Hail Register (HR)

ACFI Test Specifications No. 11 Rigid Plastic Sheets

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11 Rigid plastic sheets

11.1 General information

The test specifications for the "rigid plastic sheets" component category includes additional, component-specific provisions for the standard test, which are not governed by the general test specifications. A distinction is made between the following plastic groups:

- Plastics 1: PMMA, PET, PETG, SAN, PVC-U
- Plastics 2: PC
- Thermosetting plastics: GRP, VFK

Plastics may be used as transparent or translucent components, or as non-transparent components.

Sheets can be formed as follows:

- flat plastic sheets
- multi wall sheets (structural sheets)
- profiled plastic sheets (corrugated, trapezoidal or otherwise profiled plastic sheets)

The following plastic sheet testing specifications always apply to all plastic groups referred to above, unless reference to a different treatment type is made in any subsection.

11.2 Intended use

The plastic sheet may be used on the façade and on the roof.

11.3 Test specimen

11.3.1 Flat plastic sheet, multi wall sheet

The test specimen consists of a single piece and has a length of 1000 mm and a width of 800 mm. The sheet is mounted in a frame according to use.

11.3.2 Profiled plastic sheet

The test specimen is assembled using one piece, or with several pieces if necessary. Installation and fastening are done as per the manufacturer specifications. The profiled plastic sheet is set up for this purpose according to the intended use (horizontal or vertical arrangement of the profile). The size of the entire test sample is 0.8 – 1 m^2.

11.4 Test set-up

11.4.1 Flat plastic sheet, multi wall sheet

The flat plastic sheet is mounted in a frame on all sides as per Figure 1 or is mounted on a solid substrate with the original system frame.

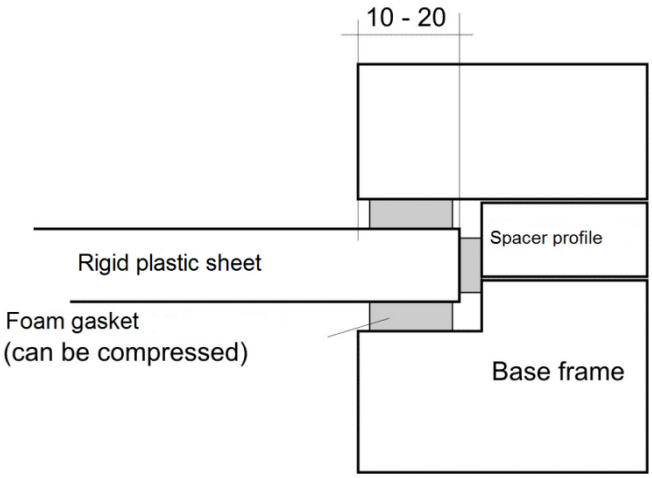

Figure 1 Rigid plastic sheet mounted in a testing frame in cross-section (dimensions in millimetres)

11.4.2 Profiled plastic sheet

The test sample is mounted on a frame.

11.4.3 Systems (plastic sheet mounted fixed in a frame)

The plastic sheet system and original frame must be mounted on a fixed support structure.

11.5 Specimen storage prior to testing (conditioning)

The test sample must be stored in the test climate for at least 3 days.

11.6 Specimen treatement before testing

The surface is cooled with ice flakes for 3 minutes before projectiles are fired.

11.7 Target area and angle of impact

11.7.1 Flat plastic sheet

The flat plastic sheet is impacted at 2 locations (Figure 2):

- Middle: Circle with a radius of 150 mm at the specimen centre (Figure 2)
- Corner: Circle with a radius of 25 mm at the coordinate (1/10 b / 1/10 l) (Figure 2)

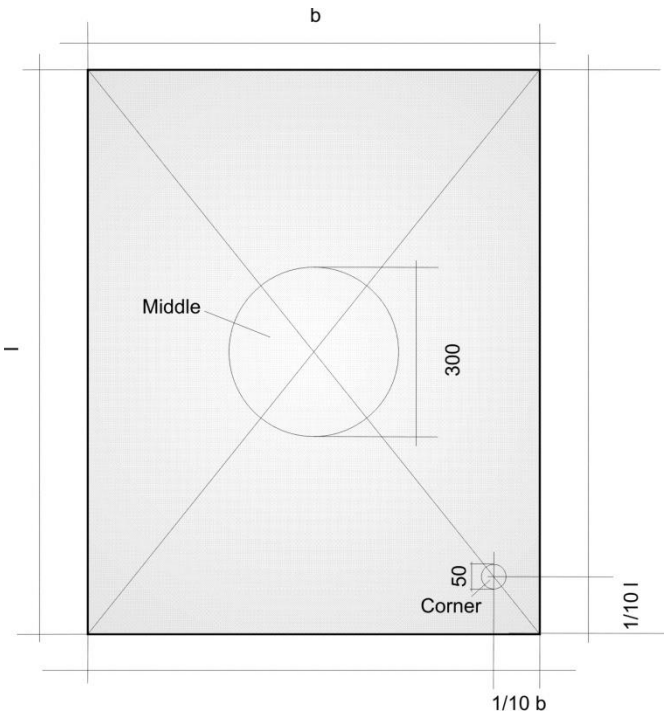

Figure 2 Plastic sheet target area (dimensions in millimetres)

Several tests can be performed on one test specimen. The angle of impact is 90° for sheets used on the roof and 45° for those used on the façade. Any other critical target areas that exist must also be tested (refer to Part A).

11.7.2 Multi wall sheet

The multi wall sheet is impacted at the following locations (Figure 2, Figure 3):

- Middle: Circle with a radius of 150 mm at the specimen centre (Figure 2)
- Corner: Circle with a radius of 25 mm at the coordinate (1/10 b / 1/10 l) (Figure 2)
- Mid-point between the ribs (Figure 3)
- Close to a rib; the distance from the rib is 1/5 of the projectile diameter (Figure 3)

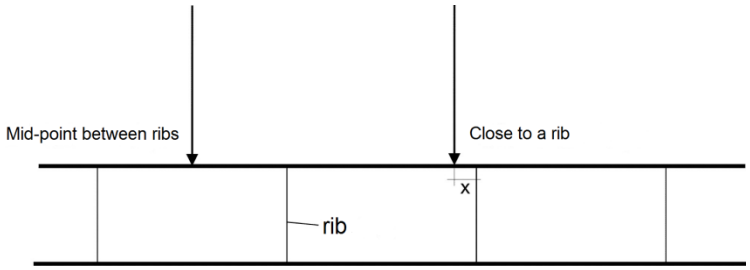

Figure 3 Target areas between ribs and close to a rib for the multi wall test specimen wall sheet (x: 1/5 projectile diameter, dimensions in millimetres)

Several tests can be performed on one test specimen. The angle of impact is 90° for sheets used on the roof and 45° for those used on the façade. Any other critical target areas that exist must also be tested (refer to Part A).

11.7.3 Profiled plastic sheet

The profiled plastic sheet for use on the roof is impacted at in the following locations (Figure 4, Figure 5):

- Corner impact: the distance from the specimen edge is 1/5 the diameter of the projectile (Figure 4)
- Midline impact: the impact is on the midline at a minimum distance of 75 mm to the edge or 150 mm to "edge impact" (Figure 4)
- Edge impact: the distance from the specimen edge is 1/5 the diameter to the projectile (Figure 4)
- Trough (Figure 5)
- Trough middle height (Figure 5)
- Peak (Figure 5)

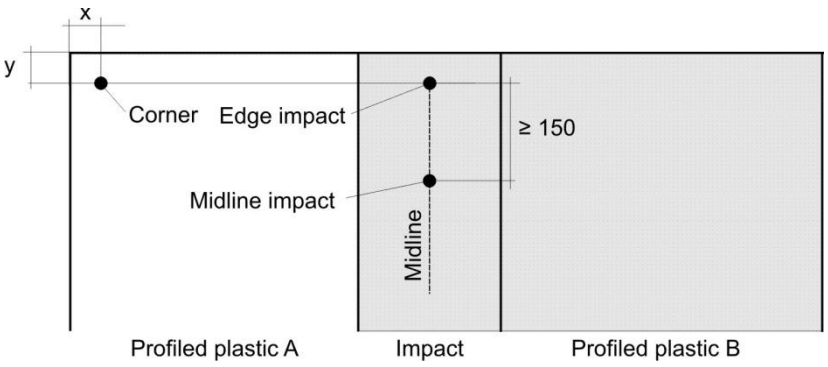

Figure 4 Corner midline, and edge target areas on profiled plastic sheet; in plan view (x=y: 1/5 projectile diameter, dimensions in millimetres)

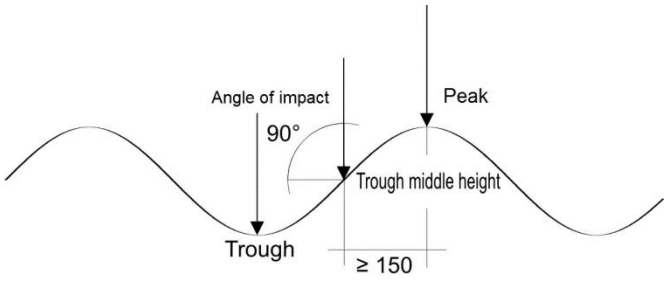

Figure 5 Target areas and angle of impact for a profiled plastic sheet used as a roof component (in this example, a corrugated plastic sheet); cross section (dimensions in millimetres)

The profiled plastic sheet for façade use is impacted at in a different way depending on the intended mounting position (horizontal, diagonal or vertical arrangement of the profile direction).

The profiled plastic sheet with horizontal or diagonal profile direction is impacted as follows (Figure 4, Figure 6):

- Corner impact: the distance from the specimen edge is 1/5 the diameter to the projectile (Figure 4)
- Midline impact: the impact is on the midline at a minimum distance of 75 mm to the edge or 150 mm to "edge impact" (Figure 4)
- Edge impact: the distance from the specimen edge is 1/5 the diameter of the projectile (Figure 4)
- Trough middle height (Figure 6)

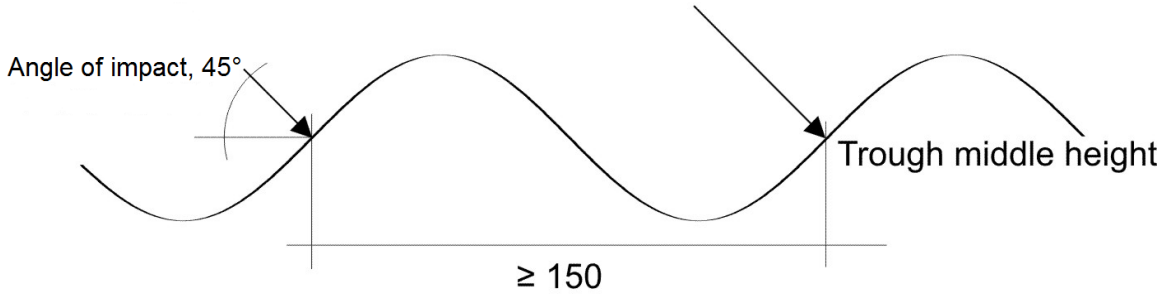

Figure 6 Target areas and angle of impact for profiled plastic sheet used as a façade component with horizontal or diagonal profile direction (alignment) (in this example, a corrugated plastic sheet); in cross section (dimensions in millimetres)

The profiled plastic sheet with vertical profile direction is impacted as follows (Figure 4, Figure 7):

- Corner impact: the distance from the specimen edge is 1/5 the diameter to the projectile (Figure 4)
- Midline impact: the impact is on the midline at a minimum distance of 75 mm to the edge or 150 mm to "edge impact" (Figure 4)
- Edge impact: the distance from the specimen edge is 1/5 of the diameter to the projectile (Figure 4)
- Trough (Figure 7)
- Trough middle height (Figure 7)
- Peak close to the fastener (Figure 7)

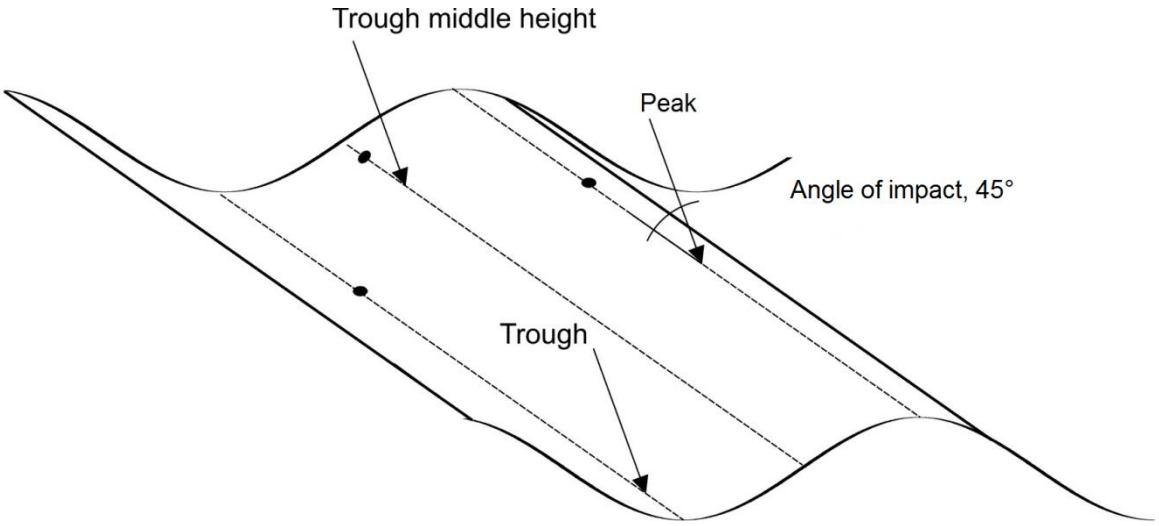

Figure 7 Target areas and angle of impact for profiled plastic sheet used on the façade in a vertical Corrugation alignment (in this example, a corrugated plastic sheet)

Several tests can be performed on one test sample. The distance between target areas must be at least 150 mm. The angle of impact is 90° for specimens used on the roof and 45° for those used on the façade. Any other critical target areas that exist must also be tested (refer to Part A).

11.8 Component function

The component is tested for watertightness, light transmission (where applicable) and appearance.

11.9 Damage criterion

11.9.1 Plastics 1, thermoplastics

Watertightness: If the test specimen has no cracks or punctures, it is considered to be undamaged regarding watertightness. If the test Specimen is torn or punctured, it is considered to be damaged regarding watertightness.

Light transmission, appearance: The plastic sheet is not damaged in terms of appearance and light transmission provided the impact has not caused any surface changes or internal material defects. If any surface changes or internal material defects are visible, the plastic sheet is considered to be damaged. Impact-resistant PMMA is considered to be undamaged regarding appearance and light transmission provided no micro-stretching occurs (bluish-white spots).

11.9.2 Plastics 2, thermosetting plastics

Watertightness: If the test specimen has no cracks or punctures, it is considered to be undamaged regarding watertightness. If the test specimen is torn or punctured, it is considered to be damaged regarding watertightness.

Light transmission, appearance: The plastic sheet is not damaged in terms of appearance and light transmission provided the impact has not caused any surface changes or internal material defects. If any surface changes or internal material defects are visible, the plastic sheet is considered to be damaged.

11.10 Measuring method

11.10.1 Plastics 1, plastics 2

Watertightness: Watertightness is tested based on whether puncturing occurs. If a puncture is not visible to the naked eye (specimen - tester distance of no more than 0.5 m), the vacuum test is carried out according to EN 13583.

Light transmission: Light transmission is tested based on whether micro-stretching or any other internal material defect limiting light transmission occurs. Visual tests for micro-stretching or internal material defects are made against a light at a distance of 5 m.

Appearance: The appearance must be tested in daylight or artificial light at a distance of 5 metres between the test specimen and tester. Depending on the product and intended use, it may be necessary to test the appearance of both sides.

11.10.2 Thermosetting plastics

Watertightness: The vacuum test is always carried out according to EN 13583 to check watertightness.

Light transmission: Light transmission is tested based on whether the presence of micro-stretching or any other internal material defect limiting light transmission occurs. Visual tests for micro-stretching or internal material defects are made against a light at a distance of 5 m.

Appearance: The appearance must be tested in daylight or artificial light at a distance of 5 metres between the test specimen and tester. Depending on the product and intended use, it may be necessary to test the appearance of both sides.

11.11 Existing standards and regulations (not exhaustive)

- SN EN 1013-1, SIA 232.301 (1997): Light transmission profiled plastic sheets for single skin roofing – Part 1: General requirements and test methods