

1.1.1 Tixophalte WET evaluation (ISO 11600 standard)

Following a SEOP request about benchmarking aspects, Tixophalte WET has been evaluated following the ISO 11600 standard, which is becoming the reference for mastic joint in the building construction area. This procedure is worldwide used more and more. It classes step by step the tested products following a logigram of trials.

The first classification is based on glazing (type G) and non-glazing sealants (type F). Tixophalte is supposed to be F. The second classification is based on the non-flowing properties and the elastic recovery of the sealant (fives classes). Then follows mechanical tests like traction, adhesion, cohesion, water sensitivity, shrinkage tendency and resistance to flow (see following extract).

(extract)

The technical evaluation was conducted by the French CEBTB lab, which has the required expertise and the compliant equipment. The CEBTP proposals depend on the class of the product and on the number of tested supports. Brushed (rough), sawed (smooth) cement concrete, PVC and aluminum materials were retained. Additional adhesion / cohesion tests were added on wet concrete surfaces. A final peeling evaluation was also supposed to be useful to finish the evaluation.

The technical description of the CEBTB tender was:

- Four kinds of support: sawed (smooth) & brushed (rough) cement concrete, anodized aluminum & PVC
- Tests oriented to waterproofing and sticking for dry & wet conditions

General test programme:

- 1) Elastic recovery ISO 7389
- 2) Tensile strength & rupture ISO 8339 (23 & -20°C)
- 3) Tensile properties under maintained strength ISO 8340 (23°C)
- 4) Adhesion/cohesion under constant temp ISO 9046
- 5) Adhesion/cohesion under variable temp ISO 9047
- 6) Adhesion/cohesion under water ISO 10590 (23°C)
- 7) Adhesion/cohesion/rupture strength under water ISO 10591
- 8) Volume shrinkage ISO 10563
- 9) Flowing resistance ISO 7390 (5 & 50°C)

Option: peeling test following the EN NF 1465

- Zinc sheet with four kinds of support: dry & wet cement concrete, steel & PVC

ISO 11600 evaluation results

Mastic type (ISO 7389)

The general class following the elastic or plastic-type was determined with the help of the elastic recovery (ISO 7389).

Support type	Sample	Results (%)
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Anodized aluminium	1	0
	2	3
	3	7
	Mean	3

The mastic can be classified as plastic (below 40%).

Non-flowing properties (ISO 7390)

- Temp = (5 ± 2) °C –Vertical flowing

Sample	Specification	Flowing (mm)	Mean (mm)
1	Flowing ≤ 3 mm	2	2
2		2	
3		3	

The mastic complies with the standard for a plastic-type sealant.

Shrinkage: loss of volume after curing (ISO 10563)

Sample	Specification	Volume variation (%)	Mean (%)
1	≤ 25 %	15,6	15,5
2		15,6	
3		15,3	

The mastic complies with the standard for a plastic-type sealant.

Subclass P sealants (12.5P & 7.5) is led by ISO 8339.

Tensile properties on dry support at 23°C (ISO 8339)

Dry support	Sample	Results			
		Max effort (N)	Elongation at F max (%)	Elongation at break (%)	Rupture mode
Sawed mortar	1	2,0	38	255	Cohesive Cohesive Cohesive
	2	2,2	28	233	
	3	2,1	43	310	
	Mean	2,1	36	266	
Brushed mortar	1	1,2	35	245	Cohesive Cohesive Cohesive
	2	1,3	32	248	
	3	1,3	35	250	
	Mean	1,3	34	248	

Anodized aluminium	1	1,6	35	270	Cohesive Cohesive Cohesive
	2	1,8	20	242	
	3	1,8	22	228	
	Mean	1,7	25	247	
PVC	1	1,9	6	326	Cohesive Cohesive Cohesive
	2	2,9	4	275	
	3	1,7	23	256	
	Mean	2,2	11	286	

The mastic can be classified within the 12.5P class (elongation at break > 100%).
In addition, the same protocol was applied on damp sawed mortar.

Tensile properties on damp support at 23°C (ISO 8339 addition)

Damp support	Sample	Results			
		Max effort (N)	Elongation at F max (%)	Elongation at break (%)	Rupture mode
Sawed mortar	1	1,7	18	226	Cohesive Cohesive Cohesive
	2	1,8	16	178	
	3	1,4	21	193	
	Mean	1,6	18	199	

Adhesion/cohesion properties at constant temperature (ISO 9046)

The temperature is 23°C. The amplitude of the 100-elongation cycles is 12.5% following the class.

Support type	Sample	Rupture mode
Sawed mortar	1	No rupture for the 3 samples
	2	
	3	
Brushed mortar	1	No rupture for the 3 samples
	2	
	3	
Anodized aluminium	1	No rupture for the 3 samples
	2	
	3	
PVC	1	No rupture for the 3 samples
	2	
	3	

The mastic complies with the standard for a 12.5P plastic-type sealant.

Designation

The expression of the conformity with the ISO 11600 standard is designated as followed:

ISO 11600 – TYPE – CLASS – SUBCLASS.

Consequently, the Tixophalte WET package is:

ISO 11600 – F 12.5P M1 up M2 up A up

With:

F for construction sealants in opposition with glazing sealants (G)

P for mastic type (elastic recovery < 40%)

12.5P following the mastic class (>100% elongation level; top tier in the plastic class)

M1 up: passes with a class-1-type mortar (sawed surface) without primer

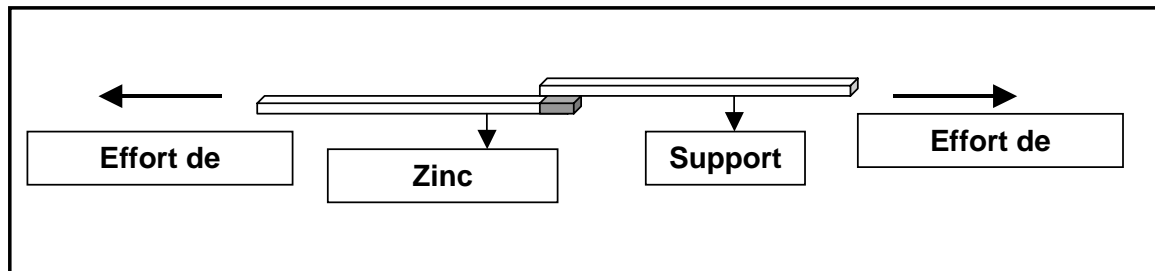
M2 up: passes with a class-2-type mortar (brushed surface) without primer

A up: passes with a anodized aluminum-type surface without primer

Peeling tests (EN NF 1465)

The tests were conducted on the following support types:

- The reference support is zinc based
- The tested supports are fibre-based cement concrete dry & damp, galvanized steel and PVC



The surface of contact is 50 x 50 mm². The conditions were:

- Procedure 1: 28 day-drying at 23°C
- Procedure 2: 28 day-drying at 23°C + 4 day-water immersion + 2 day-drying at 23°C
- Procedure 3: 28 day-drying at 23°C + 4 day-heating treatment at 70°C + 2 day-drying at 23°C

The results are collected in the following table:

Support type	Procedure 1		Procedure 2		Procedure 3	
	σ_{max} (MPa)	ϵ_{max} (%)	σ_{max} (MPa)	ϵ_{max} (%)	σ_{max} (MPa)	ϵ_{max} (%)
Dry fibre-based concrete	0,19	1,00	0,13	1,15	0,43	0,95
Damp fibre-based concrete	0,34	0,60	0,22	0,40	0,56	1,10
Galvanized steel	0,01	1,10	0,02	1,10	0,03	1,10

PVC	0,02	1,10	0,02	1,10	0,07	1,20
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The results can be distinguished in two populations:

1. A lower strain group when using a non-absorbent surface (steel & PVC)
2. A higher strain group when using an absorbent surface like concrete; damp material increases the strain to rupture

A modulus can be calculated following the surface type in a small interval of deformation.

On concrete surfaces, the rupture mode is both cohesive (joint) and adhesive (zinc). With steel and PVC, the rupture is only cohesive.

The conclusions about the product behaviour after peeling are:

- Tixophalte WET is a very suitable product for sealing & roofing even in thin layers (joint sealants, glue) but not a structural product like PU (low modulus)
- It is a very suitable product for humid / wet surfaces
- It is non support-type dependant: although a lower strain value with non-absorbent surfaces, the product still sticks
- It can support severe thermal treatment (70°C in the test) without breaking and consequently high dilatation stress especially with two different support types (i.e. between aluminium/concrete)