardian pressure plates and tubes achieves design values as high as 650-850 N/fastener. The design load for each membrane/plate-tube combination is determined on the basis of full-scale wind uplift tests according to the EN 16002 testing method.

## Torch on / Pour & Roll single or two layer - bitumen roof membrane systems

### Material

Base layer: glass-reinforced SBS or APP thickness 2,5-3,5 mm/m<sup>2</sup>)

Glass/polyester-reinforced SBS or APP thickness 2,5-3,5 mm/m<sup>2</sup>)

Top layer: glass/polyester-reinforced SBS or APP thickness 3,5-5,0 mm (4000-5000 g/m<sup>2</sup>)

Usual roof membrane width: 1,0 m

Torch on or Pour & Roll single or two layer - bitumen roof membrane systems are very common roof systems. The roof membranes are bonded onto the substrate. These systems are directly bonded onto the roof structure, for example on concrete, or on mechanically fastened insulation boards or underlayers (suitable for bonding).

The insulation boards are fastened to the roof structure by means of pressure plates or tubes. The required fastening pattern (number of fasteners per m<sup>2</sup>) is determined by the wind load of the roof according to the European wind load standard EN 1994-1-4.

### Guardian fasteners for insulation boards and underlayers

SP 70 pressure plate; round, bottom side flat and recessed (thickness 0,70 mm)

R 75 tube

## Adhered single-ply synthetic roof membrane systems

### Material

PVC, TPO or EPDM, with or without lining on the underside.

Common roof membrane width: 1,0 m, 1,5 m, 2,0 m

Adhered single-ply synthetic roof membrane systems are popular in various European countries. Depending on the wind load and roofing system, the roof membrane is completely or partially glued onto the substrate. The systems are usually glued onto mechanically fastened insulation boards or underlayers, boards (suitable for gluing).

The insulation boards or underlayers are installed to the roof structure by means of pressure plates or tubes. The required fastening pattern (number of fasteners per m<sup>2</sup>) is determined by the wind load of the roof according to the European wind load standard EN 1994-1-4.

### Guardian fasteners for insulation boards

SP 70 pressure plate; round, bottom side flat and recessed (thickness 0,70 mm)

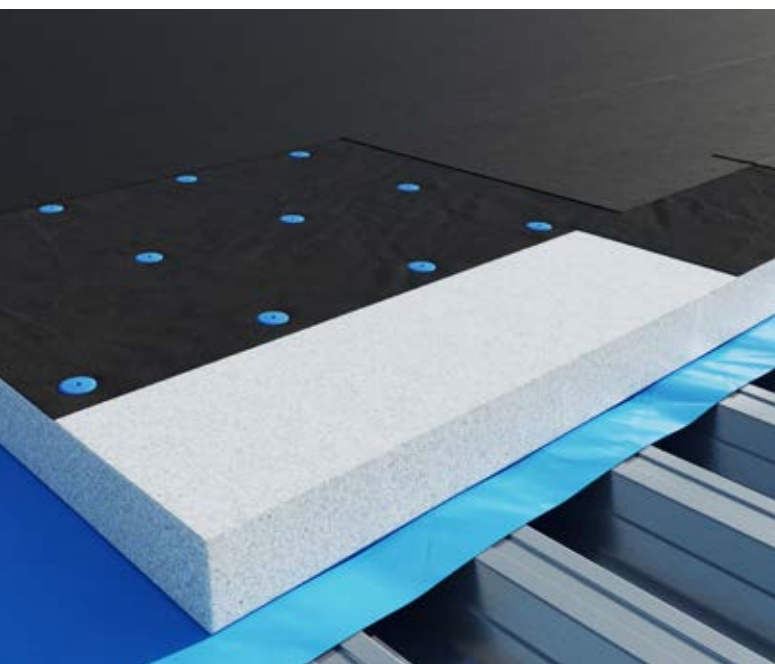
R 75 tube

## Insulation boards glued to roof structure

Insulation boards can be glued to the roof structure in various patterns depending on the wind load of the roof. Buildings with high humidity and high temperatures will benefit from insulation boards that are glued on the inside because this does not require fasteners that could penetrate the vapour barrier. For all other building types and roof structures, mechanical fastening of insulation boards using Guardian tubes and pressure plates provides a clear advantage compared to glued boards.

## Advantages of mechanical fastening of insulation boards:

- Saves application time, especially when the insulation is made up of multiple layers
- Significant savings in application and material costs
- Application at low temperatures possible
- The substrate does not have to be completely dry
- It is possible to perform highly accurate wind load calculations
- Limited thermal bridges with plastic Guardian tubes





# SYSTEMS CIRCULAR CONSTRUCTION

The new circular economy revolves around the intelligent use of resources, products and commodities such that they can be reused over and over. A closed loop. For buildings for example, circular means that materials are reused. An existing building provides raw materials for a new building.

In order to make a flat roof circular, mechanical fastening is the best solution. The tube-screw combinations from Guardian can be disassembled and are reusable; they are easy to screw out of the roof build-up. The Guardian tubes are made of polypropylene (PP). This material is not affected by moisture and also contains an anti-degradation filling, which makes the products very long-lasting. Because our products can be screwed out of the roofing membrane and insulation, these components of the roof build-up are also reusable. When you choose Guardian products, you choose a completely removable and reusable flat roof!

Last year, we started production of tubes that contain 10% recycled material from old tubes and rejected batches. This percentage will increase still further in the future. With this production process, the entire waste stream is less than 0.02%!



At Guardian, we look further than just making our own products more sustainable. It is important to us that the total build-up of the roof is built circularly. With the tube-screw combinations from Guardian, you can keep ahead with us in this development!

## ISO 14001

Guardian values sustainability a lot. People, planet and profit are woven into our DNA. Our contribution to a better environment shows itself in detachable, recyclable products and now even with a ISO 14001 certified production location.

Even though investing in a sustainable policy and a systematic approach to environmental aspects is not new to Guardian, receiving the ISO 14001 certificate goes a lot further. This proves that Guardian works on a continuous reduction of environmental impact. We do this by working according to an environmental-aspect register. By controlling environmental risks surrounding our products and processes and comply with all legal regulations.



Not affected  
by moisture



High impact polypropylene  
and polyamide material  
(PP, PA)



Not subject to  
degradation



Guardian R48,  
RB48, R75



Removable =  
circular



100% recyclable  
material

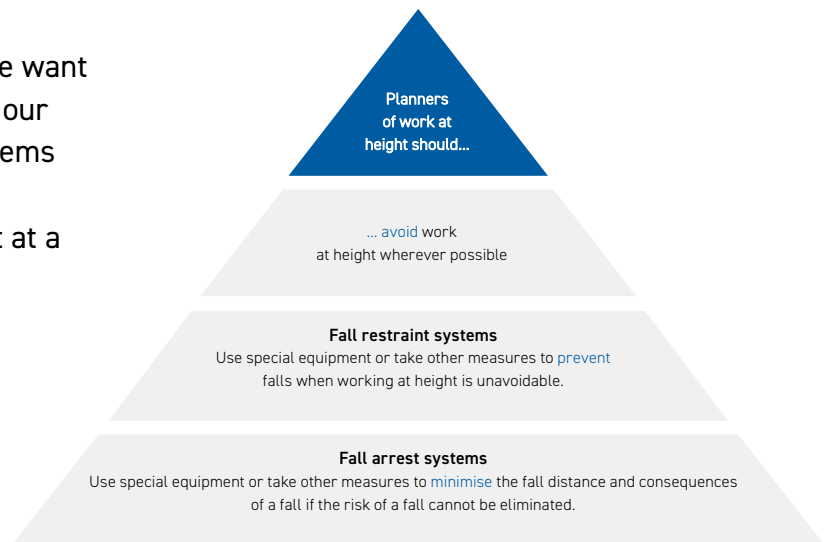


Mechanical fastening  
Steel, concrete, wood

# SYSTEMS FALL PROTECTION



Guardian stands for protection, safety. We want to contribute to work safely on flat roofs, our area of expertise. The fall protection systems offered by Guardian are characterised by high quality and continuous development at a competitive price.



The extensive knowledge and experience we have gained in developing our fastening solutions for flat roofs has helped us to develop these systems for working safely at height.

Alongside systems for horizontal applications, we also offer solutions for vertical systems and overhead applications. Guardian also provides comprehensive technical support such as installation assistance and on-site training.

Every year, 6,300 people report to a first-aid post after a fall from height during work. Some 20% (1,200) have to be admitted to hospital, and 3% (36) die. Our goal is to reduce these numbers as much as possible.

A well-known safety rule at locations where work at height is carried out is:

***'Try to avoid working at height wherever possible!'***

We must try to minimise the risks together. Current legislation and regulations stipulate that the best thing to do is use systems for 'workplace limitation' when working on roofs. The purpose of the fall protection systems offered by Guardian is to reduce the risk of falling to a minimum.



#### Fall arrest systems

The design of a fall arrest system must always be supported by published calculations applicable to the roof structure in question. In addition, the height of the building and fall clearance must be considered.

Special PPE is required for this type of fall arrest system. In addition, users must be trained and a rescue plan must be prepared.



#### Fall restraint systems

A standard fall restraint system is installed at 2,3 meters from the roof edge.

The users path, and what they have access to can be dictated/controlled.

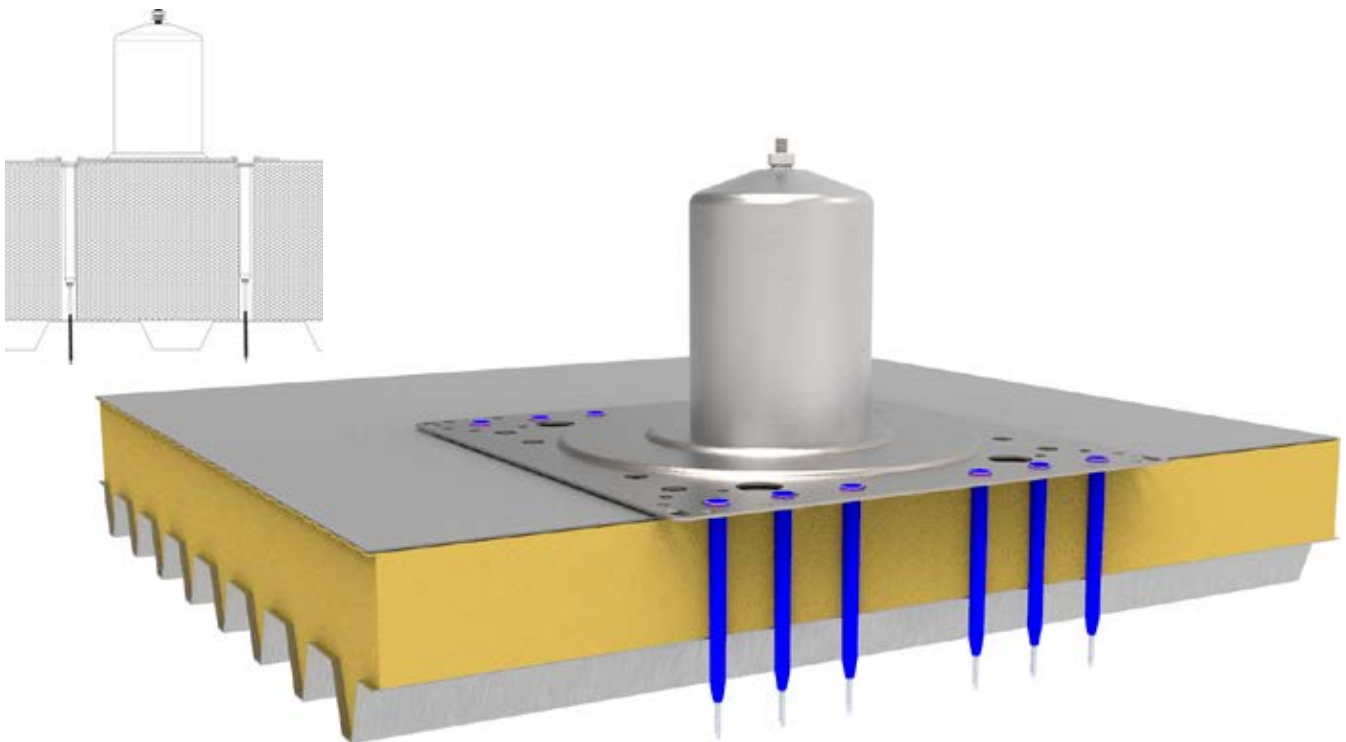
This type of fall restraint system requires little PPE and users do not need specific training.

## Fastening base plate for a flat roof structure

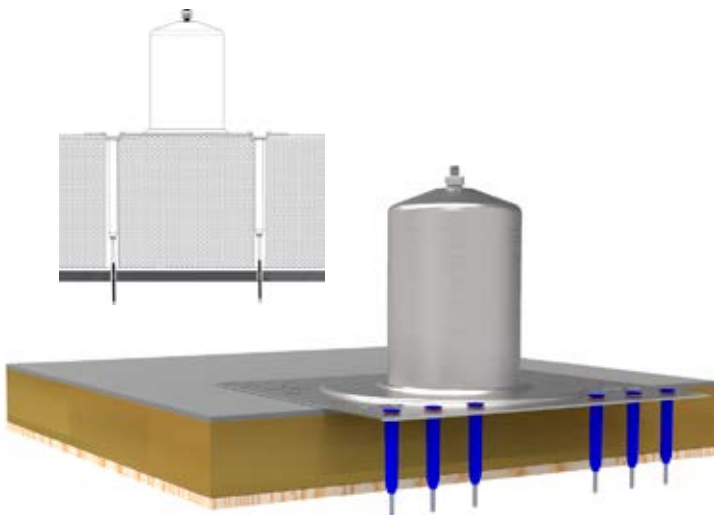
We focus on restraint systems. The focus is on temporary fall protection by means of an anchor point or permanent fall protection by means of an anchor point or line system. The fall protection systems we offer and apply are suitable for almost all sorts and types of flat roofs. The base plate is attached in combination with the Guardian High Performance tube screw combination. The GWT tube is available in lengths from 60 mm to 430 mm. Also possible to process with the variable adjustable fastener: the GWT-ASTL.

Ideal for extremely fast fixing in concrete, steel or wooden roofs. The warranty period for our fall protection systems ranges from 1 to 25 years. Using our fall protection systems has several advantages. These include cold-bridge reduction, labor savings and the fact that the system can also be used on a circular basis.

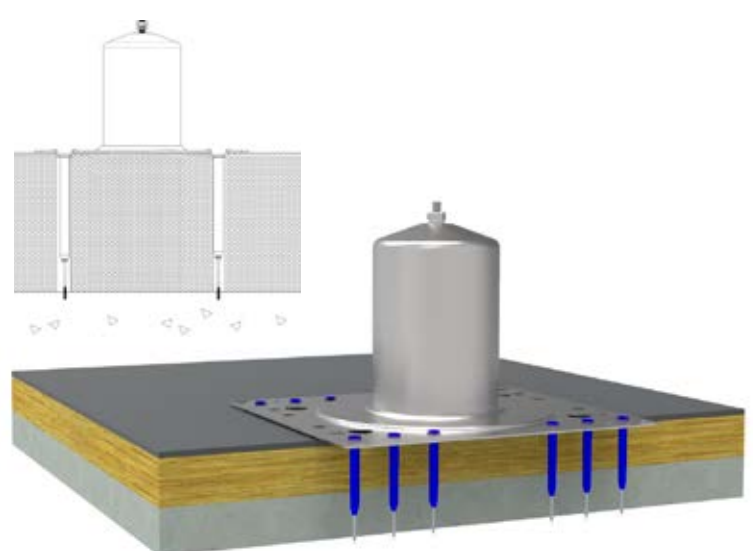
Flat roof structure on steel substrate



Flat roof structure on wooden substrate



Flat roof structure on concrete substrate

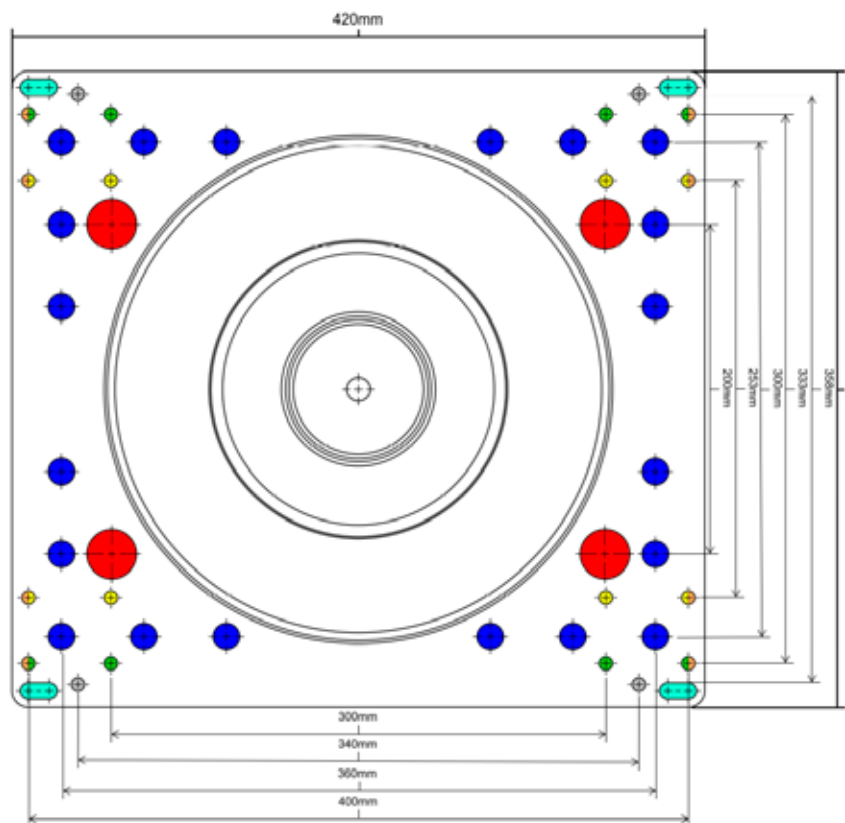
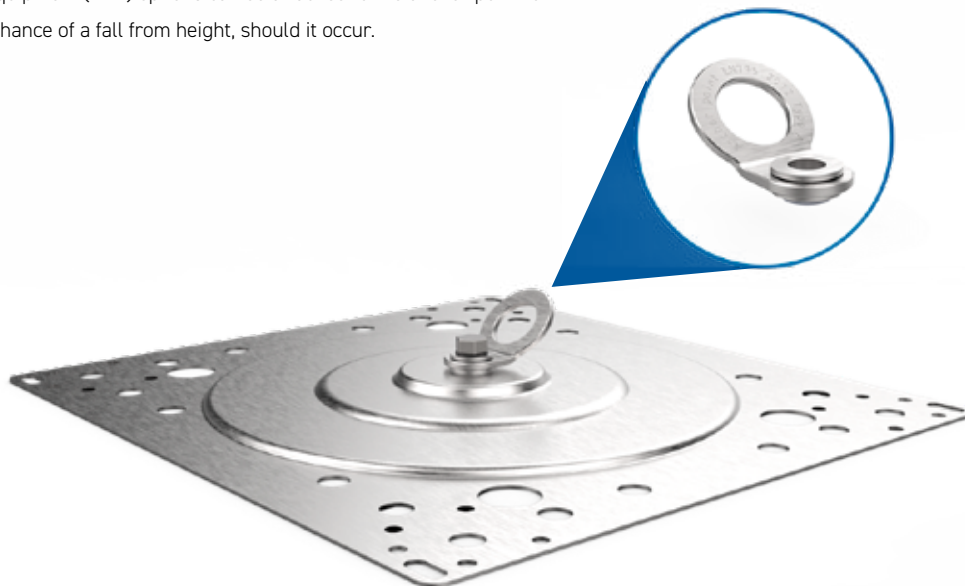




## Anchor points

The anchor points can be installed very quickly and easily on bituminous, PVC and liquid applied flat roofs in conjunction with many OEM materials. Once installation is completed by a skilled installer, a number of personal protective equipment (PPE) options can be attached to the anchor point to reduce the chance of a fall from height, should it occur.

The anchor point can be used both temporarily and permanently as a restraint system. One of the advantages is that it is cost-effective and can later on be expanded as a line system.



- **Red:** 4 x 30mm (240 x 300mm) holes for gravity toggles with toggle cups- 4 required into 0.7mm metal and 18mm ply & OSB decks.
- **Blue:** 10 x 16mm holes for sleeve and stainless steel fastener into 0.7mm metal, concrete, and timber decks. Please consult SFS for fixing numbers and details.
- **Green:** 8 x 8mm rivet holes for 333mm sheet crown centres
- **Orange:** 8 x 8mm rivet holes for 400mm sheet crown centres
- **Yellow:** 8 x 8mm rivet holes for 300mm sheet crown centres
- **Purple:** 8 x 8mm rivet holes for 250mm sheet crown centres.
- **Grey:** 4 x 8mm rivet holes @ 358mm centres for fixing Soter™ seam clamp for 400mm standing seam roofs.
- **Turquoise:** 4 x Elliptical holes @ 400 x 300mm centres for fixing S5 clamp for 400mm & 300mm standing seam roofs.
- **Black:** 4 x 8mm rivet holes @220mm centres for fixing of leg straps for special applications.

# CERTIFICATION & APPROVAL

Since July 2013, new European regulations for construction products are in force, with a mandatory CE marking for products covered by a harmonised standard and a voluntary CE marking for products covered by a European Assessment Document (EAD) (formerly ETAG (European Technical Approval Guideline)).

**The European NANDO database contains more than 550 harmonised standards for the various construction products. The European regulations for construction products are applied in the same way in all 28 member states, as well as in Norway, Liechtenstein, Switzerland, and Turkey.**

Mechanically fastened, flexible, waterproof systems are not covered by a harmonised standard but by a European Assessment Document (EAD) (former ETAG 006). Based on the EAD 030351-00-0402 guidelines, the products are tested, the production process monitored, and then approved/certified in a European Technical Approval (ETA). When a manufacturer obtains an ETA certificate, he is obliged, according to the European building regulations, to provide the packaging of the certified products with a CE marking. In addition, a Declaration of Performance (DoP) has to be made available for these products. Guardian has DoPs available on the website: [www.guardian.nl](http://www.guardian.nl).

For flat-roof fasteners, it is very important that these products are tested according to the EAD 030351-00-0402 guideline. For each product, the performance and test results are stated in the ETA/DoP. The characteristic values for the fasteners, in combination with pressure plates and tubes, together with the wind uplift tests, determine the design load that is used for a wind load calculation according to EN 1991-1-4.

Guardian ETA-08/0285 represents 40 different products and offers fastening solutions for all types of roof structures. The different performance levels, including unique characteristic values for steel, concrete and wooden constructions, make it possible to choose the optimum fastener for each project.

## Sintef

SINTEF is an independent Research organization, founded in 1950. SINTEF creates value through knowledge generation, research & innovation and develops technological solutions that are put into practice. Many of the Guardian products also have a SINTEF certification. See the product overview for the certifications achieved per product.

## ISO 14001

Guardian values sustainability a lot. People, planet and profit are woven into our DNA. Our contribution to a better environment shows itself in detachable, recyclable products and now even with a ISO 14001 certified production location.

Even though investing in a sustainable policy and a systematic approach to environmental aspects is not new to Guardian, receiving the ISO 14001 certificate goes a lot further. This proves that Guardian works on a continuous reduction of environmental impact. We do this by working according to an environmental-aspect register. By controlling environmental risks surrounding our products and processes and comply with all legal regulations.

## ISO 9001

This standard is based on a number of quality management principles, including strong customer focus, top management motivation and commitment, process approach and continuous improvement. These principles are detailed in ISO's Quality Management Principles. Using ISO 9001 helps ensure that customers receive products and services of consistent, good quality, which in turn provides many business benefits.



**Producer: Guardian |**  
**[www.guardian.nl](http://www.guardian.nl)**  
**ETAG 006**  
**ETA 08/0285**  
**FPC: 1071-CPR-1510**



**FM Approval is one of the highest achievable quality marks for risk reduction and loss prevention. It is issued by one of the largest insurers worldwide in this field: FM Global. Here's how it works, and what such a seal of approval is useful for.**

FM Approval is the seal of approval that FM Global issues on products that meet their high standards. It is a requirement of FM Global to be insured by that that the materials used for a building to be insured are FM Approved. This is because, as one of the largest property and real estate insurers in the world, they want to ensure that what they insure is of the highest possible quality in every case. By doing so, they reduce the risk of damage, and thus ultimately compensation.

## How does such a test work?

There, our mechanical fasteners - which we produce ourselves - roofing membranes and roof insulation - from other manufacturers - are tested in a system build-up. By FM Approvals, together with us.

A 3D architectural rendering of a building facade assembly. The assembly consists of several layers: a white outer panel with a faint, diamond-shaped logo containing the letters 'FIM' and the word 'APPROVED' below it; a thick yellow insulation layer; and a blue membrane at the bottom. Several blue pushpins are shown securing the layers together. The assembly is positioned above a grey metal grate or drainage system.

If a product passes the FM Approval test, it may be called FM Approved. You can tell by the seal: the letters „FM“, depicted in a diamond, printed on the product or on the label of the packaging.



For an overview of all current Guardian fastening products in combination with various types of roofing membranes with FM approvals, check the overview provided. Or check our site: [www.guardian.nl](http://www.guardian.nl)

All approved systems are listed in the Roofnav database.

[illegible]

# DESIGN LOAD

## WIND LOAD CALCULATIONS

To define the (system) design load for a mechanically fastened roofing system, it is important to study the strength of the various components.

According to CEN/TS-17659, the weakest link determines the (system) design load. The characteristic value of the fastener (pull-out) and the tube/pressure plate (pull-over) is obtained from the Guardian ETA-08/0285. The characteristic value of the roof membrane (pull-through) and the tube or pressure plate is obtained by means of full-scale wind uplift tests according to EN 16002.

Always use the lowest design load ( $W_{adm}$ ) when the pull-out, pull-through and pull-over values are to be compared.

$$W_{adm} = W_{char} / \gamma_m$$

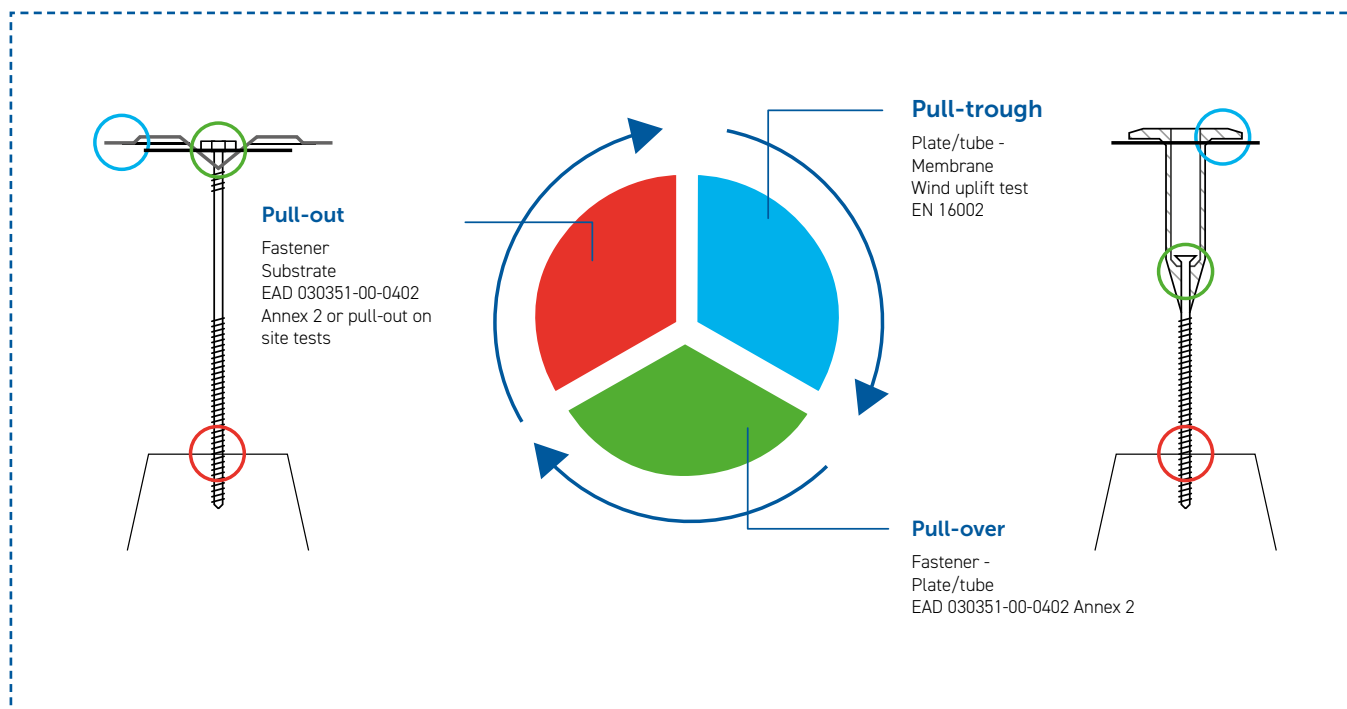
$W_{adm}$  = Design load

$\gamma_m$  = Safety factor varies for each substrate and testing method

$W_{char}$  = Characteristic load

**It is important to compare the following values (see drawing):**

- Pull-out strength of the fastener and substrate; small-scale test EAD 030351-00-0402 Annex 2.
- Pull-through strength between plate/tube and roof membrane, full-scale wind uplift test EN 16002
- Pull-over strength between fastener and plate/tube, small-scale test EAD 030351-00-0402 Annex 2.



## The weakest link determines the (system) design load value



### Example

Roof membrane PVC 1,2 mm  
Plate/tube: Guardian RB-48

Full-scale wind uplift test EN 16002,  $W_{char}$ : 1200 N

$\gamma_m = 1,5$

Design load:  $W_{adm} = 1200/1,5$

Design load:  $W_{adm} = 800$  N

Substrate: Steel deck 0,75 mm

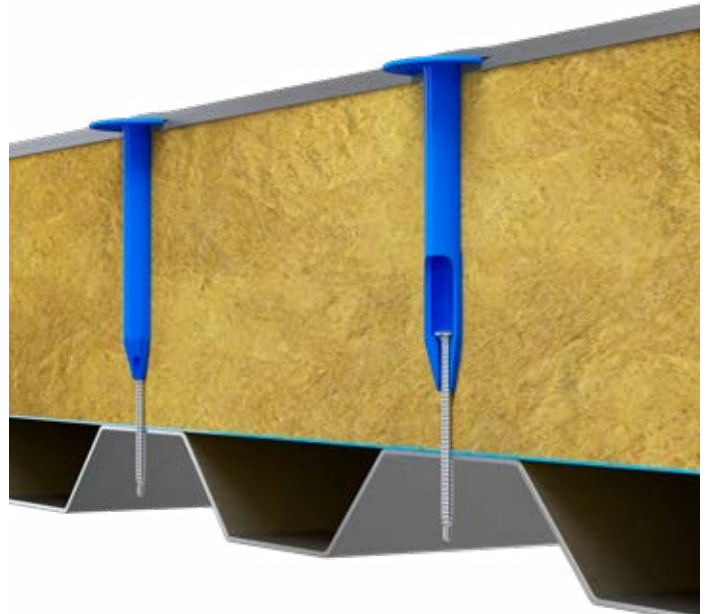
Fastener: Guardian BS 6,1

Characteristic value,  $W_{char}$ : 1980 N

$\gamma_m = 1,8$

Design load:  $W_{adm} = 1980/1,8$

Design load:  $W_{adm} = 1100$  N



### Compare

Design load 800 N vs Design load 1100 N

System design load = 800 Newton

Test/ondergrond	Materiaal/test specificaties	Test methode	$\gamma_m$	Opm.
Pull-through	Strength roof membrane with plate/tube	EN-16002	1.5	
Pull-over	Strength fastener with plate/tube	EAD-030351-00-0402	1.5	
Steel $\leq 0.65$ mm	Yield strength $\geq 280$ MPa	EAD-030351-00-0402 or Pull-out test on site	2.0	
Steel $\geq 0.70$ mm	Yield strength $\geq 280$ MPa	EAD-030351-00-0402 or Pull-out test on site	1.8	
Concrete	Min C25/30	EAD-030351-00-0402 or Pull-out test on site	2.1	
Llightweight concrete	$\geq 500$ kg/m <sup>3</sup>	EAD-030351-00-0402 or Pull-out test on site	3.0	*1
Wood - softwood $\geq 20$ mm	G4-3	EAD-030351-00-0402 or Pull-out test on site	1.86	*2
OSB $t \geq 20$ mm Plywood $t \geq 20$ mm	EUR class 3 P30	EAD-030351-00-0402 or Pull-out test on site	1.86	*2

\*1 Recommended site pull-out test

\*2  $\gamma_m$  is the total safety factor including Kmod (climate class 3, short-term load)

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