Surface resistance tests on edges. A statistical analysis of the pass/fail events

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CATAS statistical analysis of the pass/fail events of surface testing keeps going on in order to identify which are the most critical tests and the possible trend or correlation between the fail events, the type of surface treatment and the substrate material.

Further to our previous issues of CATAS newsletter about surface resistance tests (31.V.2019) and yellowing of knots in softwoods (09.XI.2018), in this article we show a statistical analysis of the 1613 surface tests on edges performed in our laboratory in a period of 12 months comparing the results with the pass/fail requirements of the IKEA specifications. The tests included in this study are listed in table 1, where an overview of the fail percentage of each test is shown. The pass/fail criteria are specified in the IOS-MAT-0101 for edges resistance to swelling and cracking for MDF boards, in the IOS-TM-0021 for accelerated water on edge test and in the IOS-MAT 0066 AA-163938-11 for all the others surface resistance tests on edges.

Test method	N° of tests performed	N° of test failed	% failure
IOS-TM-0002/21 – Impact on edges 90°	65	34	52,3
IOS-TM-0022 – Edges resistance to swelling/cracking for MDF boards	32	7	21,9
IOS-TM-0002/8 – Steam on worktops	96	17	17,7
IOS-TM-0021 – Accelerated water on edge	457	50	10,9
IOS-TM-0002/5 – Water on edges	282	26	9,2
IOS-TM-0002/9 – Impact on edges 45°	93	6	6,5
IOS-TM-0002/6 – Heat on edges	342	14	4,1
IOS-TM-0002/7 – Steam on fronts/doors	203	2	1,0
IOS-TM-0002/12 – Resistance of bathroom doors to water spray	46	0	0,0
TOTAL	**1613**	**156**	**9,7**

Tab. 1 – Surface resistance tests on edges, number of tests and failure percentage.

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In order to investigate on the possible correlation between the type of surface treatment, the substrate material and the pass/fail result, we made a statistical analysis of the pass/fail events for each type of material tested. In analogy with our previous studies, the following categories of materials were considered (tab. 2):

Category	Materials
Coated wood, veneer	Solid wood and veneers coated with clear or pigmented lacquers
Coated panels	PB, MDF or HDF, lacquered or printed
Paper coverings	Melamine, paper foils and laminate, applied on edges
Polymeric coverings	PS, PP, PPCO, PMMA, PET e ABS, applied on edges

Tab. 2 – Categories and materials.

The type of the edge (postformed or edgebanded) and the test duration were also taken into account when studying, respectively, impact on edges and accelerated water on edge tests. Both these variables were also considered for edge resistance to swelling and cracking for MDF boards.
For each relevant combination of test and material, the pass/fail percentages are shown in the following graphics.

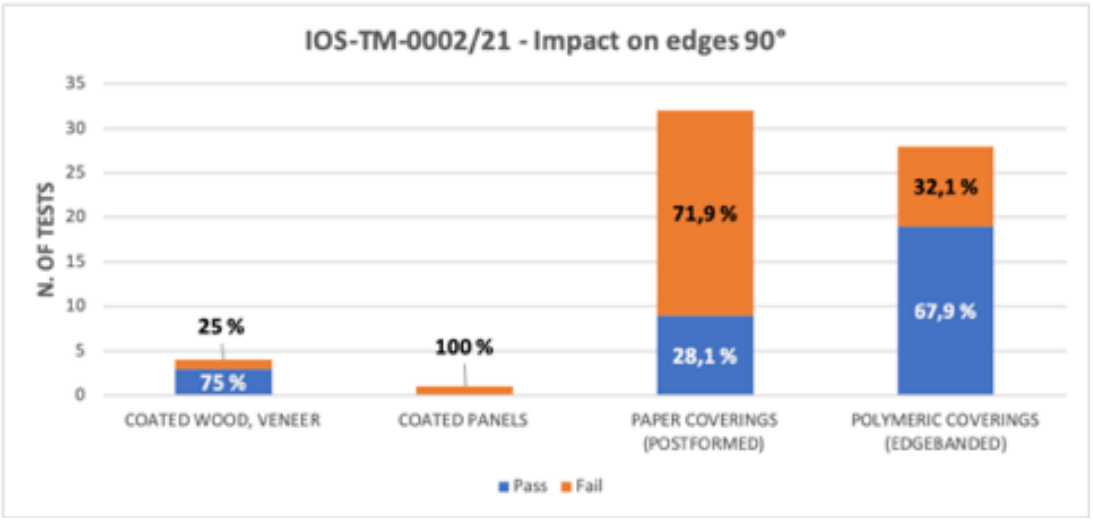

Fig. 1. IOS-TM-0002/21 – Impact on edges 90°.

Despite the relatively few tests performed, impact on edges 90° (fig. 1) was the most critical test on edges with an overall fail percentage higher than 50 %. The highest percentage of fails was recorded for paper coverings in postformed edges (71,9 %), whilst edges with polymeric coverings scored a fairly lower figure (32,1 %). As regards coated samples, the few coated wood and veneer samples failed in 25 % of cases and the only coated panel has

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not met the pass requirement.
One reason for these high fail percentages might be the pass/fail criterion that is different from the one used for impact on edges 45°: this test is passed only with a rating 4 or 5 on a scale 1 to 5, while impact on edges 45° is passed also with rating 3. If this criterion were valid for impact on edges 90° as well, the total fail percentage would drastically decrease from 52,3 % to 18,5 %, the fail percentage for paper coverings would be 25 % instead of 71,9 %, and that of polymeric coverings would be 7,1 % instead of 32,1 %.

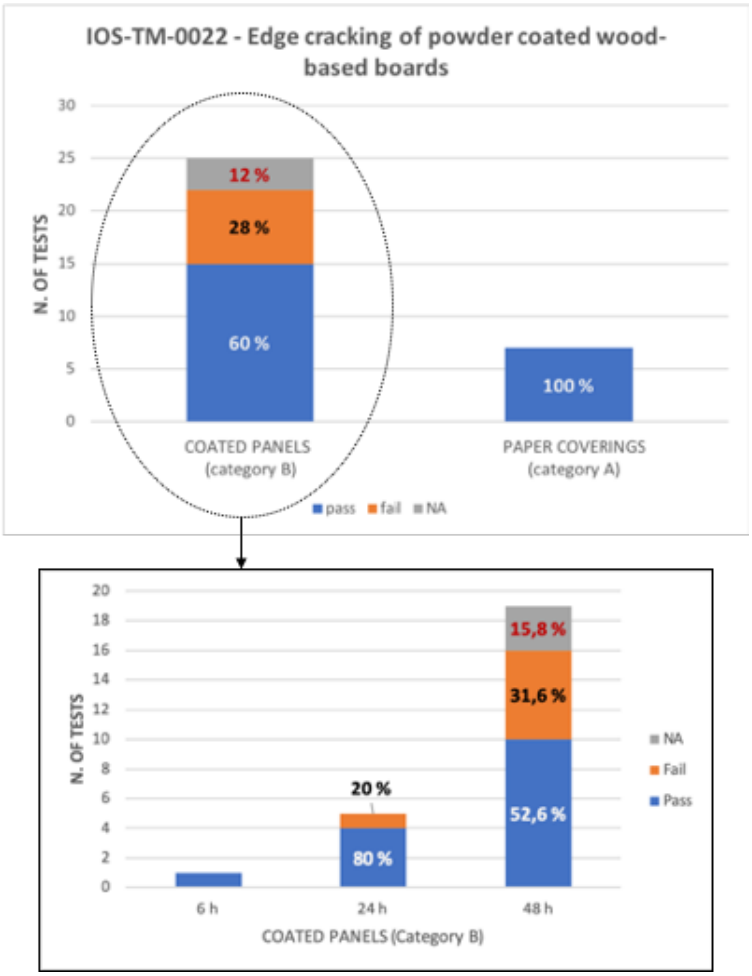

Fig. 2. IOS-TM-0022 - Edges resistance to swelling and cracking for MDF boards.

Edges resistance to swelling and cracking is only applicable to powder coated MDF boards but, as the tested edge can be or not sealed with a thin paper strip, the samples were distinguished in two categories: coated panels (MDF without sealing) and paper coverings (MDF sealed with paper strips). This analysis shows that all the paper coverings passed the tests, whereas 28 % of coated panels does not and 12 % could not be evaluated (fig. 2). In fact, the test consists in

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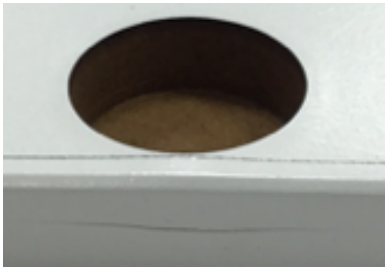
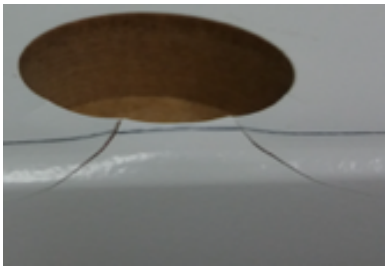
drilling a hole on the panel, fill it with water and store the panel in a climatic chamber with a specific range of temperature and humidity for a certain period of time. When cracks appear on edges, the test is failed, while cracks on top surface only are accepted; however, when cracks extend to the upper part of the edge, it is not clear whether or not the test may be passed (fig. 3).

Cracks on top surface only
(pass)



Cracks on edge
(fail)



Cracks that extend from the hole to the upper part of the edge
(not evaluable)

Fig. 3 – Examples of pass, fail and not evaluable cases.

Taking into account the test duration, it was found that 20 % of coated panels tested for 24 hours and 31,6 % of coated panels tested for 48 h failed the test. All the not evaluable samples were tested for 48 hours, whereas the only coated panel tested for 6 hours as internal analysis passed the test. All the paper coverings were tested for 6 hours.

It is important to point out that the few tests carried out cannot lead to a statistically significant survey, but there is an interesting data for possible future analyses: 35 tests were already performed in the first half of 2019, against the 32 performed in the whole 2018.

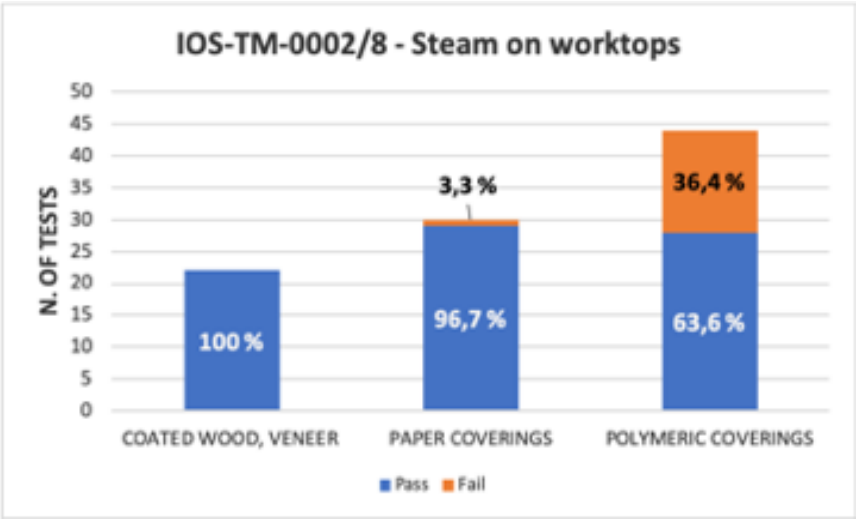


Fig. 4. IOS-TM-0002/8 – Steam on edges (worktops).

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Steam on edge on worktops (fig. 4) proved highly critical for polymeric coverings (36,4 % fail), especially those with applied edgeband, more sensitive to steam than those with postformed edges.
The fail percentage of accelerated water on edge (fig. 5) was within the range 9,6 to 11,9 % for all materials except

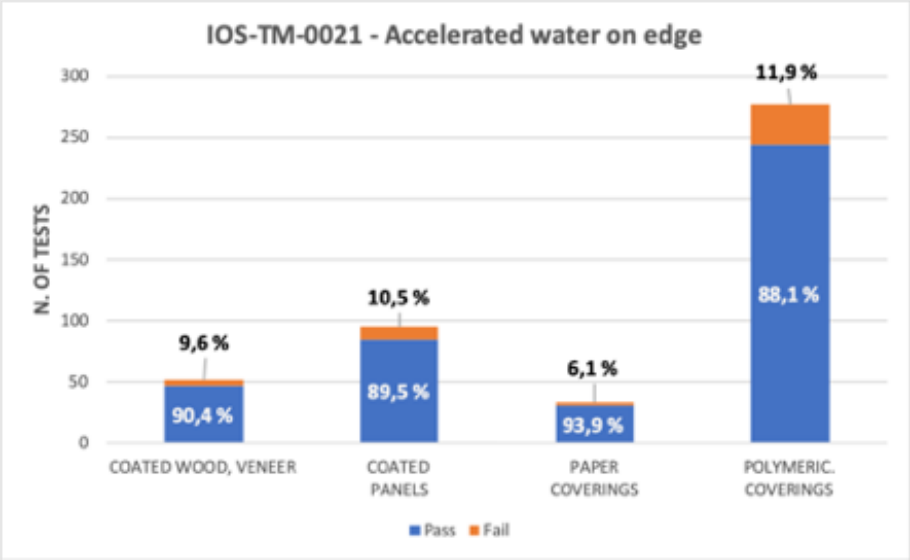

Fig. 5. IOS-TM-0021 – Accelerated water on edge.

the paper coverings, that scored a much lower 6,1% failure on test.
The same trend was found considering the samples tested for one hour only: the highest fail percentage was recorded for polymeric coverings (18,1 %), followed at distance by coated panels and coated woods and veneers (10,9 % and 10,4 % respectively) and finally paper coverings with a lower percentage of fails (7,4 %).

The very few fail events on samples tested for two hours occurred in polymeric coverings only (2,7 %), which represent the large majority of the samples tested for this duration. No failure has been recorded for all the other materials.

As regards the water on edge test (fig. 7), the most critical material was the coated wood and veneer (16, 7 % fail), most likely due to natural water absorption through the wood fibers. Much lower fail percentages were recorded with polymeric coverings (7,5 %), probably due to water penetration between the edge band and the surface covering, and coated panels (5,7 %).

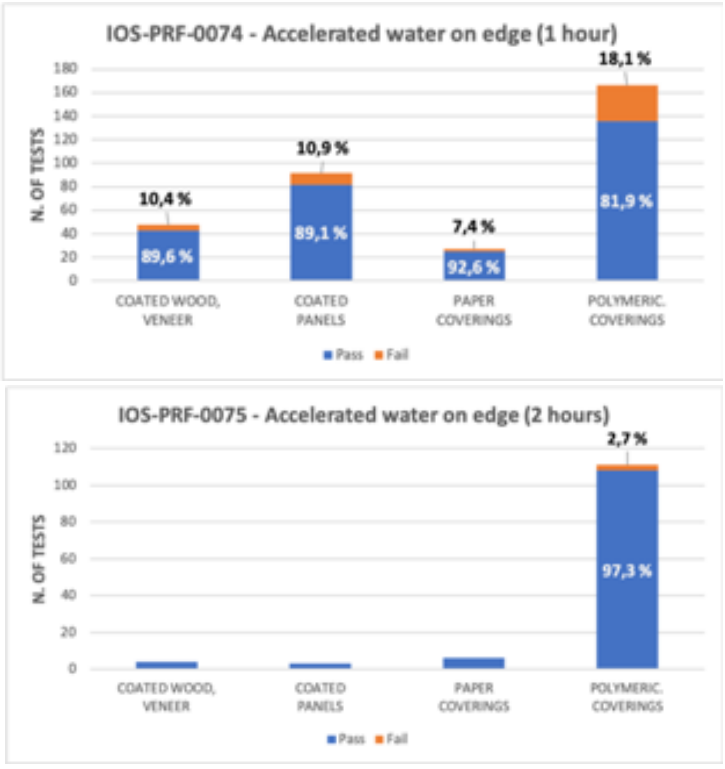

Fig. 6. IOS-TM-0021 – Accelerated water on edge tested for 1 or 2 hours.

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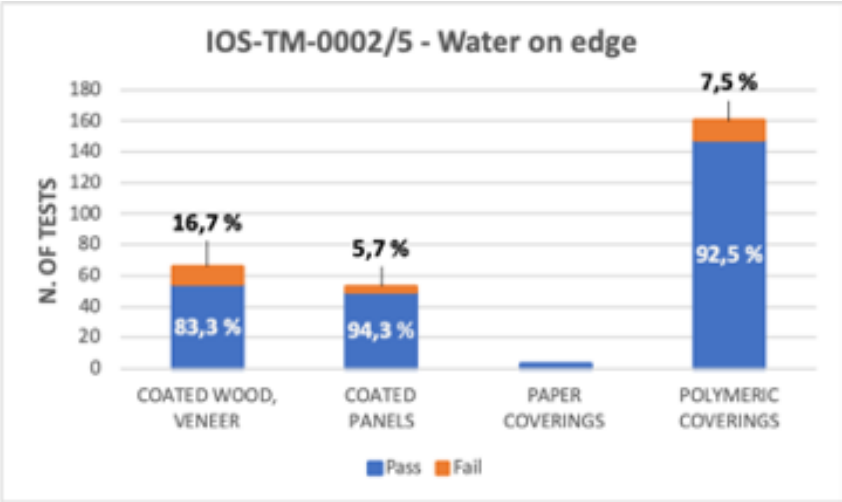

Fig. 7. IOS-TM-0002/5 – Water on edges.

No failure was found for the few paper coverings tested.
The main defects found were represented by more or less pronounced swelling of the board along the edge, with possible openings and detachments, cracking of the coating and gap levels in correspondence with the junctions of frame constructions.

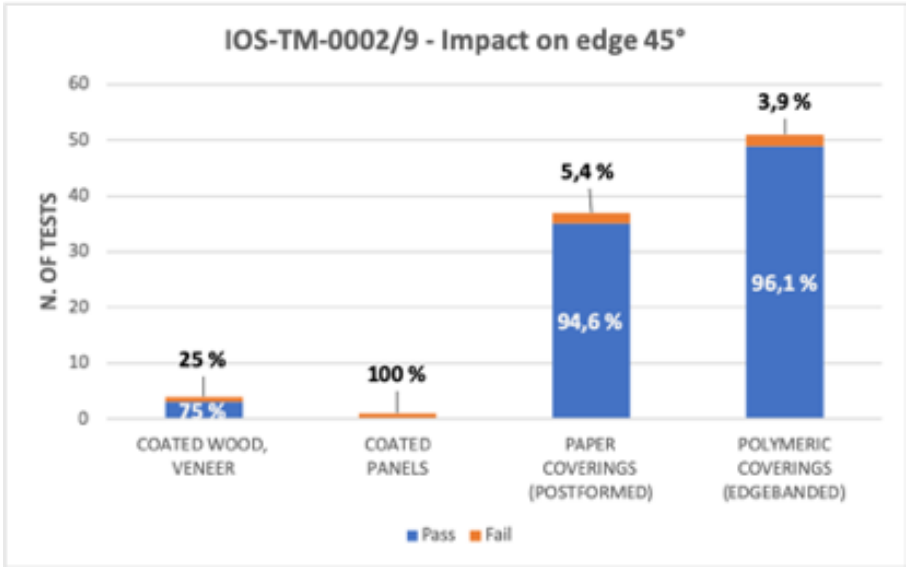

Fig. 8. IOS-TM-0002/9 – Impact on edges 45°.

Impact on edges 45° (fig. 8) is less critical than impact on edges 90°, with a total fail percentage of 6,5 %. The trend is similar to that of impact 90°, with a higher percentage of failure for paper coverings (5,4 %) and lower for polymeric coverings (3,9 %). Also in this testing, the only coated panel tested, as well as 25 % of coated wood/veneers, have not met the requirements.

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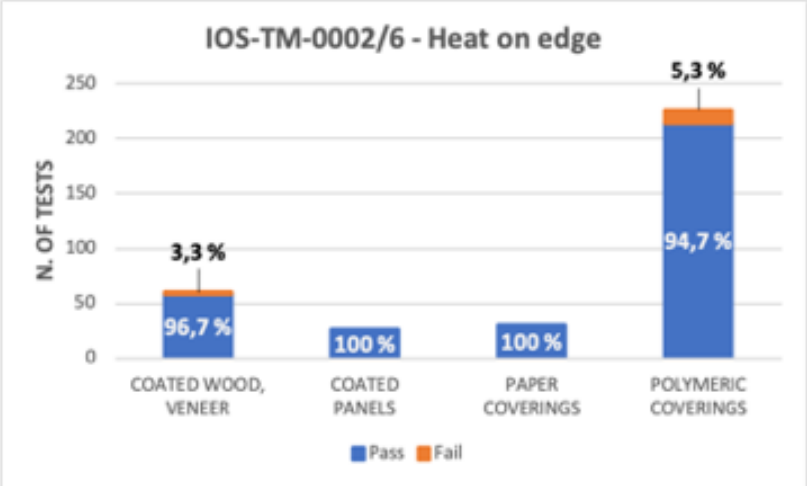

Fig. 9. IOS-TM-0002/6 – Heat on edges.

Concerning heat on edges (fig. 9), the only failures occurred in polymeric covering (5,3 %), generally due to partial or total detachment of the edge band, and in coated wood/veneers (3,3 %), generally due to cracking of the veneer or gap levels in correspondence with the junction in frame constructions. No failures were recorded for coated panels and paper coverings.

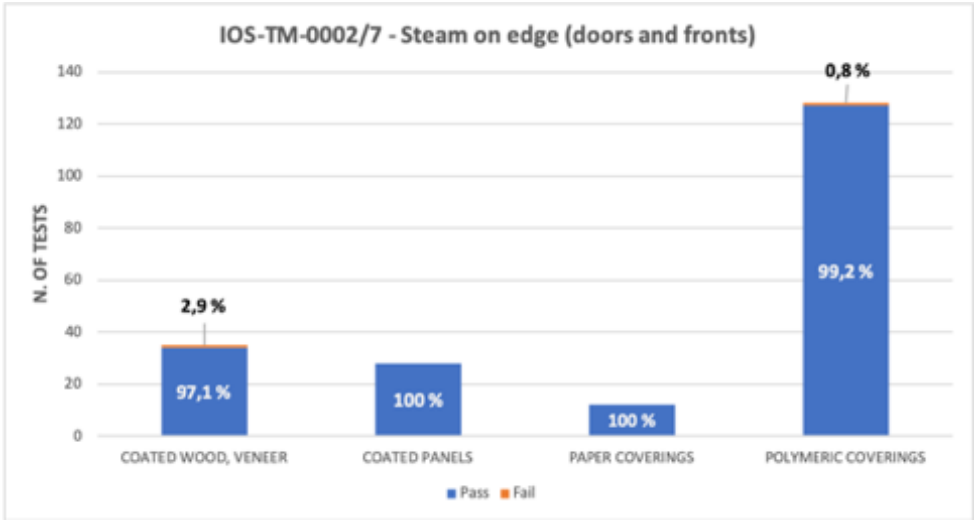

Fig. 10. IOS-TM-0002/7 – Steam on doors and fronts.

Steam on doors and fronts was one of the less critical tests on edges (fig. 10), recording an overall fail percentage of 1 %. All the fail events were related to coated wood/veneers (2,9 % of fail) and polymeric coverings (0,8 % of fail), whereas all coated panels and paper coverings passed the test. Here too, the main defects

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found were swelling of the board along the edge, cracking of the coating and gap levels in correspondence with the junctions of frame constructions.

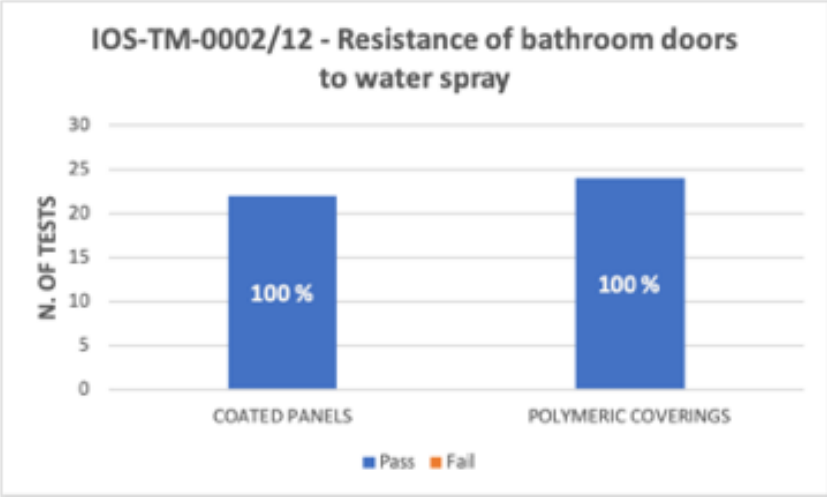

Fig. 11. IOS-TM-0002/12 – Resistance of bathroom doors to water spray.

The resistance of bathroom doors to water spray (fig. 11) has been passed by all the few samples tested, that belong to two categories of material: coated panels and polymeric coverings.

This article completes the series of statistical analyses of the pass/fail results of surface testing performed in our lab over a period of 12 months. This might reflect the general trend for tests that are repeated yearly.

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