

All tests in this report are executed according to the ISO 9001  
 certified Quality management system of the BBRI

 Test Centre  
 Offices  
 Head Office

 B-1342 Limelette, avenue P. Holoffe 21  
 B-1932 Sint-Stevens-Woluwe, Lozenberg 7  
 B-1000 Brussels, rue du Lombard 42

 Tel.: +32 (0)2 655 77 11  
 Tel.: +32 (0)2 716 42 11  
 Tel.: +32 (0)2 502 66 90

## TEST REPORT

<b>Laboratory</b>	ROOF AND FAÇADE ELEMENTS (CAR)	<b>O/References</b>	DE 651XL019 CAR 13222/1BIS (85) Page 1/9
-------------------	--------------------------------	---------------------	---

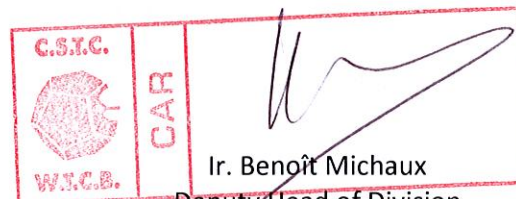
<b>Requested by</b>	<b>OFITECH</b> Zone Industrielle BP.17 F - 76 480 YAINVILLE Tel. : 0033 235 05 90 74 Fax : 0033 235 05 90 70		
<b>Date of the order</b>	2013.09.18	<b>Samples registration</b>	2013 – 50 – 035/1
		<b>Date of receipt of samples</b>	2013.11.19
<b>Date of the test</b>	2013.11.28 & 29		
<b>Drafting date of the report</b>	2015.04.28 (cancels and replaces test report CAR 13222 of 2013.12.12)		
<b>Test carried out</b>	Wind uplift test on roof element (metal + « ONDUVILLA » + screw « SPEEDY SCREW »)		
<b>References</b>	ETAG 006 – "Technical guidelines for approval of waterproof systems of mechanically fixed roofs" – Version 2000		

This test report contains 9 pages and no appendix. This test report may only be reproduced in its entirety. Each page of the original report has been stamped (in red) by the laboratory and initialled by the head of laboratory. The results and findings are only valid for the tested samples.

- No sample
- Sample(s) subjected to destructive test
- Sample(s) to be removed from our laboratories 30 calendar days after sending of the report, save in the case of a further written request.



 Ir. Edwige Noirfalisce  
 Deputy Head of Laboratory



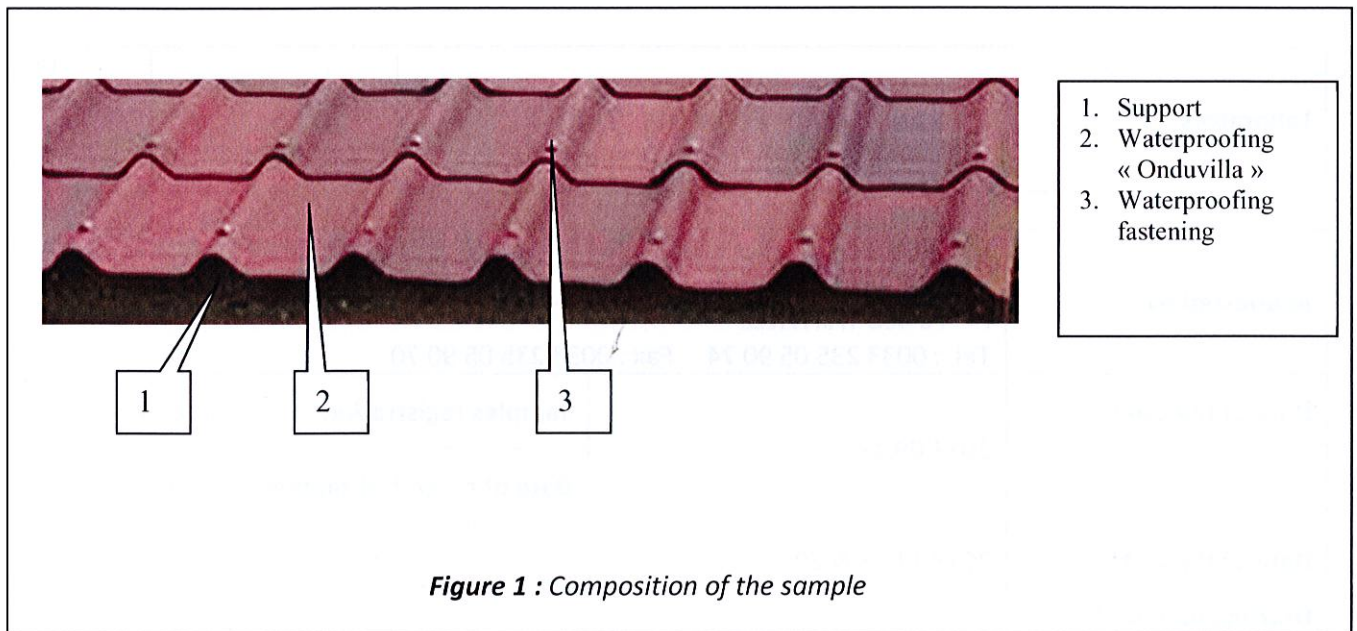
 Ir. Benoît Michaux  
 Deputy Head of Division

## 1. DESCRIPTION OF THE SAMPLE

The sample was made at the BBRI test station in Limelette. It is a roofing sample made by the applicant. The composition and dimensions are given here below.

### 1.1. Composition and dimensions of the sample

The composition of the sample is given in figure 1. The sample is laid under the test box (see figure 3)



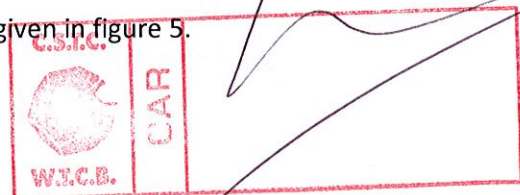
- Dimensions of the sample : 2000 × 2000 mm
- Dimensions of the test box : 2000 × 2000 mm

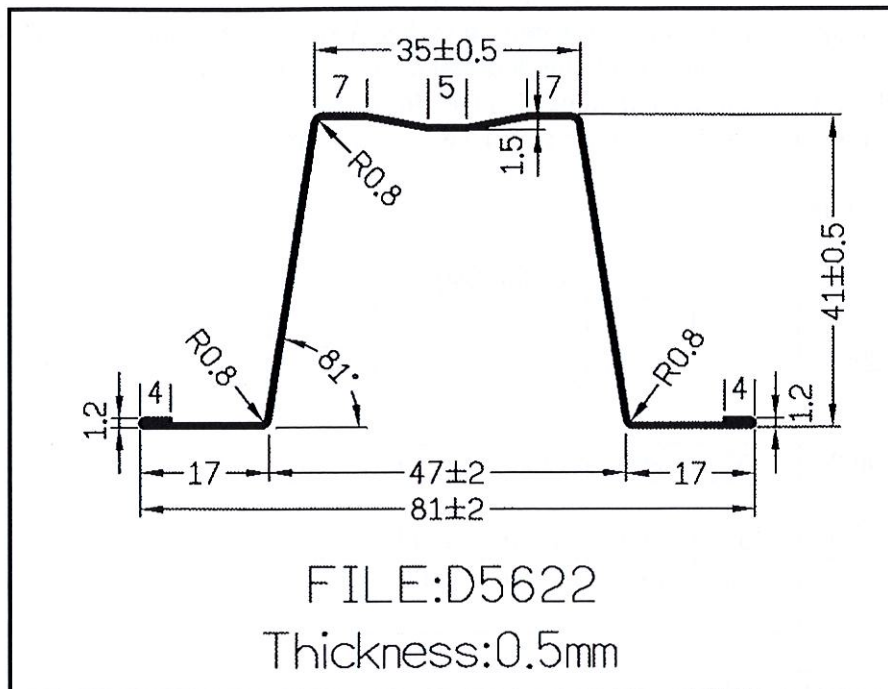
### 1.2 Description of the sample

The characteristics of the elements constituting the sample are given by the applicant and are mentioned below (\*potential observations added of the laboratory):

<b>1</b>	<b>Support</b>	Metal profiles; form and dimensions see figure 2 ; distance between two profiles: 320 mm
<b>2</b>	<b>Waterproofing</b>	Corrugated bitumen tiles « ONDUVILLA PPHR » ; thickness : 2,9 mm ; lateral overlapping: 1 corrugation + technical datasheet figure 6.
<b>3</b>	<b>Waterproofing fixing</b>	Screw « ONDULINE UNIVERSAL SPEEDY SCREW » Ø 3,9 × 60 mm ; one screw per corrugation + technical datasheet figure 7.

The disposition of the different components is given in figure 5.

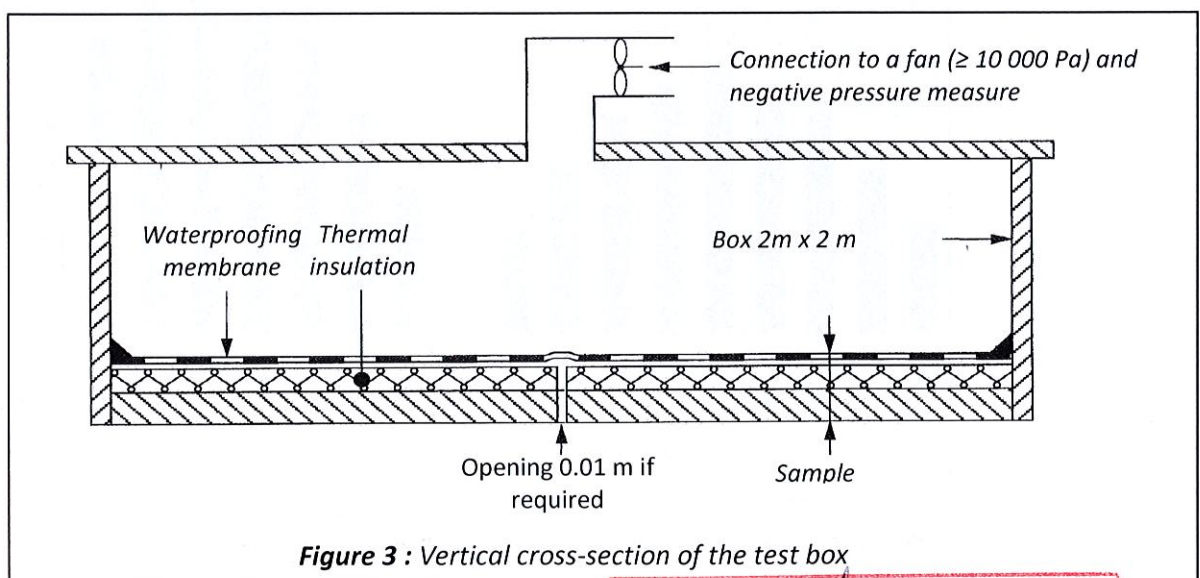




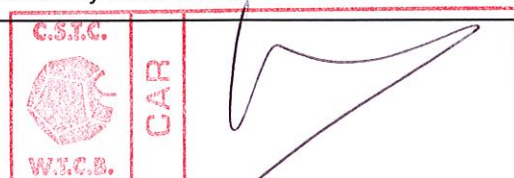
**Figure 2** : Dimensions of the used metal profiles

## 2. DESCRIPTION OF THE TEST

The windresistance of a roof system is determined based on a pressure chamber test in accordance with the guidelines ETAG 006 – “Technical guidelines for approval of waterproof systems of mechanically fixed roofs” – Version 2000 (see figure 3).



**Figure 3** : Vertical cross-section of the test box





The negative pressure cycles are applied under the test box with a fan and an electronically controlled valve system allowing the creation of cycles. A storm is a sequential combination of negative pressure cycles. One applies the depressions indicated in figure 4. The test continues until the breaking of the sample per steps of 500 Pa for  $Q_{100\%}$ .

The maximum negative pressure of each storm, i.e.  $Q_{100\%}$ , is defined for illustration in table 1.

**Table 1** : Test sequence

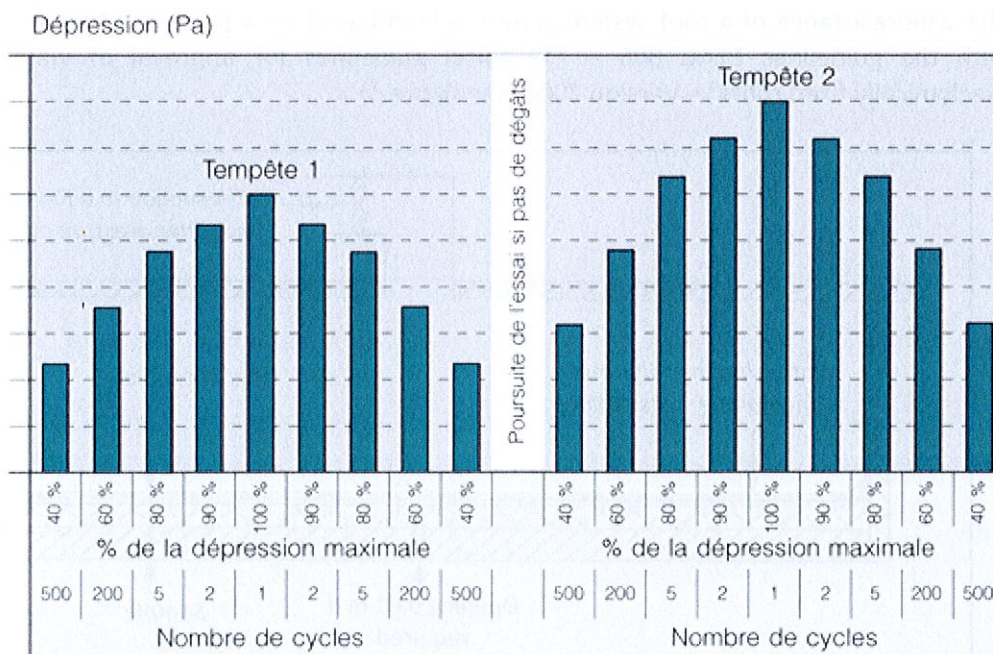
Suction (Pa)									
Nb	500	200	5	2	1	2	5	200	500
%Q	40%	60%	80%	90%	100%	90%	80%	60%	40%
Quantity of storms									
4	400	600	800	900	1000	900	800	600	400
1	200 000 cycles (if required)								
1	600	900	1200	1350	1500	1350	1200	900	600
1	800	1200	1600	1800	2000	1800	1600	1200	800
1	...	...	...	...	...	...	...	...	...

Nb : number of cycles performed.

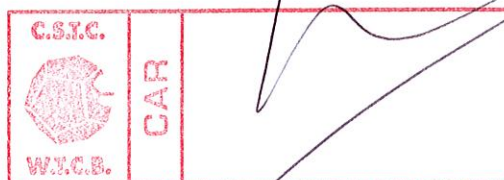
%Q : % of the maximum negative pressure of the storm.

We continue the test up to the failure of the sample. The mode of failure is specified in the test report.

The  $Q_1$  value is the maximum value of the last completed storm carried out before the failure. This value is given in the test report.



**Figure 4** : Sequential combination of negative pressure cycles during a storm



#### 4. RESULTS OF THE TEST

The test sequences are described in table 2.

**Table 2** : Remarks during the test sequences

Number of storms	Maximum negative pressure $Q_{100\%}$	Remarks
4	1000 Pa	No remark
1	1500 Pa	No remark
1	2000 Pa	No remark
1	2500 Pa	No remark
1	3000 Pa	No remark
1	3500 Pa	No remark
1	4000 Pa	No remark
1	4500 Pa	No remark
1	5000 Pa	No remark
1	5500 Pa	No remark
1	6000 Pa	No remark
1	6500 Pa	Rupture of the sample

The test has determined  $Q_1 = 6000$  Pa.

The following modes of failure can occur:

- Break of the support,
- Break of the insulation boards,
- Delamination in the insulation or between the insulation and its facing,
- Failure of the waterproofing system,
- The insulation is punched by a mechanical fastener,
- A mechanical fastener detaches from the supporting element,
- The insulation board detaches from the vapour barrier or from the supporting element,
- The vapour barrier detaches from the supporting element.

The examination of the sample reveals that the rupture is due to the extraction of a fastening screw (photo 1).







Fastening screw extracted  
from the support

**Photo 1** : Roof element after test and extracted fastening screw

---

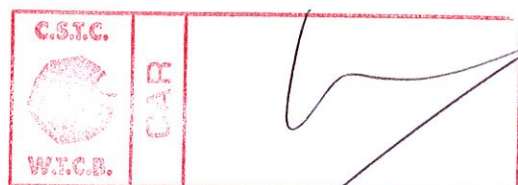
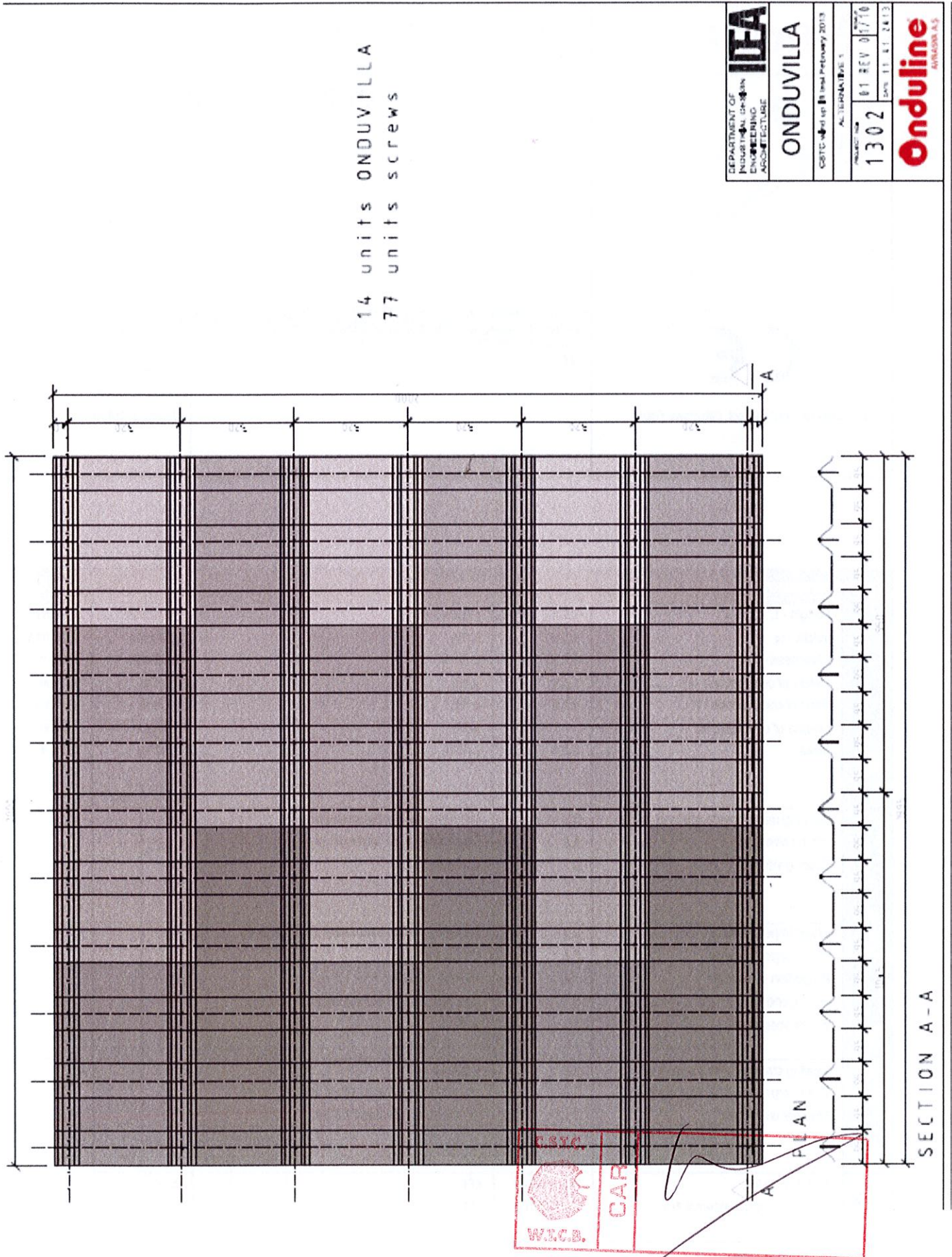



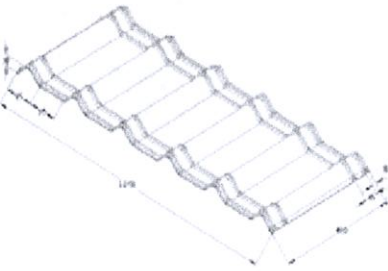



Figure 5 : Placement of the roofing tiles « ONDUVILLA PPHR » + fasteners

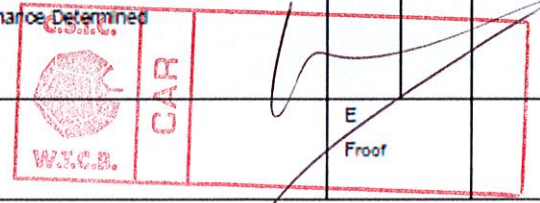




**Figure 6 : Technical datasheet of roofing tiles « ONDUVILLA PPHR »**

	<b>TECHNICAL DATA SHEET</b> CORRUGATED BITUMEN TILES	Date: September 6, 2013 Onduvilla-SR-09-05-COLOR (400x1070x2.4mm - 97x38) 04038
	<b>ONDUVILLA PPHR</b>  Profile: 6 Corrugations + 5 flat parts - 97 x 38 Dimensions: 400 x 1070 x 2.9 in mm Indicative weight: 1.28 kg Intended use: Product for Roofing	
 ETA-10/0018 Corrugated Bitumen Tiles	<b>General Information</b> Special conditions of installation are required (refer to installation guide).	<b>Color Range</b> <ul style="list-style-type: none"> <li>• Black</li> <li>• Shaded Red</li> <li>• Shaded Brown</li> <li>• Shaded Green</li> </ul>

STANDARD CHARACTERISTICS		ETA Ref.	Requirements	Target	Tolerances
GENERAL PROPERTIES	Length - L	1.2.1	[-0,2% ; +1%]	1070 mm	± 20 mm
	Width - w	1.2.1	± 2%	400 mm	± 17 mm
	Thickness - t	1.2.1	± 10%	2,90 mm	± 0.3 mm
	Height of corrugations - H	1.2.1	± 6%	38 mm	± 2 mm
	Pitch of corrugations - P	1.2.1	± 3%	97 mm	± 3 mm
	Module of corrugations	1.2.1	± 3%	195 mm	± 6 mm
	Mass	1.2.1	± 10%	1,28 kg	± 0.1 kg
MECHANICAL PROPERTIES	Bending under downward load	2.5	No Performance Determined	C <sup>(1)</sup>	NC <sup>(1)</sup>
	Impact strength	2.6	No Performance Determined		
	Tearing strength	2.7	> 200 N	☑	
PHYSICAL PROPERTIES	Water impermeability	3.2	No water underneath sheet after 48 hours	☑	
	Water Impermeability	2.4	EOTA TR 033	☑	
	Proportion of bitumen	2.4	Bitumen > 40%	☑	
	Homogeneity	3.2	No area > 1 cm <sup>2</sup> without bitumen	☑	
	Water absorption	3.2	< 20%	☑	
DURABILITY	Tearing strength after freeze/thaw	2.8	> 200 N	☑	
	Water impermeability after ageing	2.9	No water underneath sheet after 48 hours	☑	
	Thermal coefficient	2.10	No Performance Determined		
FIRE TEST	Reaction to fire	EN 13501-1	ITT	E	
	Resistance to an external fire	EN 13501-5	ITT	Froof	





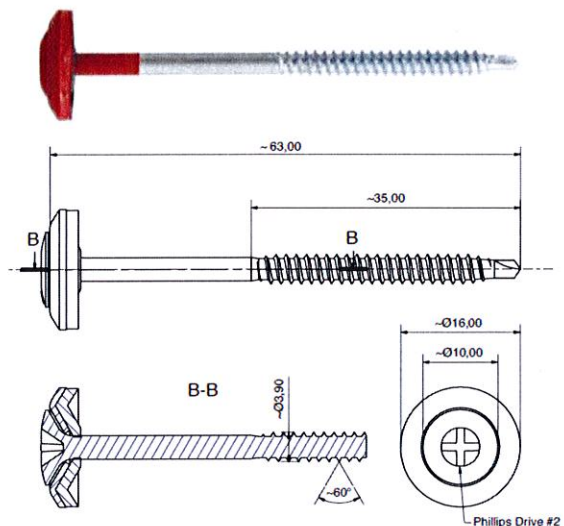
**Figure 7 : Technical datasheet of screws « ONDULINE UNIVERSAL SPEEDY SCREW » 1**

# SCREW FOR ROOFING - 60 (+3) mm

## TECHNICAL DATA SHEET

### SELF DRILLING SCREW FOR FASTENING OF ROOFING SHEET TO WOOD/STEEL

Nominal diameter:	Ø3.9 mm
Length(L):	60 (+3) mm
Head:	LP™ (low profile) head with Phillips drive
Material:	Carbon steel (C1016 - C1022)
Drill point:	#15
Drill capacity:	Max. 2.0 mm (steel 280GD)
Washer:	Ø16mm M-washer in aluminium vulcanized EPDM rubber
Surface treatment:	Electroplated, 7 µm zink with blue chrome passivation
Service class:	2 (acc. EN 1995-1-1)
Corrosion category:	C2 (acc. EN ISO 12944-6)



## TECHNICAL DATA

### CARRYING CAPACITY

The carrying capacity is calculated in accordance to the current standards. The tensile capacity for the connection are the minimum values of the pullout values and the tensile resistance of the screw. The head pull-through resistances is not taken into account.

These theoretical values must be considered indicative since the conditions of the construction site may vary. Practical tests of the specific application are recommended for verification of the listed values.

### ASSUMPTIONS

Supporting object: Steel S280GD - EN 10346  
 Supporting object: Structural timber, C24 ( $\rho_s = 350\text{kg/m}^3$ )  
 Fixed object: Roofing sheet  
 $L_g$  = Setting depth of in the supporting object [mm]  
 $F_{rd}$  = Design resistance [kN]  
 The values are in kN (1kN  $\approx$  100kg)  
 Safety factor:  $\gamma_M = 1.35$ ,  $k_{mod} = 0.90$

### TENSILE CAPACITY IN STEEL

$L_g$	1,0	1,25	1,50	1,75	2,0
$F_{rd}$	0,47	0,59	1,01	1,18	1,35

### TENSILE CAPACITY IN WOOD

$L_g$	20,0	25,0	30,0	35,0
$F_{rd}$	1,06	1,29	1,52	1,75

[www.onduline.com](http://www.onduline.com)

Onduline  
 35, rue Baudin  
 92300 Levallois-Perret, FRANCE

04/2014

