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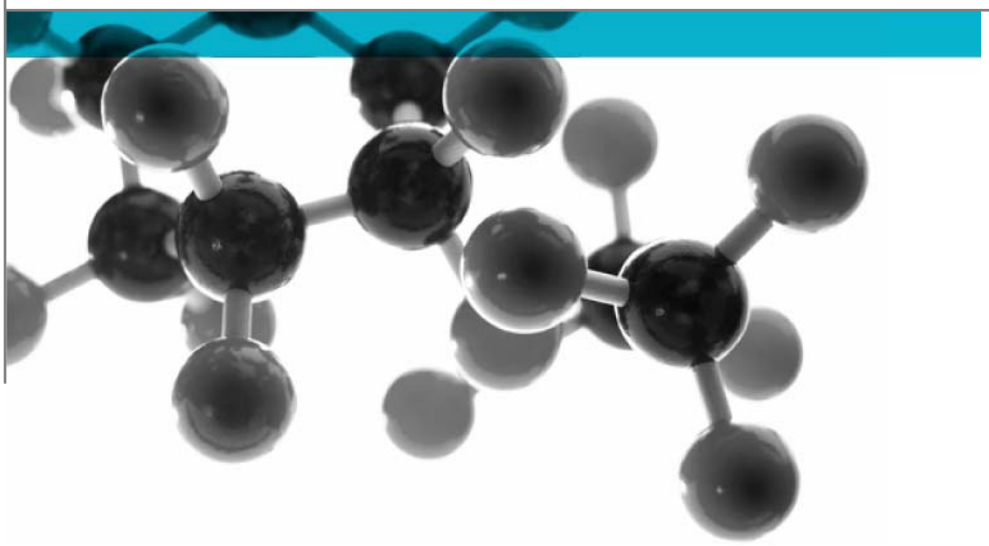
# NF F 16-101

# F Rating Summary Report



**Opinion of F classification in accordance with NF F 16-101 Railway Rolling-Stock, Fire Behaviour, Choice of Materials, complimented by STM-S-001 Technical Specification – Equipment RAT Technical Specification**

A Report To: Xiamen Wain Electrical Co., Ltd

Document Reference: 308703 and 308704

**Date:** 2nd September 2011

**Issue No.: 1**



Testing
Advising
Assuring

Laboratory approved by CERTIFER Railway Certification Agency

# Executive Summary

**Objective**

Summary of **Exova Warringtonfire** report Nos. 308703 & 308704. To assess the results of tests to NF X 10-702 and NF X 70-100 and to calculate the smoke index and corresponding F rating of the product tested, as defined in clause 6.4 of NF F 16-101.

| Generic Description | Product reference | Thickness | Density |
|---|---|---|---|
| Fibre glass reinforced polycarbonate material | Material used to produce "Heavy Duty Connector" | 6mm | 1.33g/cm³ |
| **Individual components used to manufacture composite:** | | | |
| Polycarbonate | "PC" | Not stated | Not stated |
| GRP | "GF20" | Not stated | Not stated |
| **Please see page 5 of this test report for the full description of the product tested** | | | |

**Test Sponsor**

Xiamen Wain Electrical Co., Ltd, 759-3 Chengbei Industrial Zone, Chaoyuan Road, Tongan District, Xiamen, China.

**Summary of Test Results:**

The results of the tests demonstrate that the product, as tested, can be classified as F2 in accordance with the requirements of NF F 16-101 and STM-S-001.

**Date of Test**

12th July and 14th July 2011

# Signatories

| | |
|---|---|
|  |  |
| Responsible Officer<br>B. Dean *<br>Fire Scientist | Authorised<br>T. Mort *<br>Senior Technical Officer |

* For and on behalf of **Exova Warringtonfire**.

Report Issued: 2nd September 2011

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# Test Details

## Introduction

Investigations into the behaviour of a product under the conditions of test specified in NF X 70-100 "Fire Tests. Analysis of pyrolysis and combustion gases. Tube furnace method" and NF X 10-702 "Fire test methods. Smoke emission test for measuring the specific optical density of smoke emitted by the combustion or pyrolysis of solid materials" have been conducted.

The results of the tests are fully reported in **Exova Warringtonfire** test reports nos. 308703 and 308704.

This summary test report has been prepared at the request of the sponsor and relates the results of the tests to the requirements for F classifications given in NF F 16-101, Table 4.

This summary should be read in conjunction with, and not accepted as a substitute for, the test reports nos. 308703 and 308704. These test reports may include additional information which may be relevant to the assessment of the potential fire hazard of the product.

# Description of Test Specimens

The description of the specimens given below has been prepared from information provided by the sponsor of the test. All values quoted are nominal, unless tolerances are given.

| | | |
|---|---|---|
| General description | | Fibre glass reinforced polycarbonate material |
| Product reference | | Material used to produce "Heavy Duty Connector" |
| Name of manufacturer | | Xiamen Wain Electrical Co., Ltd |
| Colour reference | | "Grey" |
| Overall thickness | | 6mm (stated by sponsor)<br>5.96mm (determined by **Exova Warringtonfire**) |
| Overall density | | 1.36g/cm$^3$ (stated by sponsor)<br>1.33g/cm$^3$ (determined by **Exova Warringtonfire**) |
| Polycarbonate | Generic type | Polycarbonate |
| | Product reference | "PC" |
| | Name of manufacturer | **See Note 1 below** |
| | Trade name of flame retardant | **See Note 1 below** |
| | Generic type of flame retardant | Non-halogen flame retardant<br>**See Note 1 below** |
| | Amount of flame retardant | 0.5 to 5% |
| Glass fibre | Type | Fibrous glass |
| | Product reference | "CAS Number - 65997-17-3" |
| | Name of manufacturer | **See Note 1 below** |
| Resin to glass ratio (by weight) | | 4 : 1 |
| Percentage glass reinforcement (by weight) | | 20% |
| Brief description of manufacturing process | | Design mould → Injection moulding → Deburring → Semi-finished products (reinforced PC body in practice) |

**Note 1. The sponsor of the test was unable to provide this, or further information, as their supplier is unwilling to provide this information.**

# Determination of F rating

## Results of test

The following test results were obtained for the specimens which were tested:-

| | | | | |
|---|---|---|---|---|
| NF X 10-702 | - | $D_m$ | = | 523 |
| | | $VOS_4$ | = | 141.2 |
| NF X 70-100 | - | C.I.T | = | 22.04 |

## Smoke index

The "Smoke Index", notated "SI", is calculated from the value of maximum specific optical density (Dm), the value of obscuration ($VOS_4$) and the value of the conventional index of toxicity (C.I.T), which are the values obtained from tests carried out in accordance with NF X 10-702 and NF X 70-100, according to the following formula:

$$S.I. = \frac{D_m}{100} + \frac{VOS_4}{30} + \frac{C.I.T}{2}$$

The SI value for the material tested is 21.

## F rating determination

According to the value obtained for SI, the material is classified in one of the six classes, F0 to F5, as defined in Table 4 of NFF 16-101 reproduced below.

| CLASS | VALUE OF SI |
|---|---|
| F0 | ≤ 5 |
| F1 | ≤ 20 |
| F2 | ≤ 40 |
| F3 | ≤ 80 |
| *F4* | ≤ 120 |
| F5 | > 120 |

## Conclusion

**The results of the tests detailed above demonstrate that the product, as tested, can be classified as F2 in accordance with the requirements of NF F 16-101 and STM-S-001.**

This classification is based on the requirements given in NF F 16-101: October 1988 and STM-S-001. If the specification is revised or amended in any way subsequent to that date, care must be taken to ensure that this opinion is not invalidated by those revisions or amendments.

## Validity

The specification and interpretation of fire test methods are the subject of ongoing development and refinement. Changes in associated legislation may also occur. For these reasons it is recommended that the relevance of test reports over five years old should be considered by the user. The laboratory that issued the report will be able to offer, on behalf of the legal owner, a review of the procedures adopted for a particular test to ensure that they are consistent with current practices, and if required may endorse the test report.

# Revision History

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|---|---|
| Issue No : | Issue Date: |
| Revised By: | Approved By: |
| Reason for Revision: | |

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| Revised By: | Approved By: |
| Reason for Revision: | |