

ESWA Guideline for the quality control of seam joints at construction site

(based on DIN 16726:2017-06)

1.7 Seam joint properties

1.7.1 General

Weldability: The suitability of the membrane for producing a durable seam connection is determined under laboratory conditions. The temperatures, membrane pretreatment or cleanliness, contact pressure and speed during the joining process are optimally adjusted in the laboratory.

Processing parameters: The membrane manufacturer determines the possible variation of the methods and the parameters that will still result in an acceptable seam quality and the criteria of this acceptable seam quality. The durability of the seam joint corresponds to the durability of the sealing membrane. The processing window (limits of permissible welding parameters) determines how a seam connection can be produced for a long-term sealed connection under laboratory conditions. The criteria established by the manufacturer shall be observed for assessing the seams manufactured at the construction site.

Due to changing conditions at the construction site, such as temperature, speed, pressure, power supply, seam width variation and joining surface cleanliness, etc., other shear strengths and peel strengths of the seam joint may result from the test at the construction site than from the laboratory test. The fracture pattern of the seam also changes in part as well.

It is crucial to seam reliability that the seam is tight and has no capillaries. The seam strength also plays an important role in terms of sealing membrane reliability and durability.

Seam and butt joints created at the construction site must be tested for leaks.

A visual inspection must be always carried out and the dimensions determined. In addition, one or more of the test methods referred to in 5.7.2 to 5.7.5 should be applied. Other test methods at the construction site must be coordinated with the membrane manufacturer and are also permitted.

Visual inspection: the seam connection must always be subjected to a visual inspection at the construction site. When there are defects, the uniformity of the seam pattern is usually interrupted. For example, a gap in the joining area at the seam edge may be visible.

Determining dimensions: You must determine the characteristic seam dimensions on strip-shaped test specimens from the seam or on the seam itself. All seam shapes can be tested. The seam dimensions provide information on setting the welding parameters within the scope of the sample welds. Measured over the seam length, these let you draw conclusions about the uniform adherence to the welding parameters when welding. The seam dimensions are

preferably determined on samples from the sample welds or at the seam ends. Single seams (overlap seams, without test channel) require a 20 mm weld seam width at all points.

NOTE When the dimensions of the seam joint are determined in the lab, the joining distance (difference between the sum of the membrane thicknesses and the seam joint thickness) is partly determined for hard films; this is not relevant for soft-elastic membranes.

1.7.2 Mechanical test

When performing the mechanical test, use a suitable tool (e.g. a 5 mm wide screwdriver with rounded edges or an specially designed seam testing tool with a rounded tip) to apply uniform pressure at the seam edge.

The test tool penetrates the seam in the event of a defect on the front edge.

1.7.3 Blowing test

When performing a blowing test, the weld seam edge must be blown with a hand tool for hot gas welding. The hot gas temperature should be about 150 °C when measured about 5 mm in front of the nozzle. The blowing test requires a pointed nozzle or a maximum 20 mm wide flat nozzle. The blowing test must not be applied to rigid membranes.

When a defect occurs the seam edge is slightly raised.

1.7.4 Compressed air test

The compressed air test is used for non-destructive leak testing of overlap seams with a test channel (double seams) under mechanical stress. It does not affect seam quality and reveals nothing about seam strength. The test should only take place about 1 hr after welding. At one end of the seam (seam start), the compressed air device is fitted with a pressure gauge or recording manometer which closes off the test channel airtight. The compressed air is entered here and the seams are checked for bleeding. The other end of the seam (seam end) then becomes airtight e. g. due to hot gas welding or clamping devices. The actual test pressure is only set after approximately 1 min prestressing with slightly elevated pressure in order to condition any initial deformations. The test pressure must be adjusted to the membrane temperature, the test channel width as well as the thickness and the sealing membrane material.

The test duration for the compressed air test is 10 min. After the test period has expired, the test channel is opened at the seam end. The pressure (indication on the manometer) must drop abruptly. Seams that cannot be verified continuously must be checked in sections. If defects cannot be detected immediately, correspondingly shorter test lengths must be selected in order to isolate the defective areas.

The pressure profile over the test period must be recorded by means of a pressure recorder or by hand at the start and at the end. The seam is considered tight if the pressure in the test

channel does not drop by more than 10 % within 10 min.

1.7.5 Vacuum test

During the vacuum test, seam tightness must be checked using a transparent suction cup under vacuum. A soapy solution must be applied along the seam edge before testing. In case there are imperfections, blisters are formed in the leakage area that are visible. The maximum permissible negative pressure must be obtained from the sealing membrane manufacturer.

1.7.6 Seam joint shear strength

Shear strength must be determined according to DIN EN 12317-2.

The factor used to mechanically dimension joined rigid membranes (Young's modulus over 100 N/mm²) is the joining factor f_z . The joining factor for homogeneous membranes is the ratio of shear strength and the tensile property tension with maximum permissible load of the non-welded test specimen, tested according to 5.6.1, but with the test specimen geometry and feed according to DIN EN 12317-2. The tension at the mechanical stress limit of the sealing membrane (e.g. the yield stress or tension at 100 % elongation) must be used as the comparative strength of the unwelded sample.

If the type of failure for soft-elastic membranes (Young's modulus below 100 N/mm²) is classified as a "break," then the joining factor is not a reliable indicator of weld seam quality.

1.7.7 Seam joint peel strength

The peel strength must be determined according to DIN EN 12316-2.