Tube Lines

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Canary Wharf
London
E14 5EU

Your ref. PO7808
Our ref. 7693-RSB-00033
Date: 5 October 2006

J Goulding
Becker Powder Coatings
Goodlass Road
Speke, Liverpool
L24 9HJ

Dear Mr Goulding

Becker Powder Coatings: Polyester Powder Coating

Fire test reports for the above mentioned powder coating were submitted for assessment against the requirements of LUL Engineering Standard 2-01001-002:A1.

The powder coating system is described as a single coat decorative polyester powder coating system applied to steel; product reference PD104596M.

Substrate – 0.8mm steel sheet
Dry film thickness – between 50 and 70 microns
Specific Gravity – 1.63
Application method – Electrostatic powder coating
Colour tested – RAL 9010 White

The above mentioned system has been tested for flammability to BS 476: Parts 6 & 7 (Warringtonfire Report's No. 153470 & 153471); for smoke emission to BS6853:1999: Annex D.8.4, a 60 deg panel test ((Warringtonfire Report's No. 155762) and toxicity (4-Rail Report No. 4RS-RO-060292-R133826). Test results are summarised in table 1 below.

Test Performed	Results	Requirements
BS476: Part 6	i_1 = 0.6	i_1 < 6
BS 476: Part 7	I = 1.1	I < 12
BS6853: Annex D.8.4	Ao(ON) = 1.87 Ao(OFF) = 2.23	**Rolling Stock** Ao(ON) ≤ 2.6 Ao(OFF) ≤ 3.9
BS6853: Annex D.8.4	Ao(ON) = 1.87 Ao(OFF) = 2.23	**Stations/Tunnels** Ao(ON) ≤ 2.4 Ao(OFF) ≤ 3.6
Quantitative Chemical Analysis	N = 0.38 C = 41.46 S < 0.22	No significant amounts of organically bound Halogens; Nitrogen; Sulphur or Phosphorus. Trace levels are acceptable.
Qualitative Chemical Analysis	Elements Detected – C; Al & Ti	

Table 1

As can be seen from table 1 above the powder coating system as tested has achieved the required flammability class '0' classification as defined in Document B of Building Regulations and has met the smoke emission requirements of LUL standard 2-01001-002 for use on both Rolling Stock and Stations.

The powder coat system was also tested for toxic fume emission and showed presence of 0.38% nitrogen, this amount of nitrogen is regarded as above trace level. However as the powder coat system has achieved a class '0' rating when tested for flammability to BS476: Parts 6 & 7 it is possible to compartmentalise the environment into fire regions. The fire region for fixed locations within stations (S) and tunnels (TU) is 1.25 m^2 and that for Rolling Stock (RS) is 0.5 m^2.

Choice of fire region is made so that spread of flame from a designated fire region to adjacent ones cannot occur faster than the time scale for escape. It is assumed that the time taken for the toxic fumes from a given fire region to dissipate into its dispersal volume (700m^3 for S; 200 m^3 for TU and 100 m^2 for RS) will be less than the fire spread from region to region and hence less than the time to escape.

Toxic fume emission calculations based on assumption that all nitrogen converts into hydrogen cyanide (HCN) show that the amount of HCN dispersed into the respective dispersal volumes will not exceed the IDLH required value of 50ppm within S; TU or RS.

Therefore, the powder coat system described above fully complies with the requirements of engineering standard 2-01001-002:A1 and may be used for the proposed application within Stations; Tunnels and Rolling Stock (interior & exterior).

Please note that the above is a reaction to fire of materials assessment and not a fit for purpose account.

Yours sincerely

[redacted]

Raj Bains
Materials Engineer TLL