Osaamista
ja oivallusta
tulevaisuuden
tekemiseen

Research report

CovidSafe membrane washability testing

- **total membrane thickness 340 µm**
- **membrane with adhesive surface 190 µm**
- **coating thickness 20-40 µm**

Washability testing

The membranes were tested in accordance with the standard SFS 3755. The washability was tested with sodium carbonate (anhydrous 0.5 p-%) and ethanol (TechniSolv 70% t-%).

- equipment: Braive instruments, Washability Tester
- polyamide brush
- brush weight 280.3 g
- brush + additional weight 457.2 g
- brushing distance 66 cm (33 x 2)/revolution

In the sodium carbonate test, observation was performed at 200 revolutions because the membrane thickness of the coating was not known. 133 and 1333 were used as observation revolutions in the ethanol test.

The number of test revolutions is calculated according to the membrane

thickness as follows: 60 µm /40 µm = 200/x 60 µm /40 µm = 2000/x

- ⇨ x = 60 µm / 40 µm * 200 = 133 revolutions
- ⇨ x = 60 µm / 40 µm * 2000 = 1333 revolutions

Washing test with sodium carbonate

In test 1, the samples were a CovidSafe basic membrane as well as a membrane with an additive. The total test time was 2000 brushes. Abrasion was examined in cycles of 200 revolutions.

In test 2, brushing of the membrane with additive was continued and new adhesive sheets were taken as the basic membrane, with additional weights applied to the washing brushes. The total test time was 2000 brushes, giving a total of 4000 brushes to the additive-coated membrane.

Table 1. Washing test findings with 0.5% sodium carbonate solution

	basic membrane (test 1)	**basic membrane + weights (test 2)**	**membrane with additive (test 2)**
200	no change (figure 2)	letters at the seam appear, surface broken (figure 7)	no change (figure 2)
400	no change	letters have begun to appear on a distance of approx. 5 cm	no change
600	letters at the seam appear, surface broken (figures 3, 4)	white base appears at the seam, letters appear for a longer distance (figure 8)	no change
800	no change to the previous		no change
900	no change to the previous	large part of letters have appeared	no change
1000	no change to the previous		no change
1100	no change to the previous	white base appears surface punctured on a small brushing area	no change
1200	no change to the previous		no change
1400	surface damaged on half the brushing area (figure 5)		no change
1600	no change to the previous		no change
1800	no change to the previous		no change
2000	surface damaged on all the brushing area but white base not visible (figure 6).	surface damaged on all the brushing area, white base visible (figure 9).	no change

3000			tape ripped at the seam (figure 10)
4000			no change to the previous (figure 11)

Figure 1. Test 1. Samples 1 and 2 magnification. Additive used in the upper membrane, basic membrane below.

Figure 2. Test 1. Membrane with additive on the left and basic membrane on the right. Test time 200 brushes. There are no visible changes in either membrane.

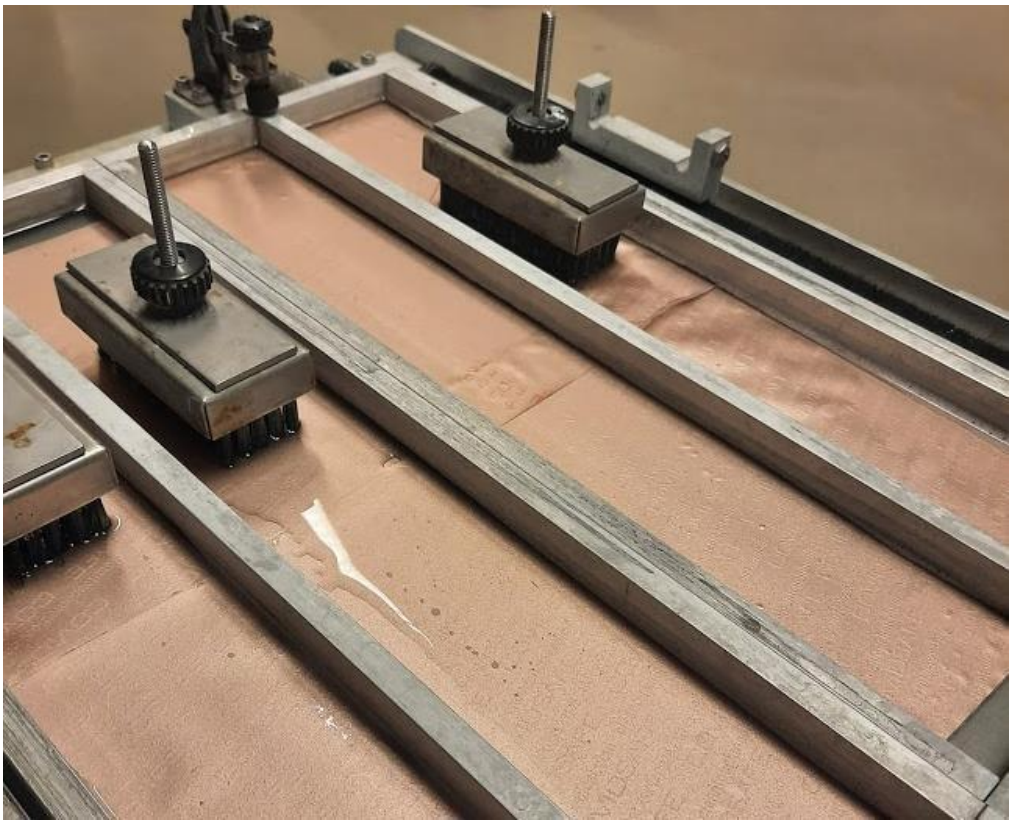

Figure 3. Test 1. Membrane with additive on the left and basic membrane on the right. Test time 600 brushes. In the basic membrane, red text appears at the seam. No visible changes in the membrane with additive.

Figure 4. Test 1. Basic membrane at the seam after 600 brushes.

Figure 5. Test 1. Membrane with additive on the left and basic membrane on the right. Test time 1400 brushes. In the basic membrane, text begins to appear and the surface is broken at the embossed letters on the brushing path. Still no visible changes in the membrane with additive.

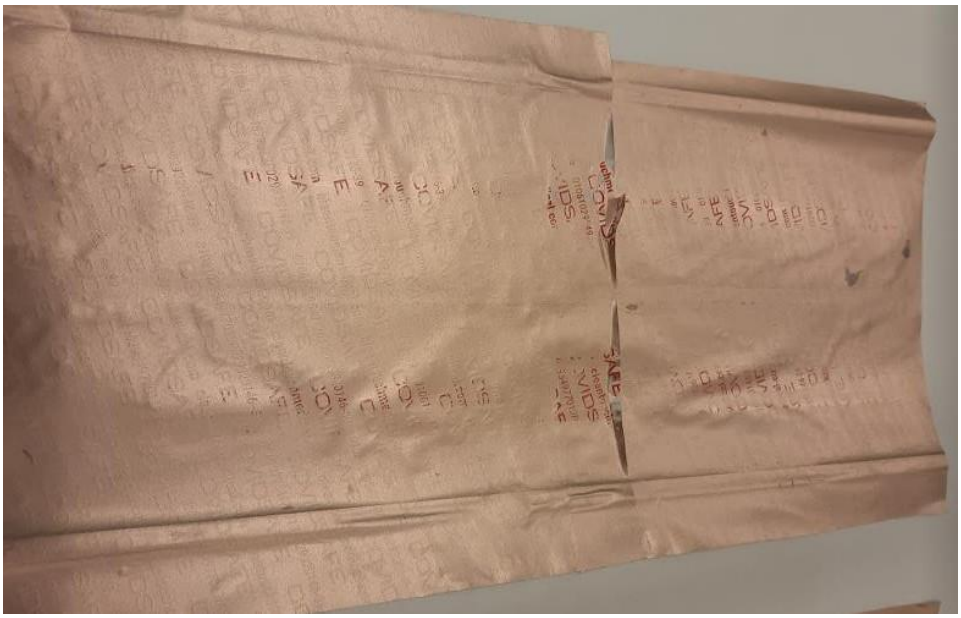

Figure 6. Test 1. Test time 2000 brushes. In the basic membrane, the surface is broken at the embossed letters on the brushing path. However, no white base visible.

Figure 7. Test 2, additional weights on the basic membrane brushes. Test time 200 brushes. Surface broken at the tape seam.

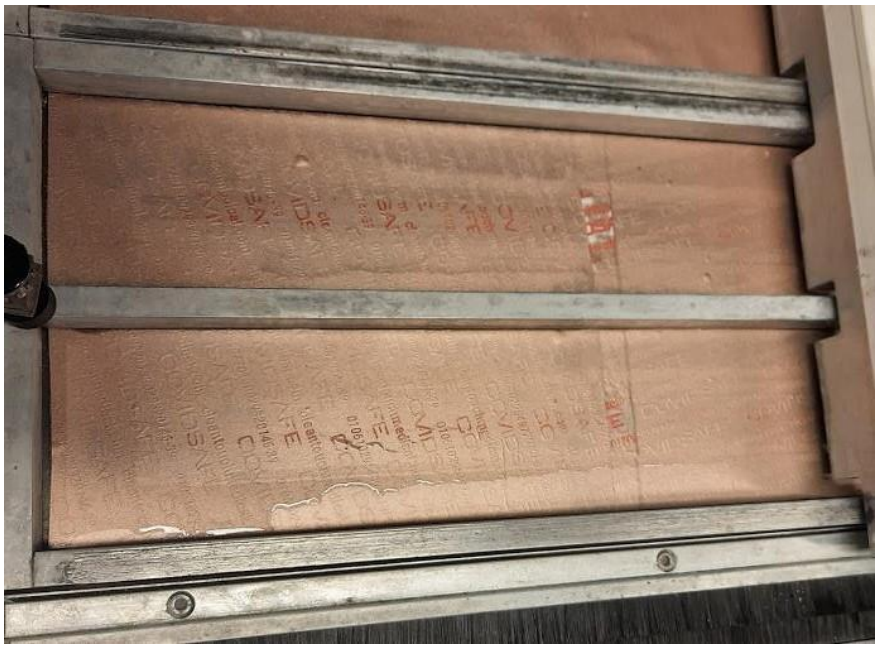

Figure 8. Test 2, additional weights on the basic membrane brushes. Basic membrane 600 brushes. In the basic membrane, the surface is broken at the embossed letters on the brushing path. The white base is exposed at the junction of the tape, which is raised from the rest of the membrane.

Figure 9. Test 2, additional weights on the basic membrane brushes. Basic membrane 2000 brushes. In the basic membrane, the surface is broken at the embossed letters on the brushing path. On the right side, the white base for a distance of approx. 10 cm is also exposed on the brushing path.

Figure 10. Test 2. Membrane with additive 3000 brushes. The membrane is torn at the tape seam. No visible changes on the membrane surface.

Figure 11. Test 2. Membrane with additive 4000 brushes. No visible changes on the membrane surface.

Washability test summary

According to the standard, the washability is determined according to the wear and tear as follows:

degree	wear and tear	washability
1	1. inspection	< 200 revolutions
2	2. inspection	200 - 2000
3	3. inspection	> 2000 revolutions

Puncture wear is considered when the white base has become visible.

Table 2. Degree of washability with sodium carbonate

CovidSafe	CovidSafe additional weight	CovidSafe additive
3	2	3

Washability test with ethanol

The CovidSafe membrane was tested with 70 t-% ethanol, which is used to disinfect countertops and instruments. 133 and 1333 were used as observation revolutions, but observations were also made between these.

Table 3. Washability test findings with 70 t-% ethanol

brushes	basic membrane	basic membrane + additional weight
133	text visible on the embossed part (figure 13)	coating punctured on the embossed part (figure 13)
360	text visible on the brushing path	coating punctured and white base visible on the brushing path (figure 15)
399	coating punctured and white base visible on the brushing path, coating precipitation accumulated at the ends of the brushing path (figure 16)	coating punctured to a larger extent
1333	coating punctured to a larger extent (figure 17)	coating punctured to a large extent of the brushing path, seam ruptured (figure 17)

Figure 12. Starting situation.

Figure 13. 133 brushes. In the basic brushing, text appears on the embossed part. With additional weights (top groove), the coating has punctured on the embossed part and the base has become visible.

Figure 14. 200 brushes. In the part brushed with additional weights, detached coating appears precipitated on the surface.

Figure 15. 360 brushes. Coating brushed with additional weights has punctured and white base is visible.

Figure 16. 399 brushes. Coating is slightly punctured and white base appears in basic brushing. Loose coating precipitation begin to accumulate at the ends of the brushing path.

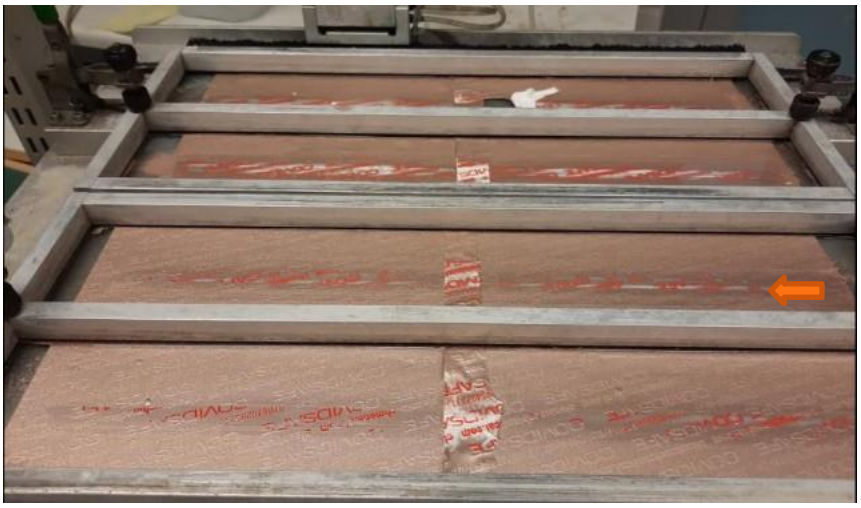

Figure 17. 1333 brushes. Coating punctured and white base visible in basic brushing. In brushing with additional weights (2 top notches), the coating is widely punctured and the tape is torn at the taping point (top notch).

Summary of the ethanol washability test

According to the standard, the washability is determined according to the wear and tear as follows:

degree	wear and tear	washability
1	1. inspection	< 133 revolutions
2	2. inspection	133 - 1333
3	3. inspection	> 1333 revolutions

Puncture wear is considered when the white base has become visible.

Table 4. Washability degree with ethanol

CovidSafe	CovidSafe additional weight
2	2

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