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Attention: Mr Cristian Cottino

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Dear Sir

EVALUATION OF THE COMBUSTIBILITY, THE FIRE PROPAGATION PROPERTIES AND THE TOXICITY OF THE COMBUSTION PRODUCTS OF VITRACLAD VITREOUS ENAMEL STEEL CLADDING MATERIAL

1. SAMPLE DESCRIPTION

A set of sample panels were delivered in order to assess several of its fire properties. The 13 mm thick panels consisted of a 0.5 mm (Z275) galvanised mild steel backing, a 12 mm thick calcium silicate core and a 0.7 mm white Vitraclad vitreous enamelled steel facing.

2. TEST METHODS AND RESULTS

2.1 Combustibility of building materials at 750 °C (SANS 10177 Part 5)

A set of 40 mm x 40 mm x 50 mm thick samples were prepared by the client and delivered for this evaluation. The samples had the representative number of glue layers.

These samples were placed on a sample holder and lowered into the standard SANS 10177-5 electrically-heated furnace, which has been pre-set to have an enclosure temperature of 750 °C. The standard test duration is 10 minutes.

The test criteria for non-combustibility are that the specimen should neither increase the furnace enclosure temperature by more than 50 °C nor support flaming continuously for more than 5 seconds during the exposure period. Should either of these criteria not be met, the specimen will be regarded as combustible at 750 °C.

Sporadic and short-lived flashes (typically lasting one second) were noted during the tests (typically between 30 seconds and a minute after insertion of the sample). The furnace temperature was not increased by more than 50 °C on any occasion. The system would therefore be regarded as non-combustible in terms of this standard.

2.2 Surface Fire Index of finishing materials (SANS 10177 Part 3)

The test specimen (2400 mm long by 350 mm wide) was tested in accordance with the abovementioned test protocol for the standard test duration of 18.5 minutes. As per the test specification two specimens were tested, and if the results differ significantly a third specimen will also be evaluated.

A smoke cell in the chimney of the test apparatus recorded the percentage light obscuration while a copper rod recorded the stack temperature. Flame spread distance was also recorded.

Based on the readings and observations a Smoke Emitted Index, a Heat Contributed Index and a Spread of Flame Index were calculated. The arithmetic mean of these three indices is referred to as the Surface Fire Index. The table below shows the maximum allowable values of these indices for the different classifications.

Class	Spread of Flame Index	Heat Contributed Index	Smoke Emitted Index	Surface Fire Index
1	0.1	0.1	0.2	0.1
2	0.7	0.8	1.0	0.6
3	1.5	1.7	2.0	1.2
4	3.5	3.8	4.0	2.9
5	5.5	5.8	6.0	4.5

The two specimens subjected to the test yielded similar results; hence the third specimen was not evaluated. The following results and classification for the panels were obtained:

	Sample 1	Sample 2
Spread of Flame Index	0	0
Heat Contributed Index	0	0
Smoke Emitted Index	0.01	0.02
Surface Fire Index	0.003	0.006
Classification	1	1

2.3 Toxicity of combustion gases (NES 713)

A representative sample of approximately one gram of material was taken from the delivered samples and burned in a chamber with a volume of 1 m³. The sample was constructed to be representative of the overall composition of the rope sample. The concentrations of certain specified gases were determined by means of colorimetric (Dräger) tubes. These concentrations were then used to calculate the quantities of gases given off by burning 100 g of material in a cubic metre of air. The toxicity index is calculated from the summation of the ratios of these concentrations to the concentrations causing fatality to man after a 30-minute exposure time. Gases to be determined and their fatality limits are:

Gas	Conc. (ppm)	Gas	Conc. (ppm)
Carbon Dioxide	100000	Nitrous Oxides	250
Carbon Monoxide	4000	Hydrogen Cyanide	150
Formaldehyde	500	Acrylonitrile	400
Hydrogen Fluoride	100	Ammonia	750
Hydrogen Chloride	500	Sulphur Dioxide	400
Hydrogen Bromide	150	Hydrogen Sulphide	750
Phenol	250	Phosgene	25

The following results were obtained for the sample:

Gas detected	Conc. of gas per 100 g of material consumed (ppm)	Toxicity Index
Carbon Dioxide	50 000	0.5
Carbon Monoxide	1 000	0.25
Nitrous Oxides	traces	-


Total Toxicity Index: 0.75

3. CONCLUSION

The product as evaluated would be regarded as non-combustible. The results of the SANS 10177-3 evaluation confirm that the system does not promote flame spread as is classified as a Class 1, which can be used in any location as a finishing material. The toxicity of the smoke, as determined in the NES 713 test, is very low.

The Vitraclad product as evaluated can therefore be used in all locations as a finishing material from a surface fire properties point of view.

Yours faithfully



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