

APPROVAL REPORT

**PHARMCO TECH™
CLASS 1 FIRE RATED INTERIOR WALL PANEL
AND
CLASS 1 INTERIOR WALL PANEL FOR SMOKE
SENSITIVE OCCUPANCIES FOR USE IN
PHARMACEUTICAL MANUFACTURING AND
STORAGE AREAS, FOOD PREPARATION and
STORAGE AREAS, OR SIMILAR OCCUPANCIES**

Prepared for:

**B & D Products, LLC
22B River St.
Dover, NJ 07801**

Project ID: 3038263

Class: 4882, 4880

Date of Approval: 21 March 2011

Authorized by:


R. P. Ferron, P.E., AVP, Group Manager, FM Approvals

**PHARMCO TECH™
CLASS 1 FIRE RATED INTERIOR WALL PANEL
AND
CLASS 1 INTERIOR WALL PANEL FOR SMOKE SENSITIVE OCCUPANCIES
FOR USE IN PHARMACEUTICAL MANUFACTURING AND STORAGE AREAS,
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from

**B & D Products, LLC
22B River St.
Dover, NJ 07801**

I INTRODUCTION

1.1 B & D Products, LLC submitted their Pharmco Tech™ PVC wall panels, maximum 2 mm (0.079 in.) thick to determine if they meet the Approval requirements of the **Standards** listed below for Class 1 fire for interior plastic wall panels and Class 1 interior wall panels for smoke sensitive occupancies in pharmaceutical manufacturing and storage areas, food preparation and storage areas or similar occupancies for installation without height restriction.

1.2 Standards:

Title	Class Number	Date
Class 1 Interior Wall and Ceiling Materials or Systems for Smoke Sensitive Occupancies	4882	June 2010
Class 1 Fire Rating of Insulated Wall or Wall and Roof/Ceiling Panels, Interior Finish Materials or Coatings, and Exterior Wall Systems	4880	May 2010

1.3 Examination included FM Approvals 16 ft High Parallel Panel Test, UBC 26-3 Room Test, ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials, and ISO 871 Determination of Ignition Temperature Using a Hot-Air Furnace, ISO 1716 Reaction-To-Fire Tests for Building Products and ASTM D482 Test Method for Ash from Petroleum Products testing.

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

1.5 Tests show that the Pharmco Tech™ , maximum 2 mm (0.079 in.) thick, wall panels, as tested, meet the Approval requirements of the **Standards** listed above for Class 1 fire rated interior plastic panel and Class 1 interior wall system for use in pharmaceutical manufacturing and storage areas, food preparation and storage areas or similar occupancies for installation without height restriction.

1.6 Listings: The tested constructions meet the Approval criteria of FM Approvals when installed as specified in the CONCLUSIONS of this report and when Approval is effective will be listed in the FM Approval Guide, an online resource of FM Approvals.

FM APPROVALS
Project ID: 3038263

II DESCRIPTION

- 2.1 Pharmco Tech™ Wall Panel wall panels are extruded PVC sheets. The panels are nominal 2 mm (0.079 in.) thick, white in color and are provided in various stock dimensions from 12 to 54 in. (305 – 1,370 mm) wide by 12 ft (3.7 m) long and other custom dimensions..
- 2.2 Fastbond™ 30NF is a water-dispersed spray or roller applied contact adhesive.
- 2.3 A 5/32 in. (4 mm) diameter PVC rod supplied in 110 ft (33.5 m) spools is heat welded to seal panel to panel seams.
- 2.4 The panel formulations and specifications are on file at FM Approvals.

III EXAMINATIONS AND TESTS

- 3.1 Samples were submitted for examination and testing as follows:
 - 3.1.1 Tests conducted were as required by the Standards listed in paragraph 1.2 above.
 - 3.1.2 A representative of FM Approvals witnessed production and selected samples of the Pharmco Tech™ PVC wall panels June 21, 2010 and August 23, 2010. All samples were considered to be representative of standard production and were examined and tested as indicated below.
 - 3.1.3 Sample panels incorporated into test samples were selected by FM Approvals personnel. Test samples were prepared by, or under the supervision of, FM Approvals personnel. All testing was conducted at the Fire Technology Center at the FM Global Research Campus in West Glocester, RI.
 - 3.1.4 All data is on file at FM Approvals under FM Approvals Project ID 3038263 along with other documents and correspondence applicable to this program.
- 3.2 UBC No. 26-3 Room Fire Test
 - 3.2.1 A room fire test was conducted in accordance with Uniform Building Code Standard No. 26-3 "Room Fire Test Standard for Interior of Foam Plastic Systems".
 - 3.2.2 The room fire test was conducted in a room sheathed on the ceiling and all four walls with glass fiber faced gypsum board secured to wood framing. A 30 in. (760 mm) wide by 7 ft 0 in. (2135 mm) high door was located in one 8 by 8 ft mm (2440 by 2440) wall (front).
 - 3.2.1 Four Pharmco Tech™ panels, 48 in. x 96 in. (1220 mm x 2440 mm), were prepared by applying one coat of Fastbond™ 30NF adhesive to each panel. One coat of Fastbod™ 30NF adhesive was applied to the 0.5 in. (13 mm) thick gypsum wall board. The prepared panels were then adhered vertically on the 8 by 8 ft (2440 by 2440 mm) wall opposite the door (back) and the first 8 ft (2440 mm) of the adjacent 12 by 8 ft (3660 by 2440 mm) wall (left). Vertical panel joints were seal using 5/32 in. (4 mm) diameter PVC rod with a proprietary heat gun. The ceiling was exposed 0.5 in (12 mm) gypsum board.
 - 3.2.2.1 The exposure fire was a 15 by 15 in. (380 by 380 mm) 30.42 lb (13.5 kg) crib of 1-½ in. (38 mm) square Douglas fir sticks conditioned to a moisture content of 6.8% placed at the intersection of the sample covered walls 1 in. (25 mm) from the interior of the sample panels and 3 in. (76 mm)

FM APPROVALS
Project ID: 3038263

above the noncombustible floor. The exposure fire was ignited using 1 lb (0.45 kg) of shredded wood excelsior and 4 oz. (0.12 l) of ethanol.

- 3.2.2 The exposure fire was removed from the corner location 15 minutes after ignition and extinguished with water. Flaming on sample panel surfaces or at sample panel joints was extinguished with a fine water spray after the exposure fire was extinguished.
 - 3.2.2.1 A video tape of the room fire test was taken through the door opposite the exposure fire. Temperature readings were taken at 1 second intervals using thermocouples located 3 ft (TC 01), 5 ft (TC 02) and 7 ft (TC 03) (915, 1525 and 2135 mm) above the floor 3 in. (76 mm) from the adjacent interior wall surfaces above the exposure fire, and 1 in. (25 mm) below the ceiling and at the center of the 8 by 8 ft (2440 by 2440 mm) sample ceiling area (TC 04).
- 3.2.3 Performance in the room fire test is satisfactory if charring of the plastic panel core does not extend to the outer extremities of the test area within 15 minutes of the ignition of the excelsior and smoke levels generated during the test are not excessive. Discoloration extending up to 0.25 in. (6.4 mm) into the foam plastic is not considered to be charring.
- 3.2.4 The Uniform Building Code Standard No. 26-3 Room Fire Test Standard for Interior of Foam Plastic Systems was conducted on July 7, 2010. The following observations were noted during the test. All distances are approximate. See Appendix B for Room Test Thermocoupling Graph:

<u>Time</u> (min:sec)	<u>Observations</u>
0:00	Ignition of exposure fire.
1:00	Corner panel on rear wall buckling.
2:00	Temperature at TC 04, 196° F (91°C): light gray colored smoke 1.5 – 2 ft (0.46 – 0.6 m) below top of door frame opening.
3:00	Flame in corner to 7 ft (2.1 m): From the corner to 5 ft (1.5 m) panels on rear wall and 1 ft (0.3 m) down from the top sagging.
4:00	Temperature at TC 04, 440° F (227°C): Panels in corner flaming; Flames at intersection walls to ceiling; dense gray smoke 1.5 ft (0.46 m) below top of door frame opening.
5:00	Temperature at TC 04, 571° F (299°C): Heavy black smoke 1.5 ft (0.46 m) below top of door frame opening.
5:40	Pieces of non flaming black material falling from rear wall.
6:00	Pieces of non flaming black material falling from left wall from corner to 4 ft (1.2 m).
7:00	Temperature at TC 04, 623 °F (328°C)
7:15	Pieces of non flaming black material continue falling from left wall.
8:00	Temperature at TC 04, 580 °F (304°C); Top of wall panels drop down 1 – 3 ft (0.3 -1 m) along left wall.
9:00	Top of wall panels drop down the 8 ft (2.4 m) length of the rear wall.
12:00	Temperature at TC 04, 568 °F 297°C).
14:00	Temperature at TC 04, 614 °F (323°C).
15:00	End test. Exposure flame extinguished by water hose; Temperature at TC 04, 614 °F (304°C).

- 3.2.5 Peak temperature at TC 04 was 636°F (336°C). Post test observations showed that charring of the Pharmco Tech™ plastic panel cores did not extend to the outer extremities of the test area within the 15 minute period after the start of the test.

FM APPROVALS
Project ID: 3038263

- 3.2.6 A DVD and digital photographs are in the Technical Information Center at FM Approvals under Project ID 3038263.
- 3.3 FM Approvals 16 ft (4.9 m) High Parallel Panel Test
- 3.3.1 A 16 ft (4.9 m) parallel panel fire test with a propane gas ignition source of 360 kW was conducted in accordance with Revision 1 of TEST PROCEDURE CLASS NUMBER 4882: FM APPROVALS 16 ft (4.9 m) HIGH PARALLEL PANEL TEST using the FM Approvals 16 ft (4.9 m) parallel panel test structure under the 5 MW Calorimeter in the Small Burn Lab at the Fire Technology Center at the FM Global Research Campus in West Glocester, RI on January 28, 2011.
- 3.3.2 The 16 ft (4.9 m) parallel panel fire test apparatus consists of two 192 in. (4875 mm) high by 42 in. (1065 mm) wide parallel panels 21 in. (535 mm) apart (face to face with test samples in place) and a 42 in. (1065 mm) long by 21 in. (535 mm) wide by 12 in. (305 mm) high sand burner located at the bottom of the panels under a 5 MW calorimeter with gas flow control equipment for the sand burner and smoke measurement equipment located in the exhaust duct for the 5 MW calorimeter.
- 3.3.2.1 The 16 ft (4.9 m) parallel panel test structure consists of two 210 in. (5335 mm) high by 42 in. (1065 mm) wide angle iron frames sheathed on one side with 1 in. (25 mm) thick Marinite I refractory over 1/2 in. (13 mm) thick plywood from the top of each frame to 18 in. (455 mm) above the bottom of each frame. See Appendix A.
- 3.3.2.2 The ignition source is a 42 in. (1065 mm) long by 21 in. (535 mm) wide by 12 in. (305 mm) high sand burner connected to a flexible 2 in. (50 mm) diameter high pressure hose. The hose is connected through a gas flow control panel which is in turn connected to a 2 in. (50 mm) diameter propane gas line. The flexible 2 in. (50 mm) hose is connected through a reducer to a 1 in. (25 mm) stainless steel pipe burner at the entrance to the sand burner. The output of the sand burner is set by controlling the propane gas flow rate to the burner with a gas flow control panel. The 2-in. main gas supply pipe providing propane at 20 psi (138 kPa) is connected to a tee which splits the gas line into two 1 in. (25 mm) piping systems. There are two Hasting flow meters, each controlling flow through one of the 1 in. (25 mm) piping systems. The Model 305 flow meter has a range of 0 to 600 standard liters/minute of propane while the Model 301 flow meter has a range of 0 to 260 standard liters/minute of propane. The Model 305 flow meter is used with the Model 301 flow meter blocked using a by-pass valve. A 1-in. control needle valve controls the gas flow to maintain the specified burner output of 360 ± 10 kW. The sand burner is ignited with a propane torch and the moment of ignition is taken as 0 minutes.
- 3.3.2.3 The propane supply to the sand burner was tuned off 15 minutes after ignition of the burner and the sample panels were extinguished with water 20 minutes after ignition of the burner.
- 3.3.2.4 Digital video and still photographs were taken of the 16 ft (4.9 m) parallel panel fire test. Duct thermocouple data, gas flow meter data, smoke measurement data and mass flow in the duct of the 5 MW calorimeter are taken at intervals of 0.1 second and then averaged to intervals of 1 second.
- 3.3.2.5 Performance in the 16 ft (4.9 m) parallel panel fire test is satisfactory for Class 1 Approval for smoke sensitive occupancies if the average smoke emission rate (\dot{G}_{smoke}) for pharmaceutical manufacturing and storage areas, food preparation and storage areas or similar occupancies is equal to, or less than 240 mg/s, or for cleanrooms or similar occupancies is equal to, or less than 120 mg/s during the test period.

FM APPROVALS
Project ID: 3038263

- 3.3.2.6 Performance in the 16 ft (4.9 m) parallel panel fire test is satisfactory for Class 1 Approval without height restriction if the peak chemical heat release rate (PCHRR) of the test panels during the test with a propane gas ignition source of 360 kW is less than, or equal to, 830 kW for combustible walls with a noncombustible ceiling or combustible walls with a combustible ceiling.
- 3.3.3 Four 8 ft (2440 mm) by 42 in. (1065) mm wide test panels were prepared. Each test panel consisted of two 21 in. (533 mm) by 8 ft (2440 mm) long Pharmco Tech™ panels, 2 mm (0.0079 in.) thick adhered to a 42 in. (1065) mm wide by 8 ft (2440 mm) long by 0.5 in. (13 mm.) thick gypsum wall board with Fastbond™ 30NF. The panels were installed as indicated below:
- 3.3.4 Sample panels were installed vertically on both the east (left) and west (right) 42 in. (1065 mm) wide by 16 ft (4.9 m) high parallel panel frames. Panels were fastened through prepared test panels and 1 in. (25 mm) thick Marinite I refractory to 0.5 in. (13 mm) thick plywood secured to the steel parallel panel frames with fasteners and 1 in. (25 mm) diameter washers located approximately 24 in. (610 mm) on center starting approximately 6 in. (150 mm) from the bottom of each panel and ending approximately 6 in. (150 mm) from the top of each panel in rows approximately 10 in. (255 mm) apart starting approximately 6 in. (150 mm) from one side of each parallel panel frame and ending approximately 6 in. (150 mm) from the other side of each parallel panel frame.
- 3.3.5 The central vertical and horizontal panel side joint were seal using 5/32 in. (4 mm) diameter PVC rod with a proprietary heat gun. Raw panel edges at the top, bottom and both sides of each test panel were covered with 0.5 by 1.5 by 1.5 in. (25 by 50 by 50 mm) 16 gauge angle iron frame. The joint between the bottom and side angle irons were welded. The joints between the top and side angle irons were not welded.
- 3.3.6 The results of the 16 ft (4.9 m) parallel panel fire test were as follows:
- 3.3.6.1 Visual observations during the test period were:

<u>Time</u> (min:sec)	<u>Observations</u>
0:00	Ignition of exposure fire.
0:30	Flames on panels
0:54	Heavy black smoke
1:11	Panels black to 8 ft (2.4 m)
2:15	Black smoke continues, flames on panels to 6 ft
3:21	Heavy gray smoke
3:50	PVC panel east side burned to substrate gypsum board
4:50	Intermittent flames on panels, moderate light gray smoke
6:00	Edge of test panels continue with intermittent flames
7:00	Smoke light gray color
11:00	Flames from fire exposure to 4 ft (1.2 m), flaming on east panel to 1 ft (0.3 m), light white smoke
13:00	Non flaming pieces falling from sample
15:00	Propane supply to sand burner turned off. Glowing embers on panels
18:00	Glowing embers on panels continue 0.5 ft (0.2 m) from sand burner
19:00	Non flaming pieces falling from sample, no glowing embers
20:00	Test Ends

- 3.3.7 The average smoke emission rate (\dot{G}_{smoke}) of the test sample was 145 mg/sec. This compares favorably with the maximum 240 mg/s limit for wall and ceiling materials or systems Approved

FM APPROVALS
Project ID: 3038263

for use in pharmaceutical manufacturing and storage areas, food preparation and storage areas or similar occupancies in the FM Approvals Standard 4882.

- 3.3.8 The Peak Chemical Heat Release Rate (PCHRR) of the test sample was 644 kW. This compares favorably with the 830 kW limit in the FM Approvals Standard 4880.
- 3.3.9 A digital record of duct thermocouple data, gas flow meter data, smoke measurement data and mass flow in the duct of the 5 MW calorimeter taken at intervals of 0.1 second and averaged to intervals of 1 second are on file in the Technical Information Center at FM Approvals under Project ID 303263

3.4 Surface Burning Characteristics of Building Materials

- 3.4.1 The surface burning characteristics of Pharmco Tech™ PVC wall panels were determined in accordance with ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials.
- 3.4.2 Three 23 in. (585 mm) by 24 ft. (7.3 m) test specimens were prepared. Each consisted of three 2 mm (0.079 in.) thick by 23 in. (585 mm) wide by 8 ft. (2.44 m) long Pharmco Tech™ PVC wall panels. Each specimen was conditioned to constant mass at 73.4±5.0°F (23.0±2.8°C) and 50±5% relative humidity prior to installation on the ledges of the ASTM E84 tunnel furnace..
- 3.4.3 The test was conducted with 0.5 in. (13 mm) support rods and wire mesh to support the test sample during the fire test.
- 3.4.4 The performance is satisfactory for Class 1 Approval for smoke sensitive occupancies if the average Flame Spread Index (FSI) from three samples equal to, or less than, 25 and the Smoke Developed Index (SDI) is equal to, or less than, 450.
 - 3.4.4.1 The surface burning characteristics of the test specimens were as follows:

<u>Sample</u>	<u>FSI*</u>	<u>SDI*</u>
1	25	200
2	25	190
3	20	110
Average	25	165

* These numerical Flame Spread and Smoke Developed indexes do not define the hazard presented by this or any other material under actual fire conditions.

3.5 Ignition Tests

- 3.5.1 The Self Ignition and Flash Ignition tests were completed according to ISO 871 Determination of Ignition Temperature Using a Hot-Air Furnace
- 3.5.2 Test specimens were removed from a 2 mm (0.079 in.) thick by 23 in. (585 mm) wide by 96 in (2440 mm) long sample of a witnessed Pharmco Tech™ panel.
- 3.5.3 The self ignition temperature of the sample was 842° F (450° C) and the flash ignition temperature of the sample was 834° F (446° C).

FM APPROVALS
Project ID: 3038263

3.6 Heat of Combustion

3.6.1 The heat of combustion of the Pharmco Tech™ panel material was determined in accordance with ISO 1716:2002 Reaction to Fire Tests for Building Products - Determination of the Heat of Combustion.

3.6.2 Test specimens were removed from a 2 mm (0.079 in.) thick by 23 in. (585 mm) wide by 96 in (2440 mm) long sample of a witnessed Pharmco Tech™ panel.

3.6.3 The heat of combustion of the test specimens was:

<u>Test</u>	<u>Btu/lb (kJ/g)</u>
1	7,072 (16.45)
2	7,132 (16.59)
3	7,244 (16.85)

3.7 Ignition Residue

3.7.1 The ignition residue of the Pharmco Tech™ panel material was determined in accordance with ASTM Standard D482 Test Method for Ash from Petroleum Products.

3.7.2 Test specimen was removed from a 2 mm (0.079 in.) thick by 23 in. (585 mm) wide by 96 in (2440 mm) long sample of a witnessed Pharmco Tech™ panel.

3.7.3 The residue left after ignition of the test sample was 20.16% by weight.

3.8 Apparent Density

3.8.1 The apparent density of the Pharmco Tech™ panel material was determined in accordance with ASTM D1622 Standard Test Method for Apparent Density of Rigid Cellular Plastics.

3.8.2 A test specimen was removed from a 2 mm (0.079 in.) thick by 22 in. (560 mm) wide by 96 in (2440 mm) long sample of a witnessed Pharmco Tech™.

3.8.3 The apparent density of the sample was 1630 oz/ft³ (1.63 g/cm³).

IV MARKING

4.1 The manufacturer shall mark each panel or packing container with the manufacturer's name and product trade name.

4.2 Markings denoting Approval by FM Approvals shall be applied by the manufacturer only within and on the premises of manufacturing locations that is under the FM Approvals Facilities and Procedures Audit program.

4.3 The manufacturer agrees that use of the FM Approvals name or Approval Mark is subject to the conditions and limitations of the Approval by FM Approvals. Such conditions and limitations must be included in all references to Approval by FM Approvals.

4.4 The manufacturer shall comply with the FM Approvals' Certification Marks Usage Guidelines.

V REMARKS

Pharmco Tech™ Wall Panel panels have not been evaluated for the toxicity of the products of combustion.

VI FACILITIES AND PROCEDURES AUDITS

- 6.1 The Pharmco Tech™ manufacturing location at the Warsaw, IN is subject to periodic audit inspections to determine that the quality and uniformity of the materials have been maintained and will provide the same level of performance as originally tested. The facility and quality control procedures in place have been found to be satisfactory to manufacture product identical to that examined and tested as described in this report.
- 6.2 Periodic, unannounced Facilities and Procedures Audits will be conducted to determine that the quality and uniformity of the industrial fluids is being maintained and that they are providing a level of quality equivalent to that originally tested and listed. Unsatisfactory results of Facilities and Procedures Audits may result in additional Facilities and Procedures Audits, as deemed necessary by FM Approvals, or forfeiture of recognition.

VII MANUFACTURER'S RESPONSIBILITIES

- 7.1 Documentation considered critical to this listing is on file FM Approvals and listed in the Documentation File, Section VIII of this report. No changes of any nature shall be implemented unless notice of the proposed change has been given and written authorization obtained from FM Approvals.
- 7.2 The manufacturer shall notify FM Approvals of any change in the listed products prior to general sale and distribution using Form 797, FM Approved Product/Specification Tested – Revision Report.
- 7.3 The customer shall comply with the FM Approvals, Certification Marks Usage Guidelines.

VIII DOCUMENTATION

The following document describes the Pharmco Tech™ wall panel and is filed at FM Approvals.

Document	Issue or Revision	Description
B & D Products, LLC Facility and Procedure Audit Manual at Warsaw, IN	March 15, 2011	Formulations, Specifications and Quality control

FM APPROVALS
Project ID: 3038263

IX CONCLUSIONS

- 9.1 The engineering evaluation and test results indicate that Pharmco Tech™ wall panel, maximum 2 mm (0.079 in.) thick, wall panel systems as described in Section 2.1, 2.2 and 2.3 above and when installed as tested, meet the Approval requirements of the **Standards** listed above for Class 1 fire for interior plastic wall panels and Class 1 interior wall panels for smoke sensitive occupancies in pharmaceutical manufacturing and storage areas, food preparation and storage areas or similar occupancies for installation without height restriction
- 9.1.1 Pharmco Tech™ wall panels shall be installed with Fastbond™ 30NF adhesive adhered to non-combustible walls. Wall panels may be installed vertically or horizontally. Panel joints are sealed using 5/32 in. (4 mm) diameter PVC rod with a proprietary heat gun. The Pharmco Tech™ wall panels shall be installed with a non-combustible interior ceiling.
- 9.1.2 Interior wall corner joints are covered with preformed Pharmco Tech™ PVC cove, or sealed using 5/32 in. (4 mm) diameter PVC rod heat welded with a proprietary heat gun.
- 9.2 Tests show 1) that the panels in and of themselves would not create a need for automatic sprinklers and 2) that the panels would be acceptable in a combustibile occupancy protected by automatic sprinklers as defined by FM Global Loss Prevention Standards.
- 9.3 Since a duly signed Master Agreement is on file for this customer, Approval is effective as of the date of this report.
- 9.4 Continued Approval will depend upon satisfactory field experience and periodic Facilities and Procedures Audits.

TESTING SUPERVISED BY: G. K. Daday


PROJECT DATA RECORD: Project ID 3038263

ORIGINAL TEST DATA: Project ID 3038263

ATTACHMENTS: Appendix A - FM Approvals 4.9 m (16 ft) Parallel Panel Test Structure

Appendix B – UBC 26-3 Room Test Thermocoupling Graph

REPORT BY:



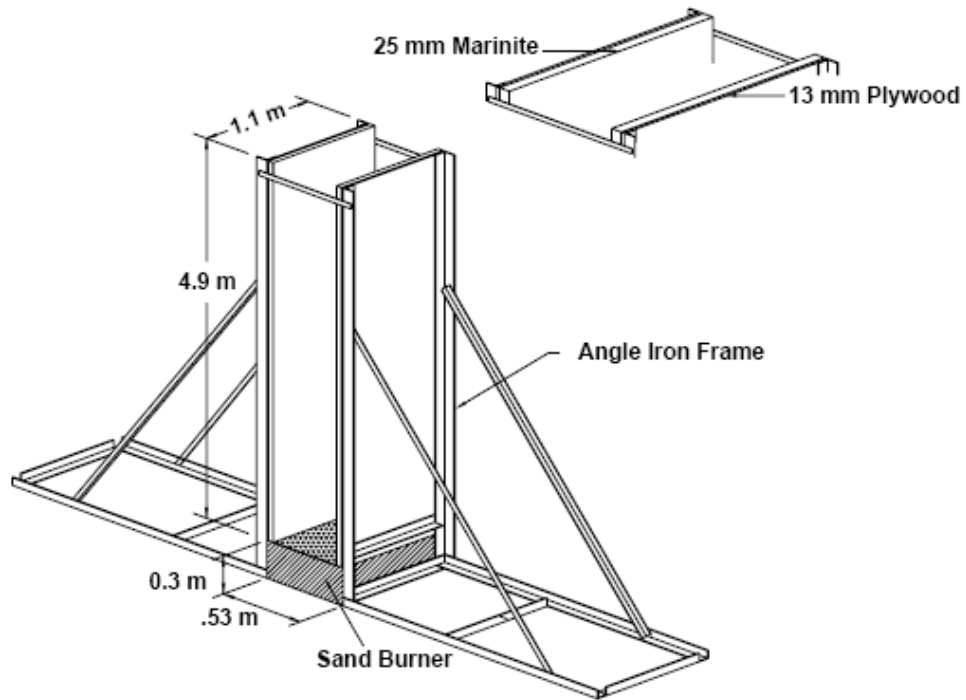
G. K. Daday
Senior Engineer - Materials Group

REPORT REVIEWED BY:



Jill Norcott
Technical Team Manager - Materials Group

Appendix A
FM Approvals 4.9 m (16 ft) Parallel Panel Test Structure



Appendix B
Room Test Thermocoupling Graph

