ROOFING

TECHNICAL DOCUMENT

VENTILATED HIPS AND RIDGES

Technical Document 99035-01

Initial tests protocols of the certification QB 35 Ventilated Hips-and-Ridges

The English version is provided for information.

In case of doubt or dispute, the French version is the decisive text.

Technical Document 99035-01 rev. 01
February 7th 2020

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TABLE OF CONTENTS

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MODIFICATION HISTORY

Revision No.	Date brought into application	Modification made
00	10-09-2018	Initial version regarding to the approbation of the QB 35 reference system V1.
01	07-02-2020	Modification follow-up : - §2.2.2 : measurements for initial tests - §2.3 : detailed indications on test reports

1. Scope

The purpose of the present document is to describe tests protocols for the GEV rating, tensile and ageing tests in the context of the QB 35 – Hips-and-Ridges certification:

- Adaptability test method (G);
- Spray method for the behavior to water (E);
- Ventilation capacity test method (V);
- Tensile test method;
- Ageing test method.

2. Adaptability test method

2.1 General

2.1.1 Scope

Adaptability tests on a sample of ventilated Hip-and-Ridge are performed on jigs which are representative of classes defined in the paragraph 3.5.1.1 of the QB 35 reference system and assembled on a testing model. Jigs permit a comparison with small discontinuous elements for roofing covered by the certification.

2.1.2 Samples

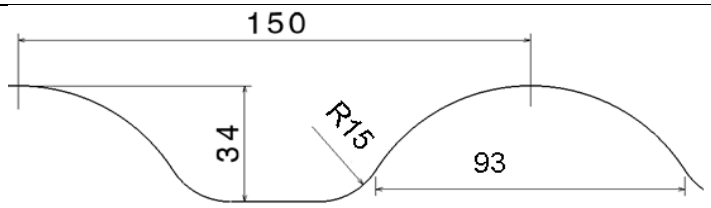
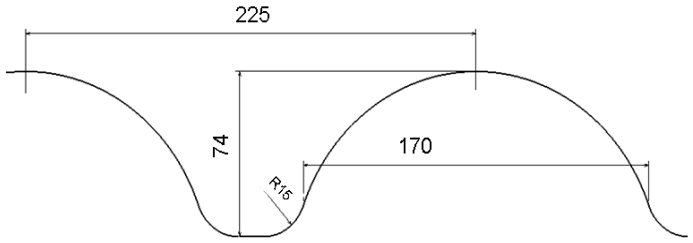
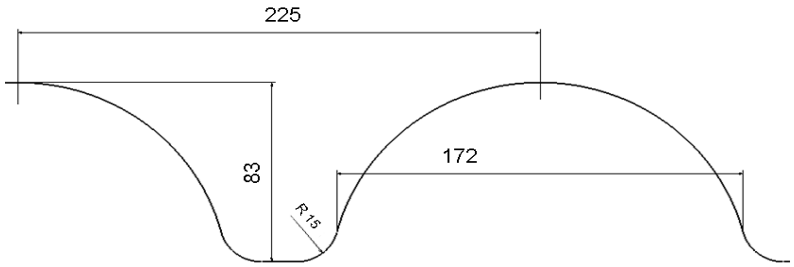
Tests are performed on 1 sample.

The sample is constituted by a ventilated Hip-and-Ridge length of 2000 mm.

2.1.3 Test device

2.1.3.1 Jigs

Each jig corresponds to an adaptability class, as defined in the paragraph 3.5.1.1 of this certification reference system. The length of assembled jigs must be higher than 1800 mm.

Class G0	
Class G1	
Class G2	
Class G3	

The distances are measured by a benchmark (for example : adhesive tape) placed at 150 mm from the jig top.

2.1.3.2 Testing model

Testing model has 2 pitches, with 45% slope.

Testing model length is higher than assembled jigs length.

The dimension, on structural frame, between the top of assembled jigs and the elevated plate axis is 15 +/- 2 mm.

The elevated plate height for each curved shape is defined as below:

- Class G0: 25 +/- 2 mm
- Class G1: 55 +/- 2 mm
- Class G2: 80 +/- 2 mm
- Class G3: 110 +/- 2 mm.

For rigid Hips-and-Ridges, the elevated plate must be heightened to be in contact with the nailing stripe of the Hip-and-Ridge.

Ridges are simulated by a half-tube with an inner diameter of 205 +/- 5 mm, a thickness of 5 +/- 2 mm, a minimum length of 2000 mm and a minimal weight of 10 kg.

2.2 Test method

2.2.1 Modus operandi

Place the Hip-and-Ridge on the appropriate elevated plate.

The plate height is indicated in the test report and maintain for the spraying test.

Position the Hip-and-Ridge bottom on the jig and stretch the side stripe to maximum point.

Fix the Hip-and-Ridge in the axis of elevated plate with screws, nails or staples.

Press the Hip-and-Ridge from the middle of side stripe to the extremities to fit the shape of the jig.

Place the half tube in contact with side stripes, symmetrically in regard to the elevated plate. For the class G0, the half tube is heightened of 10 mm.

2.2.2 Expression of results

Tests are performed with a measurement device with a minimal accuracy of 1 mm.

The test is deemed to be fulfilled if following criteria are respected:

Concerned Hips-and-Ridges		Criteria	Number of measuring point	Specification
All families and all classes		Visual appearance of the implemented side stripes	At any point	No tear
Classes G1, G2, G3		Contact between the ridge and the side stripes	On each upper part of the jig	All upper part of the jig in contact
Classes G1, G2, G3		Length of side stripe covering the upper part of the jig	On each upper part of the jig	Mean ≥ 100 mm
Classes G1, G2, G3		Length of side stripe covering the lower part of the jig	On each lower part of the jig	Mean ≥ 80 mm
Class G0		Length of side stripe covering the jig	Minimum at 8 points distributed on each side of the gable	Mean ≥ 80 mm
Families F1, F2 et F3	**Classes G0 et G1**	Gap between the side stripes and the jig	On each lower part of the jig or, at minimum 8 points distributed on each side of the gable (G0)	Mean = 0
	Classes G2 et G3			Mean ≤ 10 mm
Families F1a, F2a et F3a		Contact between the adhesive strip and the jig	At any point of each section	Continuous continu
Families F1a, F2a et F3a		Width of adhesive strip collage on the jig	At any point of each section	Mean ≥ 20 mm

2.3 Test report

The test report should mention for each test:

- The Hip-and-Ridge trade name and his identification (marking, batch…),
- The Hip-and-Ridge width,
- The intended adaptability class or classes,
- The plate height,
- The minimum, maximum and mean values measured under the paragraph 2.2, according to the Hip-and-Ridge family and intended adaptability classes,
- The standard deviation,
- The pictures of implementation, especially the side-way to illustrate the position of the ventilation apertures on jigs (in contact or not).

3. Spray method for the behavior to water

3.1 General

3.1.1 Scope

Spraying tests for the behavior to water of Hip-and-Ridge (sample) are performed on jigs which are representative of classes defined in the paragraph 3.5.1.1 of the QB 35 reference system and assembled on a testing model. Jigs permit a comparison with small discontinuous elements for roofing covered by the certification.

This test cannot be performed if the adaptability test is not successfully passed for the intended adaptability classes (G0, G1, G2 and/or G3).

3.1.2 Samples

Tests are realized on 1 sample per adaptability class.

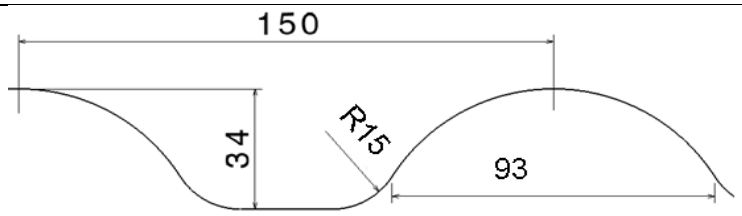
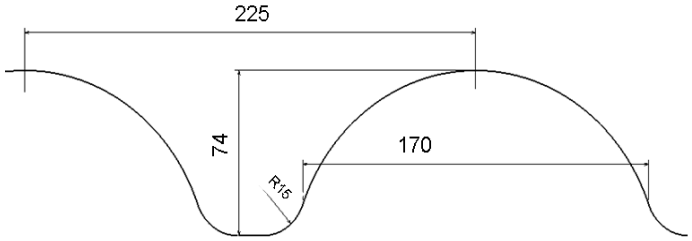
The sample is constituted by a Hip-and-Ridge with a length:

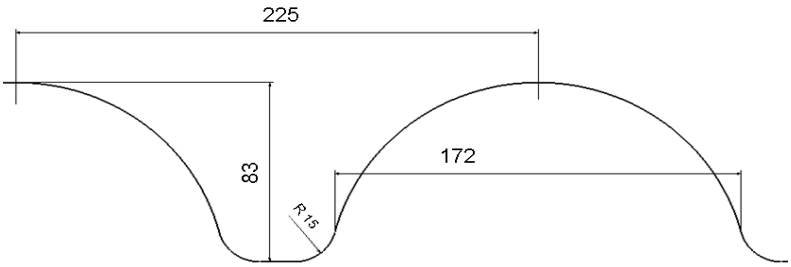
- Of 925 mm for rigid Hips-and-Ridges,
- Of 1050 mm for flexible Hips-and-Ridges.

3.1.3 Test device

3.1.3.1 Jig

Each jig corresponds to an adaptability class, as defined in the paragraph 3.5.1.1 of this certification reference system. The length of jigs must be higher than 900 mm.

Class G0	
Class G1	
Class G2	

Class G3	

3.1.3.2 Testing model

Testing model has 2 pitches, with 45% slope.

Testing model length is higher than assembled jigs length.

The dimension, on structural frame, between the top of assembled jigs and the elevated plate axis is 15 +/- 2 mm.

The elevated plate height for each curved shape is defined as below:

- Class G0 : 25 +/- 2 mm
- Class G1 : 55 +/- 2 mm
- Class G2 : 80 +/- 2 mm
- Class G3 : 110 +/- 2 mm

For rigid Hips-and-Ridges, the elevated plate must be heightened according to the setting defined in the § 2 during the adaptability test.

Ridges are simulated by a half-tube with an inner diameter of 205 +/- 5 mm, a thickness of 5 +/- 2 mm, a minimum length of 900 mm and a minimal weight of 6 kg.

The model inner face is closed to apply a pressure differential.

A water tank, called loft tank, is placed under the elevated plate to collect the water ingress through the Hip-and-Ridge.

In case of Hip-and-Ridge with adhesive strip, a device, called wave trough tank, is provided in flow areas to collect the water blocked by adhesive strip on sprayed pitch.

In case of Hip-and-Ridge without adhesive strip, this system is deactivated.

3.1.3.3 Spraying device

A « flat pan » nozzle with a spraying angle of 80° is used.

It is placed horizontally at 450 +/- 50 mm from the ridge edge to simulate the driving rain.

The spraying flow is 38 +/-5 L/h.

3.1.3.4 Depression device

A depression of 15 +/- 5 Pa is applied under the support.

3.2 Test method

3.2.1 Modus operandi

Place the Hip-and-Ridge on the appropriate elevated plate, defined in annex A.

Fix the Hip-and-Ridge in the axis of elevated plate.

Stretch the side stripe to maximum point on each pitch.

Press the Hip-and-Ridge to fit the shape of the jig.

Place the half tube symmetrically in regard to the elevated plate.

Turn on the water spray and apply the depression under the support. Stabilize the installation for 30 minutes to ensure the total humidification of water way before the first measure.

Start the test. After 10 minutes, weigh the quantity of water collected in loft tank and wave trough tank in a scale with an accuracy of 0,1 g.

Perform the test 3 consecutive times.

3.2.2 Expression of results

The result is expressed by the average of total water collected in loft tank and wave trough tank for each test.

The average is used to define the behavior to water class of the Hip-and-Ridge.

The classes are defined as below:

- Class E1: the product is classified E1 when the quantity of collected water is lower than 5 grams on the test duration, namely 10 minutes.
- Class E2: the product is classified E2 when the quantity of collected water is comprised between 5 and 25 grams on the test duration, namely 10 minutes.

3.3 Test report

The test report should mention for each test:

- The Hip-and-Ridge trade name and his identification (marking, batch…),
- The Hip-and-Ridge width,
- The intended adaptability class or classes,
- The plate height,
- The mean and the individual quantities of collected water in total and for each tank for the tested adaptability classes.

4. Ventilation capacity test method

4.1 General

4.1.1 Scope

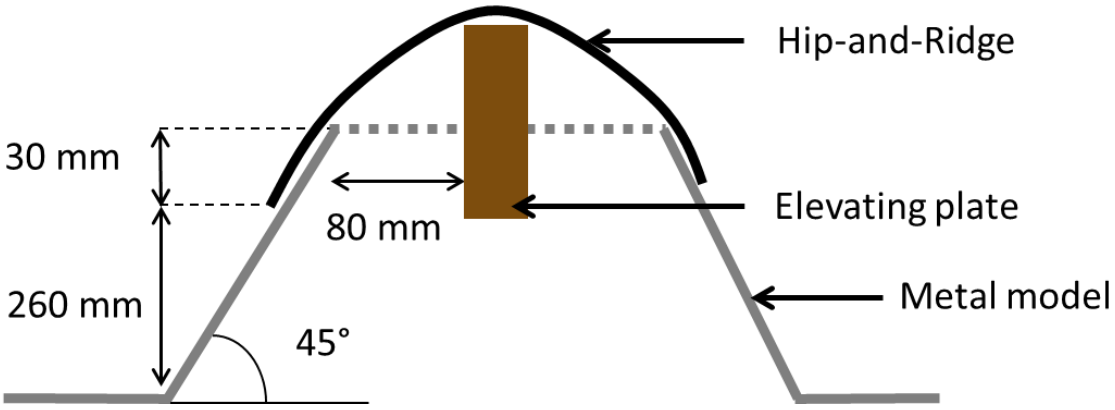
These tests permit to determine the ventilation capacity of Hips-and-Ridges, according to the test standard NF EN 13141-1 «Ventilation for buildings - Performance testing of components/products for residential ventilation - Part 1: Externally and internally mounted air transfer devices».

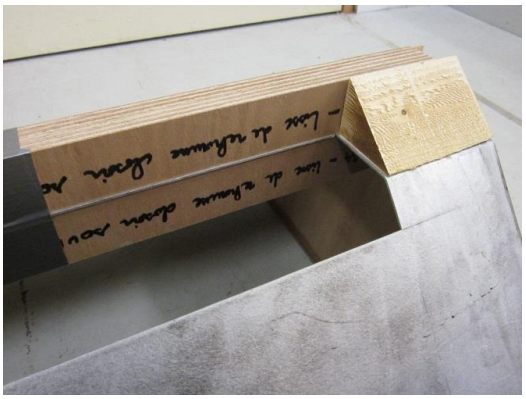
4.1.2 Samples

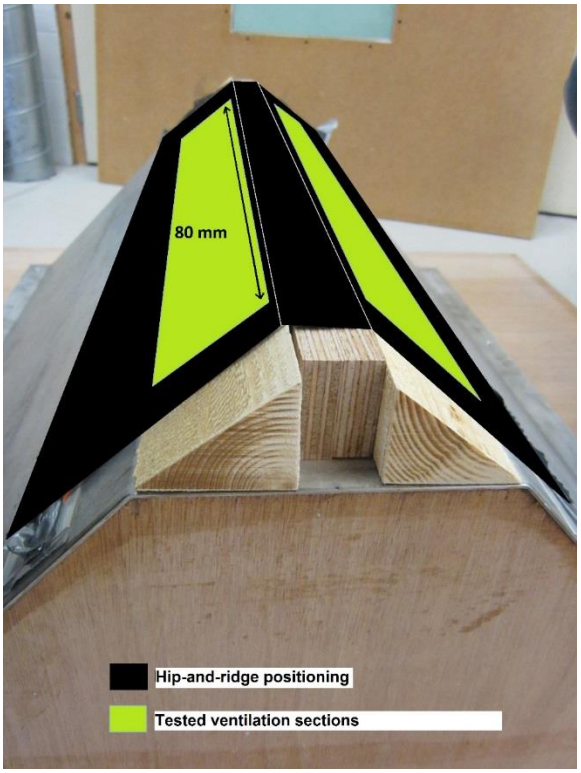
The tests are performed on 3 samples length of 900 mm taken in a roll or a length of Hip-and-Ridge.

4.1.3 Test device

The test device is constituted by a settlement chamber linked to a fan at the back. The sample is implemented on the support defined below, which represents a classic roof with a 45° slope. The support periphery is sealed by an adhesive tape.







The compensation fan is installed in blowing mode on the test device.

The total ventilation sections' opening is 1440 cm².

4.2 Test method

4.2.1 Modus operandi

4.2.1.1 Hip-and-Ridge positioning

Flexible Hips-and-Ridges

Cut the sample to obtain a length of 900±10 mm.

Position 2 elevated plates of 28 x 40 mm on the test support.

Center the sample on the support and fix it according to the manufacturer implement prescriptions.

Press the adhesive strips if the Hip-and-Ridge has one.

Check that the support does not clog the ventilation sections' opening.

Rigid Hips-and-Ridges

Cut the sample to obtain a length of 900±10 mm.

Position 2 elevated plates of 28 x 50 mm on the test support.

Center the sample on the support and fix it according to the manufacturer implement prescriptions.

Check that the support does not clog the ventilation sections' opening.

Waterproofing test

The totality of the sample is clogged by a plastic film taped on the support to perform a tightness test.

A leakage rate measurement is performed at 150 Pa until the value is lower than 1,5 m^3/h.

4.2.1.2 Air flow measurement

Cut the plastic film around the Hip-and-Ridge. For rigid Hips-and-Ridges, the measurement takes account of ventilation sections' opening only. Leakage rate between the nailing stripe and the side stripes are thus excluded. The non-complete ventilation sections are clogged.

Place the support on test device.

Apply a differential pressure of 4 Pa against the external pressure.

For each sample, record continuously the air flow as a function of the increased pressure differential applied to the element (from 4 to 40±1 Pa).

4.2.2 Expression of results

For each sample i, calculate the equivalent geometric surface A_i (cm^2/m) at 15 Pa according to the formula:

$$A_i = \frac{Q \times 10000}{Cd \times L_i} \times \left(\frac{\rho}{2 \times \Delta P}\right)^{0.5}$$

Where Q : air flow (m^3/s)

ΔP : pression variation (Pa)

L_i : sample length (m)

ρ : measured air density (kg/m^3)

Cd = 0,6.

For this calculation, the pressure differential applied to the Hip-and-Ridge as well as the air flow are experimental values. The useful length of sample to use for this calculation depends on the Hip-and-Ridge type:

- For flexible Hips-and-Ridges, the useful length corresponds to the useful length of the test support, namely 0.80 m,
- For rigid Hips-and-Ridges, the number of ventilation sections per linear meter determines the useful length of the Hips-and-Ridges. Indeed, for a Hip-and-Ridge with 16 ventilation sections per linear meter and 12 complete ventilation sections during the test, the useful length of the Hip-and-Ridge is equal to:

$$L_{sample} = \frac{Number\ of\ useful\ ventilation\ sections\ during\ the\ test}{Number\ of\ ventilation\ sections\ per\ linear\ meter}$$

$$L_{sample} = \frac{12}{16} = 0.75\ m \text{ for this example.}$$

Take for reference value A_m, the arithmetic average of reference values A_i obtained for the 3 samples.

4.3 Test report

The test report should mention for each test:

- The Hip-and-Ridge identification (trade name and marking), with dimensions of ventilation sections,
- The sample length and/or the number of ventilation sections,
- The individual and mean values of Q for the following levels: 4, 8, 10, 15, 20, 30 and 40 Pa,
- The individual and mean values of A,
- The air flow/pressure differential curves.

5. Tensile test method

5.1 General

5.1.1 Scope

This method determines, at initial state and after ageing, the characteristic resistance of the assembly between nailing stripe and side stripes and the resistance of the adhesive strips.

5.1.2 Samples

The tests are only performed on the smallest width of the Hips-and-Ridges range.

The holder/applicant delivers the cut samples to the laboratory. In case of Hip-and-Ridge with adhesive strip, the part of the side stripes with the adhesive strip is cut by the holder/applicant. All samples of which the width will exceed a tolerance of 10% will not be admitted.

5.1.2.1 Tensile test on assembly

The tests are performed on 5 samples length of 100 mm (at least 2 included liaison points) sampled in the Hip-and-Ridge width of a roll or of a rigid Hip-and-Ridge.

For the tests on the assembly between the nailing stripe and the side stripes, a part of the side stripe can be cut to adjust the total length of sample to the press (for example, cut of the adhesive strip).

5.1.2.2 Tensile test at 90° on adhesive strip

The tests are performed on 5 samples length of 50 mm sampled in the Hip-and-Ridge width of a roll or of a rigid Hip-and-Ridge.

For the tests on the adhesive strip, only the side stripe is tested. The tests are performed on a half-Hip-and-Ridge. Each sample is implemented on a raw aluminium plate previously degreased. The implementation is made by a steel roller of approximately 1,5 kg (6 passages of the roller on the Hip-and-Ridge).

After collage, the samples are conditioned for at least 7 days in laboratory normal conditions (23 ±5°C) before initial tensile test or ageing/conditioning.

5.1.3 Test device

The tests are performed by a test device appropriate to the range of loads and displacements.

An increasing tensile load is applied at a constant speed of 150 mm/min.

5.2 Test method

5.2.1 Modus operandi

5.2.1.1 Samples conditioning or ageing

The tensile tests on the assembly between the nailing stripe and the side stripes can be performed after the following conditionings:

- Initial state ;
- UV ageing ;
- Freeze/unfreeze ageing ;
- Heat/humidity ageing for 45 days.

The tensile tests at 90° on the adhesive strip are performed in the following conditions:

- at initial state ;
- at low temperature (-15°C) ;
- at high temperature (85°C) ;
- after heat/humidity ageing for 7 days.

The paragraph 6 reminds the conditionings for each family of Hips-and-Ridges.

In all cases, the samples are conditioned for at least 48 hours before the beginning of the tensile test in laboratory normal conditions at 23°C +/- 5 °C.

5.2.1.2 Tensile test

Measure with a ruler the width in the middle of the Hip-and-Ridge and the useful length after the potential cut of the sample (in case of folded side stripes, measure without exerting force to not flatten the waves).

Set the speed of load.

Place the sample between the jaws of tensile device. For the tensile test at 90° on the adhesive strip, the aluminum plate is flanged to the support of tensile device on bottom part.

Apply the load at constant speed during the entire test.

Register the maximal strength for each sample.

Register the deformation of each sample during the entire test.

Continue the test until the sample rupture or, failing that, the procurement of a force at least 3 times higher than the required force with registrations of solicitations and deformations.

5.2.2 Expression of results

For each sample i, calculate the reference value V_{ri} per 50 mm width equal to :

$V_{ri} = F_i / b_i \times 50$.

Where F : breaking load (newtons)

b : sample width (mm)

L : sample length (for information)

Calculate the reference value V_r equal to the arithmetic average of reference values V_{ri} obtained for the 5 samples.

The minimal one-sided 95 % confidence range (fractile of 5 %) of the average is calculated according to the old standard ISO 2602.

5.3 Test report

The test report should mention for each test:

- The Hip-and-Ridge trade name and his identification (marking, batch…),
- The sample length and width,
- The individual and mean values of strength for 50 mm, expressed in N/50 mm,
- The pictures of rupture mode.

6. Ageing test method

6.1 Introduction

The table below synthetized the conditionings or ageings to realize on the different families of Hips-and-Ridges for the tensile tests.

6.1.1 Conditioning and ageing of assembly between nailing stripe and side stripes

	Initial	UV ageing	Freeze/ Unfreeze	45-days heat/humidity ageing
Tensile test temperature	**23°C**			
F1	X			
F1a	X			
F2	X	X	X	X
F2a	X	X	X	X

6.1.2 Conditioning and ageing on adhesive strip

	Initial	Low Temperature -15°C	High Temperature 85°C	7-days heat/humidity ageing
Tensile test temperature	**23°C**			
F1a	X	X	X	X
F2a	X	X	X	X
F3a	X	X	X	X

6.2 UV exposure

When UV exposure tests are required to characterize the sensibility of a product to the UV radiation, the artificial ageing method used is the standard EN 1297 with 67 cycles of 6 h, namely 402 hours.

The cycles of 6 hours are the following:

- Exposure to UV rays, at a temperature of 60°C for 5 hours,
- Then spraying for 1 hour without UV rays.

6.3 Freeze/unfreeze

When freeze/unfreeze tests are required to characterize the sensibility of a product to the alternation of freeze and unfreeze (+15 / -15 °C), the following procedure is applied.

The samples are disposed on a plate containing at least 10 mm of water. The plates are then placed into a freeze/unfreeze chamber, to undergo the following cycle:

- 9 h of freeze (with a plateau of 7 h +/-10mn at -15°C +/-5°C)
- 3 h of unfreeze (to reach the temperature of initial water +15 °C +/- 5°C)

These two phases constitute a cycle. The samples undergo a total of 10 cycles.

6.4 Heat/humidity

6.4.1 For assembly between nailing stripe and side stripes

When heat/humidity tests are required to characterize the sensibility of a product to the temperature and to the humidity, the following procedure is applied.

The water is heated to obtain an air temperature in the chamber of 65 (± 5) °C. As the chamber is closed, the inside air is saturated in humidity (100 %HR).

The samples are places on the chamber shelves. Then the chamber is closed.

The samples are aged for at least 45 days.

The heat/humidity ageing can be interrupt (in this case, the samples are maintained in laboratory ambient conditions.

6.4.2 For adhesive strip

When heat/humidity tests are required to characterize the sensibility of a product to the temperature and to the humidity, the following procedure is applied.

The water is heated to obtain an air temperature in the chamber of 65 (± 5) °C. As the chamber is closed, the inside air is saturated in humidity (100 %HR).

The samples are places on the chamber shelves. Then the chamber is closed.

The samples are aged for at least 7 days.

6.5 Conditioning at low and high temperatures of adhesive strip

When ageing tests at low and high temperatures are required to characterize the sensibility of the adhesive strip to the variation of temperatures, the following procedure is applied.

The samples are conditioned for 4 h at -15°C or at 85°C.