Approval Standard for Plastic Suspended Ceiling Panels

Class Number 4651

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Foreword

The FM Approvals certification mark is intended to verify that the products and services described will meet FM Approvals' stated conditions of performance, safety and quality useful to the ends of property conservation. The purpose of Approval Standards is to present the criteria for FM Approval of various types of products and services, as guidance for FM Approvals personnel, manufacturers, users and authorities having jurisdiction.

Products submitted for certification by FM Approvals shall demonstrate that they meet the intent of the Approval Standard, and that quality control in manufacturing shall ensure a consistently uniform and reliable product. Approval Standards strive to be performance-oriented. They are intended to facilitate technological development.

For examining equipment, materials and services, Approval Standards:

a) must be useful to the ends of property conservation by preventing, limiting or not causing damage under the conditions stated by the Approval listing; and

b) must be readily identifiable.

Continuance of Approval and listing depends on compliance with the Approval Agreement, satisfactory performance in the field, on successful re-examinations of equipment, materials, and services as appropriate, and on periodic follow-up audits of the manufacturing facility.

FM Approvals LLC reserves the right in its sole judgment to change or revise its standards, criteria, methods, or procedures.

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I INTRODUCTION

1.1 A suspended ceiling installed below an automatic sprinkler system can impede the operation of automatic sprinkler heads and their water distribution. By acting as an insulator, the suspended ceiling may delay sprinkler head operation. By obstructing sprinkler water flow and distribution, the suspended ceiling panels or tiles may contribute to fire spread at floor level and subsequent building damage.

1.2 Situations may also occur in which sprinklers adjacent to a fire area may be activated by elevated temperatures resulting from the entrapment of hot gases in the area above a suspended ceiling. The cooling effect of sprinkler water on the ceiling panels or tiles must not significantly alter their drop-out or melt-out behavior.

1.3 A suspended ceiling system installed in sprinklered or unsprinklered areas can be a hazard if the ceiling material itself contributes significant fuel to a fire or spreads the fire along its surface.

1.4 Suspended ceilings are available in materials which incorporate special features that will minimize the hazards mentioned above. These features include their melt-out properties which enable the ceiling tiles to decompose without flaming when subjected to heat, and/or drop-out properties which enable the panels to shrink when absorbing heat. These properties permit the ceiling panels to fall from their suspension grid allowing prompt and unobstructed sprinkler water flow. The melt-out or drop-out behavior of the panels minimizes the potential propagation of fire across the surface of the entire suspended ceiling. For this reason, no clips which limit drop-out of the ceiling panels shall be used with Approved ceiling panels unless they have been incorporated during the fire tests.

1.5 Approval examination will include appropriate fire tests to determine ease of drop-out or melt-out, the cooling effect of sprinkler water on drop-out behavior, surface flammability and quality control inspections of the product manufacturing facility.

1.6 Continued Approval will depend upon satisfactory field experience and periodic follow-up inspections of the manufacturing procedures.

II TEST MATERIAL

2.1 The manufacturer shall furnish 500 sq ft (46.5 sq m) of the thickest ceiling panel in the shortest length and width for which Approval is sought and a sufficient amount of suspension grid system to support a 10 ft (3.05 m) × 12 ft (3.66 m) test system. The ceiling panel submitted must be truly representative of production-run material. The suspension grid supplied shall be of the inverted-T type, with no clips or ridges which might impair drop-out performance of the panels.

III FIRE TEST PROCEDURES

3.1 Three series of fire tests are performed to evaluate the behavior of the ceiling panels. During Tests 1 through 6, a forced draft is created under the simulated ceiling arrangement by a 12 in. (30.5 cm) diameter fan, 1/4 hp, 1000 rpm, to induce surface flame spread, if possible.

3.2 Melt-Out or Drop-Out Behavior Before Sprinkler Operation

3.2.1 Tests 1, 2 and 3 are conducted to determine the effect of heat and flame on the ceiling tiles before sprinkler operation and their ability to melt out quickly. For each test, a 10 ft × 12 ft (3.05 m × 3.66 m) ceiling is assembled horizontally incorporating a suspension frame and centered over a fire exposure derived from a 1 in. (2.54 cm) depth of isopropyl alcohol in a 1 sq ft (0.093 sq m) pan located 35 in. (88.9 cm) below the panels. The fire source is ignited, and the panels observed for decomposition and the elapsed time required for panels to fall free from the grid is noted. This arrangement is considered to simulate a fire with ceiling temperatures reaching 1000°F (538°C) in about 1½ min.

3.2.2 If the ceiling panels directly above the fire melt out or drop out of the grid system within one minute and 45 sec., and if no spreading flame is observed on the surfaces of the panels, the performance is considered satisfactory. Full scale laboratory tests indicate this time lag will be little or no detriment to sprinkler effectiveness.

3.3 Melt-Out or Drop-Out Behavior When Sprinklers are Operating

3.3.1 Tests 4, 5 and 6 are conducted to determine if sprinkler water adjacent to a fire area would cool the ceiling panels and significantly delay fallout. The test set-up is essentially the same as described in Paragraph 3.2.1, except as follows: One pendant type sprinkler, ½ in. (12.7 mm) orifice, is centrally mounted 18 in. (45.7 cm) above the 10 ft (3.05 m) × 12 ft (3.66 m) suspended ceiling. A sprinkler flow (10 gpm) is initiated 15 sec. prior to ignition of the fire source and is maintained at the same flow rate throughout each test. The panels above the fire exposure are timed for melt-out or drop-out performance under the cooling effect of the sprinkler flow.

3.3.2 If the ceiling panels drop free of the grid system within one minute and 45 sec. after ignition of the exposure, and if no spreading flame is observed on the surfaces of the panels, the performance is considered satisfactory.

3.4 Surface Flammability

3.4.1 Tests 7, 8 and 9 are performed to determine if the panels would contribute to a spreading fire over their surface. For each test, two ceiling panels are held vertically ½ in. apart and a Bernz-o-matic propane torch is placed between the panels at their base and held for a 15 sec. period. The torch is then removed and observations are made to determine if the panels support combustion.

3.4.2 When the exposure is removed, the flame shall not spread to the top of the panels.

IV MANUFACTURING QUALITY CONTROL TESTS

4.1 For purposes of acquiring Quality Control data, original samples will be analyzed by the following methods:

4.1.1 Density:

One sample of the submitted ceiling panel shall be measured and the volume shall be determined. The sample shall then be weighed and the density of the panel will be computed by dividing the panel weight by the panel volume.

4.1.2 Total Ash:

A section of the suspended ceiling panel shall be cut of minimum dimensions 2 in. × 2 in. (50.8 mm by 50.8 mm) by submitted thickness. This section shall be weighed and placed in a tare of known weight. The tare shall then be subjected to sufficient heat to effect complete combustion of all combustible material in the tare. The weight of remaining ash shall be determined. The percent of total ash is determined by dividing the weight of the ash by the weight of the section before combustion.

4.1.3 Emerson Oxygen Bomb Calorimeter:

A section of the suspended ceiling panel shall be cut of minimum dimensions 2 in. × 2 in. (50.8 mm × 50.8 mm) by submitted thickness. This section is weighed and placed in a pressure vessel or bomb which is then sealed. The bomb is completely immersed in water of known volume and temperature. Oxygen at a pressure of 300 psi (21.1 kg/cm^2) is introduced inside the bomb. The bomb is then fired by a hot wire. The heat release from the bomb is measured in Btu's by the rise in temperature of the volume of water. By dividing the heat release in Btu's by the weight of the section in pounds, we determine the heat of combustion in Btu's per pound.

4.1.4 Pyrolytic Gas Chromagraphy:

A section of the suspended ceiling shall be cut of minimum dimensions 1 in. (25.4 mm) × 1 in. (25.4 mm) by submitted thickness. A small portion of this sample material shall be weighted to the nearest milligram and introduced into the test apparatus. The test apparatus shall subject the material to metered quantities of heat sufficient to completely gassify the test material. The gases produced are passed through a glass column containing an inert gas and electrically recorded on a graph which plots response versus time. The areas under the peaks of this response curve are related to amounts of different compounds produced during gassification.

4.2 The data developed from these small scale quality control tests shall be maintained on file by FM Approvals. Results of these tests will be considered as nominal for the Approved product. Should periodic control testing of the Approved product at any time yield significantly different results from the original small scale test, re-examination of the Approved product may be necessary.

V MARKINGS

For purposes of identifying the Approved product, each panel shall be marked on its edge with the FM Approval mark and manufacturer's trade name as Approved.

VI QUALITY ASSURANCE IN-PLANT INSPECTION

An inspection of the product manufacturing facility is part of the Approval investigation. Its purpose is to determine that production procedures and manufacturing controls are properly maintained to produce the same quality of material as the tested product. Periodic re-inspections will be conducted to assure adequate quality control. Samples of the Approved product may be taken at this time for small scale quality control re-examination.

VII RE-EXAMINATION

7.1 A re-examination will be conducted periodically on the Approved ceiling material to determine that the quality and uniformity of the product has been maintained and that the product will provide the same level of performance as originally Approved.

7.2 Changes in formulation by the manufacturer, evidence of unsatisfactory performance of the Approved product, or significant variations between small scale re-examination results and original small scale test results may be cause for complete Approval re-examination.

VIII MANUFACTURER'S RESPONSIBILITY

8.1 The manufacturer shall notify FM Approvals of any change in the Approved product prior to general sale and distribution. Non-compliance with this provision is grounds for immediate withdrawal of FM Approval.

8.2 The manufacturer shall make every reasonable effort to supply all necessary instructions and other assistance to the installer to insure proper installation.

8.3 Approved ceiling tiles are not to be painted or altered in any way. The manufacturer shall be responsible for so advising distributors, installers, and customers. If tiles are painted or altered in any way, FM Approval is automatically voided.