

SPECIFICATION TESTED

Project No: PR451892
Class: 4910
Product Name: Nan Ya Rigid PVC Plate
Product Type: Cleanroom Material
Name of Listing Company: Nan Ya Plastics Corp.
Address of Listing Company: 201 Tung Hwa N Rd
Taipei, Taiwan
Customer ID: 133824
Customer website www.npc.com.tw

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5/15/19
Date

1 INTRODUCTION

1.1 Nan Ya Plastics Corp. requested Specification Testing of their Rigid PVC Plate listed in Section 1.4 to determine if it meets the requirements of the standard listed in Section 1.3.

1.2 This report may be freely reproduced only in its entirety and without modification.

1.3 Standard

Title	Number	Issue Date
Cleanroom Materials Flammability Test Protocol	4910	June 2009

1.4 Listing

The product will be listed in the Approval Guide, an on-line resource of FM Approvals, as follows:

Specification Tested > Building Materials > FM Approvals Cleanroom Materials Test Protocol (Class Number 4910)

NAN YA RIGID PVC PLATE

Trade Name:	Nan Ya Rigid PVC Plate
Thickness:	6 mm – 20 mm (0.24 in. – 0.79 in.)
Size:	1220 mm (48.0 in.) wide panels to various lengths
Material:	Fire Retardant PVC

Formulations, drawings, and specifications are on file at FM Approvals.

2 DESCRIPTION

Nan Ya Rigid PVC Plate is a rigid PVC plate. It is manufactured thickness of 6 mm (0.24 in.) to 20 mm (0.79 in.) in panel widths of 1220 mm (48.0 in.).

3 EXAMINATIONS AND TESTS

3.1 Test Sample production was witnessed by a representative of FM Approvals. Samples submitted for examination and testing were considered to be representative of standard production and were examined or tested as indicated below. All data is on file at FM Approvals along with other documents and correspondence applicable to this program.

3.2 All testing and analysis considered appropriate was conducted and verified to be in compliance with the Standard defined in Section 1.3 as described in the table below:

Section	Test Name	Justification/Comments
4.3	Ignition Test	Included
	Combustion Test	Included
	Fire Propagation Test	Included
4.4	8 ft. (2.4 m) Parallel Panel Test	Not Included

3.3 Tests indicated in the table above were conducted to determine the Fire Propagation Index (FPI) and Smoke Damage Index (SDI) of the sample material.

3.4 Fire Propagation Index (FPI)

3.4.1 The FPI is the ratio of the one-third power of the radiative fraction of the chemical heat release rate per unit width of the sample to the ignition resistance of the sample, defined as the Thermal Response Parameter (TRP). The FPI is determined as a function of time. The average of the individual peak FPI values is used for classification of non-propagating vs. propagating. An $FPI \leq 6$ is used as the criterion for non-fire propagation beyond the ignition zone. The chemical heat release rate and the TRP are determined as follows:

3.4.2 Piloted Ignition Test Method - The piloted ignition test is used to obtain data to calculate the TRP. For this test, multiple 100 mm x 100 mm (4 in. x 4 in.) samples of the plate material were exposed to increasing heat flux levels between the materials critical heat flux (CHF) and 60 kW/m² (317 BTU/ft²·min.). A pilot flame was used to ignite the combustible vapors. Each test sample was exposed to the heat flux and the time to ignition was recorded. The CHF is the maximum heat flux at, or below, which there is no ignition.

3.4.3 Fire Propagation Tests Method - The fire propagation test is used to obtain data to calculate the chemical heat release rate. For this test, three 100 mm x 300 mm (4 in. x 12 in.) samples of each material were individually set up vertically in the test apparatus, within a glass cylinder. Co-flowing air with an oxygen concentration of 40 percent enters the test chamber in such manner to achieve uniform flow across the tube. The bottom portion of each sample is surrounded by four radiant quartz heaters and exposed to 50 kW/m² (264 Btu/ft²/min.) of external heat flux. A pilot flame was used to ignite the combustible vapors. The test was continued until there were no visible flames issuing from the test specimen. The chemical heat release rate is determined from the generation rates of carbon monoxide (CO) and carbon dioxide (CO₂).

3.5 Smoke Damage Index (SDI)

3.5.1 The SDI is the product of the yield of smoke, known as the smoke index (SI) and the FPI. The SI is the ratio of the total mass of the smoke generated to the total mass of the material loss.

3.5.2 Combustion Tests Method - The combustion test is used to obtain data to calculate the SI. For this test, three 97 mm (3.8 in.) diameter samples of each material were individually set up horizontally in the test apparatus, within a glass cylinder. Co-flowing air with an oxygen concentration of 21 percent enters the test chamber in such manner to achieve uniform flow across the tube. The sample is surrounded by four radiant quartz heaters and exposed to 50 kW/m² (264 Btu/ft²/min.) of external heat flux. A pilot flame was used to ignite the combustible vapors. The test was continued until there were no visible flames issuing from the test specimen. A turbidimeter is located in the sampling duct of the test apparatus. During the test, the measurements are made for the optical transmission through smoke and the sample mass as a function of time.

3.5.3 The average of the individual SI values is multiplied by the FPI for classification. A $SDI \leq 0.4$ is used as the criterion for significantly limiting smoke concentration for non-fire propagating fires beyond the ignition zone.

3.6 The TRP, FPI, and SDI of the sample material were determined to be:

Material	TRP kW/m ² s ^{-1/2}	FPI (m/s ^{1/2})/(kW/m) ^{2/3}	SDI [(m/s ^{1/2})/(kW/m) ^{2/3}][g/g]
Nan Ya Rigid PVC Plate	472.77	5.7	0.056

4 MARKING

- 4.1** The manufacturer shall mark each package with the manufacturer's name and product trade name. In addition, each item must be marked with FM Specification Tested to FM 4910 and include the Project ID number of FM Approvals.
- 4.2** Markings denoting Specification Tested by FM Approvals shall be applied by the manufacturer only within and on the premises of manufacturing locations under the FM Approvals Surveillance program.
- 4.3** The manufacturer agrees that use of the FM Approvals name or Specification Tested Mark is subject to the conditions and limitations of the Specification Tested listing by FM Approvals. Such conditions and limitations must be included in all references to Specification Tested by FM Approvals.

5 REMARKS

- 5.1** Continued listing as Specification Tested in the Approval Guide is based upon consistent manufacturing of Nan Ya Rigid PVC plates in accordance with this Specification Tested Report, satisfactory field experience and continued use of acceptable quality control procedures as determined by Surveillance Audits.
- 5.2** Additional guidance for the use of Nan Ya Rigid PVC Plate is outlined in FM Global Property Loss Prevention Data Sheets 1-56 and 7-7.

6 SURVEILLANCE AUDIT

The manufacturing facilities at the following locations shall be visited on a routine basis. The facility processes and quality control procedures in place have been determined to be satisfactory to manufacture products identical to that Specification Tested. An FM Approved Products/Specification Tested Revision Request shall be submitted to FM Approvals for requesting to manufacture products at any additional or alternate manufacturing facilities which are not listed below.

Audit Locations

Nan Ya Plastics Corp.
201 Tung Hwa N Rd
Taipei, Taiwan

Nan Ya Plastics Corp.
201, Sec. 2, Pei Kang Road
Tai Bao, Chiayi, Taiwan

7 MANUFACTURER'S RESPONSIBILITIES

- 7.1** Documentation that is applicable to this Specification Tested Listing is on file at FM Approvals and listed in the Documentation File, Section 8, of this report. No changes of any nature shall be made unless notice of the proposed change has been given and written authorization obtained from FM Approvals. An FM Approved Products/Specification

Tested Revision Request Form shall be submitted FM Approvals as notice of proposed changes.

- 7.2** In accordance with the Master Agreement, the manufacturer shall make full and immediate disclosure to FM Approvals of all information concerning any defect in, or potential hazard of, the product or service manufactured or provided by the Customer which is Listed by, or being examined by, FM Approvals. The manufacturer shall make all necessary arrangements for the investigation of complaints / anomalies applicable to this listing and shall keep records of all complaints / anomalies including actions taken.

8 DOCUMENTATION

The following document describes Nan Ya Rigid PVC Plate and is on file at FM Approvals:

Document Title	Issue Date
Surveillance Audit Manual	May 2019

9 CONCLUSION

The products described in section 1.4 meet FM Approvals requirements for a Specification Tested listing. Since a duly signed Master Agreement is on file for this manufacturer, Specification Tested Listing is effective the date of this report.

PROJECT DATA RECORD: PR451892

ATTACHMENTS: None