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Buildings and civil engineering works — Sealants — Test method for the determination of stringiness

Bâtiments et ouvrages de génie civil — Mastics — Méthode d'essai pour la détermination du pouvoir filant

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 59, *Buildings and civil engineering work*, Subcommittee SC 8, *Sealant*.

This second edition cancels and replaces the first edition (ISO 11527:2010), which has been technically revised.

The main changes compared to the previous edition are as follows:

— the title was modified to read *Buildings and civil engineering work — Sealants — Test method for the determination of stringiness*;

— the method of representing the diameter in Figure 1 and Figure 2 was modified;

— the additional rate of extension was introduced;

— the test procedure was modified to take account of both slower curing and faster curing sealants;

— the report section was modified include the type of tip used.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Buildings and civil engineering works — Sealants — Test method for the determination of stringiness

1 Scope

This document specifies a method for the determination of the stringiness of a wet-applied one-component sealant.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 6927, *Buildings and civil engineering works — Sealants — Vocabulary*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 6927 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at https://www.iso.org/obp

4 Principle

This method determines the stringiness of a sealant by measuring the maximum length of a strand or string which can be pulled from a wet sealant sample. A probe (tip) is forced into the wet sealant sample. After a short time (2 s to 10 s), the probe is removed from the sample using a constant rate of pull. A universal testing machine (also known as a universal tester, materials testing machine or materials test frame) or similar apparatus is used to provide a constant traverse rate, and the maximum travel before the "string" breaks is reported in millimetres.

5 Apparatus

5.1 Extension device, universal testing machine or other apparatus, e.g., pneumatic piston, which allows a grip to be pulled at a constant traverse rate (rate of grip separation) and provides a reading of the distance between the grips to the nearest millimetre. The extension device must be capable of maintaining a permissible value of less than 1 % relative tolerance in the traverse rate control.

5.2 Probe, with the following:

— Tip 1 (round, radius R = 7,5 mm) according to Figure 1 made of aluminium.

— Tip 2 (conical) according to Figure 2 made of polyethylene (PE).

Dimensions in millimetres

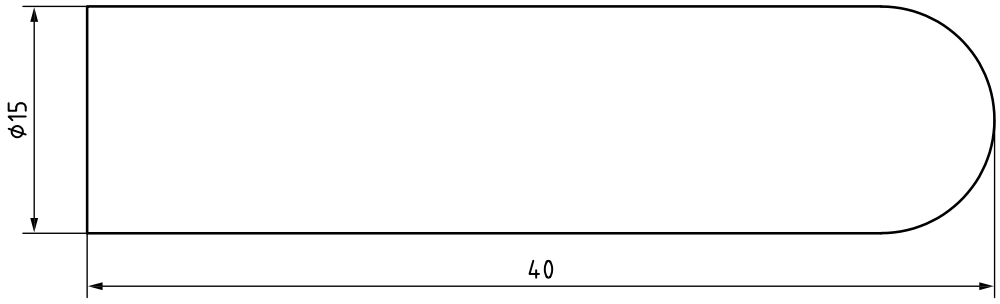

Figure 1 — Tip 1

Dimensions in millimetres

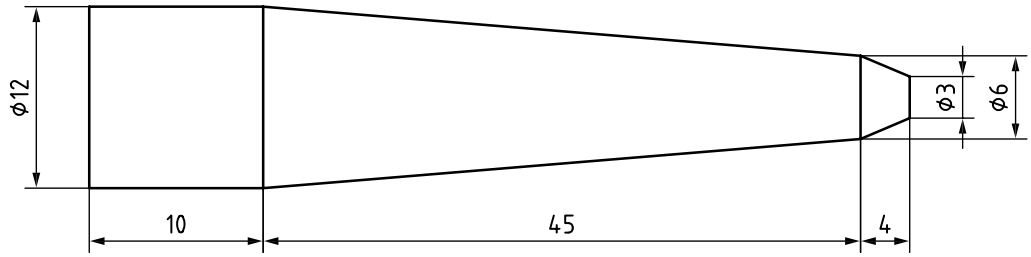

Figure 2 — Tip 2

5.3 Container, from any suitable source and/or material, with a minimum depth of 30 mm and minimum diameter of 30 mm.

6 Conditioning

The sealant shall be shelf-aged for a minimum of 1 day from production. Prior to the preparation of the test specimens, the container, the probe (tip) and the sealant (in the unopened package) shall be stored at a temperature of (23 ± 2) °C for a minimum of 6 h.

7 Preparation of test specimens

Maintain a temperature of (23 ± 2) °C and relative humidity of (50 ± 10) % during the preparation of test specimens. Fill the container with the sealant sample and remove excess with a spatula to provide a clean, smooth surface free of bubbles. Prepare each test specimen separately and subject it to testing immediately afterwards. The preparation of the test specimen shall be concluded within a time period corresponding to less than one third of the skin-over time of the sealant. In total, three (Method A) or nine (Method B) test specimens per sealant shall be prepared.

8 Test procedure

Maintain a temperature of (23 ± 2) °C and relative humidity of (50 ± 10) % during the test procedure. Attach the probe (tip) to the upper clamp of the extension device (e.g. the universal testing machine). Fix the container to the lower clamp of the extension device. Slowly raise the container with the wet sealant or move the probe downwards until the probe just touches the sample surface. This is the "zero" reading. Alternatively, the “zero” reading can also be determined by placing a sheet of paper on the container (assuming the sealant is tooled evenly with the upper edges of the container).

Raise the container with the wet sealant further or move the probe downwards at a rate of 60 mm/min until the tip of the probe is submerged a minimum of 10 mm into the sample. Record the depth of

submersion. After a short time (2 to 10) s, begin the test by moving either the probe upwards or the container with the sealant sample downwards at a rate of 700 mm/min, or at a rate of 500 mm/min, as agreed between the parties concerned.

Stop the extension machine when the string formed between the sealant in the container and the tip of the probe breaks and report the length of the string at break, L_{max}.

Carry out four (Method A) or two (Method B) sequential measurements on each sealant specimen. Do not clean the tip between repetitive tests on the same sealant specimen. The sequential measurements on the same sealant specimen shall be concluded within a time period corresponding to less than half of the skin-over time of the sealant. Repeat the sequential measurements for a total of three (Method A) or nine (Method B) sealant specimens. Always discard the first measurement, i.e. generate nine (Method A: 3 × 3, Method B: 9 × 1) measures in total for each sealant tested (see Table 1 and Table 2).

NOTE It is not necessary to smooth the sealant surface between repetitive tests on the same test specimen.

8.1 Method A: Four sequential measurements on the same sealant test specimen

Method A generally is suitable for slower curing sealants (skin-over time: more than about 10 min).

Table 1 — Measurements obtained on test specimens for each sealant tested (Method A)

Test specimen	Measurement	Record	Test result for each test specimen (average per set)	Average over all test specimens
1	1	Discard (do not report)	/	$L_{ave,\,max}$
1	2	$L_{1.1,max}$	$L_{1.ave,max}$	
1	3	$L_{1.2,max}$		
1	4	$L_{1.3,max}$		
2	1	Discard (do not report)	/	
2	2	$L_{2.1,max}$	$L_{2.ave,max}$	
2	3	$L_{2.2,max}$		
2	4	$L_{2.3,max}$		
3	1	Discard (do not report)	/	
3	2	$L_{3.1,max}$	$L_{3.ave,max}$	
3	3	$L_{3.2,max}$		
3	4	$L_{3.3,max}$		

If the sample surface cures before measurements are complete, results will be in error. If one of the three measurements made on a single test specimen deviates by more than ±15 % from the median, discard the data and repeat the test procedure from the initial preparation. If repetition of the test does not lead to improved repeatability of the measurement data, use Method B for the evaluation.

8.2 Method B: Two sequential measurements on the same sealant test specimen

Method B generally is suitable for faster curing sealants (skin-over time: shorter than about 10 min).

Table 2 — Measurements obtained on test specimens for each sealant tested (Method B)

Test specimen	Measurement	Record	Test result for each test specimen	Average over all test specimens
1	1	Discard (do not report)	/	$L_{ave,\ max}$
1	2	$L_{1,max}$	$L_{1,max}$	
2	1	Discard (do not report)	—	
2	2	$L_{2,max}$	$L_{2,max}$	
3	1	Discard (do not report)	—	
3	2	$L_{3,max}$	$L_{3,max}$	
4	1	Discard (do not report)	—	
4	2	$L_{4,max}$	$L_{4,max}$	
5	1	Discard (do not report)	—	
5	2	$L_{5,max}$	$L_{5,max}$	
6	1	Discard (do not report)	—	
6	2	$L_{6,max}$	L_{6max}	
7	1	Discard (do not report)	—	
7	2	$L_{7,max}$	$L_{7,max}$	
8	1	Discard (do not report)	—	
8	2	$L_{8,max}$	$L_{8,max}$	
9	1	Discard (do not report)	—	
9	2	$L_{9,max}$	$L_{9,max}$	

9 Expression of results

Report the individual readings ($L_{i.j,max}$), the test result ($L_{i.ave,max}$ or $L_{i,max}$) for each test specimen as well as the total average ($L_{ave,max}$) over all test specimens to the nearest millimetre (see Table 1 or Table 2). The repeatability limit of the value reported (the expected maximum absolute difference between two independent results) should not exceed 5 mm at the 95 % confidence level. If neither Method A or B provide acceptable repeatability of results, report only the individual measurement values for each test specimen in the test report.

NOTE According to ISO 5725-1, repeatability is the precision under repeatability conditions where independent test results are obtained with the same method on identical test items in the same laboratory by the same operator using the same equipment within short intervals of time. See also ISO 3534 (all parts). As a quantitative measure of repeatability, the repeatability limit is defined as “the value less than or equal to which the absolute difference between two test results obtained under repeatability conditions may be expected to be within a probability of 95 %”.

10 Test report

The test report shall include at least the following information:

a) the name of test laboratory, number and date of test report;

b) the reference to this document, i.e. ISO 11527;

c) the name, type (chemical family) and colour of sealant;

d) the batch of sealant from which the test specimens were produced, if possible;

e) the type of tip used (tip 1 or tip 2);

f) the depth of submersion in wet sealant sample (in mm);

g) the traverse rate (500 or 700 mm/min);

h) the method used to determine point of break during measurement procedure (e.g., visual determination);

i) the individual measurement values, average measurement values for each test specimen, and average measurement value over all test specimens for stringiness (if neither Method A nor B provide acceptable repeatability of results, only individual measurement values for each test specimen are reported and a comment “insufficient reproducibility of results” is added to the report);

j) any deviations from the specified test conditions.