



Brussels, 13 November 2019

TM 1016:2014

Spacer bar removal time of a self-curing PU foam¹

1. Scope

This test method describes how to determine the time after which a self-curing foam shows no further expansion/shrinkage (e.g. by CO₂ formation) during the curing process. It gives an indication for the correct time to remove the spacers after the fixation of door frames with self-curing PU foam. This method does not describe the load bearing time, where the foam is fully cured.

2. Short description of the procedure

The foam is dispensed into the gap between two boards fixed by clamps. The clamps are removed after the expected spacer bar removal time. After full curing, the volume increase of the foam is determined by measurement of the distance between the boards. The spacer bar removal time is reached when the foam does not expand above the accepted threshold any more. In case of further expansion, the test has to be repeated with a longer fixation time.

3. Background and purpose

One of the main application areas of self-curing PU foams is the fixing of internal door frames. The usual expansion of the foam, applied into the gap between the frame and the adjacent wall, would deform the door frame during curing. To avoid this deformation, the frame must be stabilised by spacers until the expansion stops. This method defines the minimum time the spacers need to remain in position.

4. Equipment

For each measurement:

- 2 particle boards (P3 or P5 to EN 312), size 200 mm x 100 mm x 10 mm
- 2 spacers, thickness 20 mm, length 90 mm (according to FEICA TM 1004).
- 2 screw clamps

Further tools:

- knife
- slide ruler, accuracy 0,01 mm

¹ **Self-curing PU foam:** activatable system extruded as a froth from single pressurised containers (so called 1.5 component foams) as well as 2-component foams.

5. Procedure

It is necessary to prepare 7 specimens.

5.1 Preparation

Bring the product to the test temperature for at least 24 h. The particle boards should be stored at standard conditions (23 °C/50 % RH) for at least 1 week. One test setup consists of two plates, two spacers and two clamps. Marks are put onto the 4 edges of the boards (Figure 1). The distance between the boards is measured at these marks (inside, four reading points per joint).

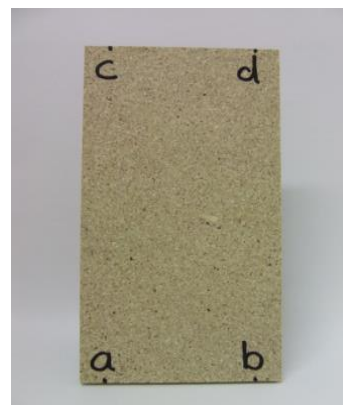


Figure 1

5.2 Experimental procedure

- a) Attach spacers between the particle boards centrally on both short sides and fix with screw clamps. The spacers are placed 5 mm from the long edge of the boards to enable the slide rule to be inserted between the boards. The clamps are used to fix the joints (positioned at each corner or in line of the spacers, Figure 2).

Important: The boards do not need to be moistened.

- b) Prepare 7 specimens, as recommended for the initial 3 – 5 samples.
- c) Prepare the PU system for use according to manufacturer's instructions.
- d) Discard the first 50 g of foam.
- e) The joints are placed vertically and filled from both sides without voids and without moistening. Avoid overexpansion of cured foam and fill according to manufacturer's instructions (typically 40 – 50% of joint depth).
- f) The filled samples are kept upright (see Figure 3) at standard conditions (23 °C, 50 % RH) during the curing period.
- g) Cut excess foam directly before you remove the screw clamps and spacers.

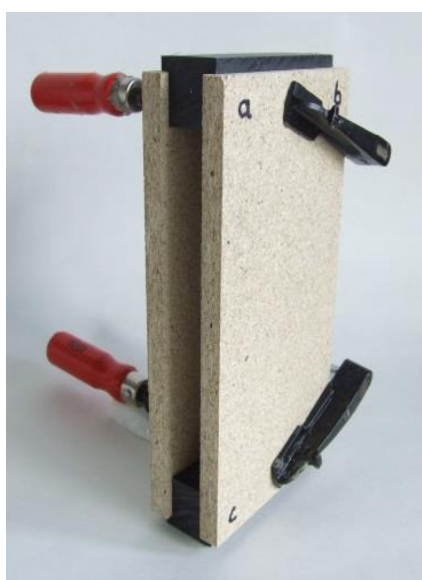


Figure 2



Figure 3

5.3 Measurement

- a) Remove the clamps of the first sample when no further expansion is expected and perform the measurement at points a – b – c – d according to table 1. For first orientation the spacer bar removal time should be slightly longer than the cutting time (see TM 1005), so the cutting time or 15 (5) min (assumed) is a good starting point for the first sample.
- b) Remove the clamps of the remaining 6 samples at the times indicated in table 1 below and immediately perform the measurement. Then remove the spacers.
- c) Repeat the measurements of distances at a – b – c – d between the particle boards with all 7 samples until a constant value (no further expansion) is observed. Note that a time period of 2 weeks (or longer if further expansion) is necessary until the foam is fully cured and does not expand anymore.
- d) Calculate each value of resulting dimensional stability ("Exp") according to the equation given below. The initial value d_0 corresponds to the thickness of the spacer.

5.4 Evaluation

After time n the distances d_n of the boards are measured and the increase of the distance to the initial value d_0 is obtained using the following equation:

$$\text{Exp} = 100\% \cdot \frac{d_n - d_0}{d_0}$$

where Exp - the expansion

d_0 - the initial value (thickness of the spacer) in mm

d_n - the value of the measurement at time n in mm

Table 1: Example times for measurement of the plate distances for the 7 specimens:

time interval of removal of clamps for 1.5 c	time interval of removal of clamps for 2 c	change of distance							
		a		b		c		d	
min	min	mm	%	mm	%	mm	%	mm	%
15	5								
30	10								
45	15								
60	20								
75	25								
90	30								
24h	1 h								

If the distance between two boards calculated from values in table 1 approaches a constant value (+/- 5% tolerance) the system has reached the recommended spacer bar removal time.

It is also possible to transfer the values in table 1 into a diagram.

6. Revision

Version	Date	Remarks
1	10.02.2014	First release
2	10.12.2018	Modification with pictures
3	20.03.2019	Eliminate 1c foam and adapt
4	04.07.2019	Adapt to self-curing PU systems only
5	12.09.2019	Finishing details of point 5 procedure

7. Contact

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Publication ref.: TM-1016-2014

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