



# Smoke and Toxicity Test

## IMO FTP Code Annex 1, Part 2 - Smoke and Toxicity Test

This information sheet describes the general principles of determining the emission of smoke and toxicity of materials which are intended for use as surface of bulkheads, linings or ceilings; as primary deck coverings; as floor coverings, or plastic pipes and cables.

### Before the test

Although general rules have been adopted by IMO, the interpretation of these rules may differ between national authorities and classification societies. Therefore it is important to determine which type approvals are to be obtained and to consult the relevant bodies. DBI has extensive experience in co-operating with national authorities and classification societies and can offer guidance about what to do, so that the process of testing will follow the proper requirements

Information Sheets: 'SHIP WHEEL-MARKING AND TYPE APPROVAL OF MARINE PRODUCTS' and 'TESTING AND INSPECTION FOR USCG'

### General

The smoke generation test is conducted in accordance with ISO 5659:1994, Part 2 and the toxicity test is conducted by use of FTIR, GC/MS, direct MS or similar. At DBI we use FTIR, which can produce traceable results.

### The test equipment

The smoke density chamber (SDC) is as used for ASTM E662 and BS 6401 but is modified with a truncated cone heater, as used in the cone calorimeter and the ignitability apparatus, just smaller. This allows for smoke generation from test specimens in the horizontal position. The amount of smoke is measured by photometric equipment. From the chamber the smoke/gasses are recirculated through FTIR.

The conditions to which the specimens are exposed are:

- 1) an irradiance of 25 kW/m<sup>2</sup> in the presence of a pilot flame;
- 2) an irradiance of 25 kW/m<sup>2</sup> in the absence of a pilot flame;
- 3) an irradiance of 50 kW/m<sup>2</sup> in the absence of a pilot flame.

### Verification of materials

The applicant shall provide a complete material specification to DBI before a test can commence.

### Test specimens

The applicant shall provide DBI with 15 test specimens, each with the dimensions 75 x 75 mm and a maximum thickness of 25 mm. The material shall be attached by means of adhesives to the substrate that will be used in practise. This includes airgaps etc. if the test specimen represents an assembly. Deck coverings should be applied on a 3 mm steel plate in the amount used in practise (see also IMO resolutions A.653, A.687 and A.753).

### Test procedure

Three specimens will be tested under each of the conditions described above for at least 10 minutes. If the minimum light transmission has not been reached during these 10 minutes the test shall continue for a further 10 minutes. The toxicity will be measured at each test condition.

### Test result

The result is given as the specific optical density of smoke ( $D_s$ ) as defined below

$$D_s = (V/(AL))\log_{10}(I_0/I) \quad \text{where}$$

V = total volume of the chamber ( $m^3$ )

A = exposed area of the specimen ( $m^2$ )

L = optical length (m) of smoke measurement

$I_0$  = light intensity before the test

I = light intensity during the test (after absorption by the smoke)

The test result is given as  $D_m$  the average of the  $D_{s-max}$  for three tests.

1. For materials used as surface of bulkheads, linings or ceilings, the  $D_m$  shall not exceed 200 in any test condition;
2. For materials used as primary deck covering, the  $D_m$  shall not exceed 400 in any test condition;
3. For materials used as floor coverings, the  $D_m$  shall not exceed 500 in any test condition; and
4. For plastic pipes and electric cables, the  $D_m$  shall not exceed 400 in any test condition.

### Toxicity

The gas concentration measured at each test condition shall not exceed the following limits:

CO	1450 ppm	HBr	600 ppm	HCl	600 ppm
HCN	140 ppm	HF	600 ppm	SO <sub>2</sub>	120 ppm (200 ppm for floor coverings cf. Res. MSC 173(79))
NO <sub>x</sub>	350 ppm				

### Test report

The test report will be written in English. It will contain all necessary information about the test specimens, test results and classification.

**For further information you are welcome to contact**

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