APPROVAL REPORT

PYROCRETE 239 AND PYROPRIME/TIE-COTE 775 WB FOR PROTECTION OF POLYISOCYANURATE AND POLYURETHANE FOAM INSULATIONS

Prepared For:

CARBOLINE COMPANY
350 HANLEY INDUSTRIAL COURT
ST. LOUIS, MISSOURI 63124

3000116
Class 4975
Date: December 22, 1998

FACTORY MUTUAL | Factory Mutual System

Factory Mutual Research Corporation
1151 Boston-Providence Turnpike
P.O. Box 9102
Norwood, MA 02062

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I INTRODUCTION

1.1 Carboline Company submitted their Pyrocrete 239 and Pyroprime/Tie-Cote 775 WB to determine if they meet the Factory Mutual Research Corporation (FMRC) Standard 4975 (1974) Approval requirements as a Class 1 interior finish for the protection of polyisocyanurate and polyurethane foam insulations, delaying the ignition and reducing the surface burning rate for a 10 to 15 minute period without the need for automatic sprinkler protection when used in a noncombustible occupancy.

1.2 Examination included testing of the potential for fire spread in the FMRC Construction Materials Calorimeter to determine the fire hazard of the coating and it's ability to protect polyisocyanurate and polyurethane foam insulations.

1.3 Tests show that Pyrocrete 239 and Pyroprime/Tie-Cote 775 WB, as tested, meet the FMRC Standard 4975 (1974) Approval requirements for protection of polyisocyanurate and polyurethane foam insulations when installed as specified in the CONCLUSIONS of this report.

II MATERIALS TESTED

2.1 Pyrocrete 239 is a cementitious inorganic composition that is mixed with water in a mortar mixer with rubber tipped blades at the rate of 5 ± ¼ gallons (19±1 ℓ) per 50 lb (22.7 kg) bag to obtain a minimum mixer wet density of 37 lbs/ft^3 (590 kg/m^3) for trowel application or 6 ± 1 gallons (23 ± 3½ ℓ) per 50 lb (22.7 kg) bag to obtain a minimum applied wet density of 37 lbs/ft^3 (590 kg/m^3) for spray application. For spray application, pumps, air pressure, material lines, air lines and spray guns must be as specified by Carboline. At the time of application the ambient and substrate temperatures must be between 40°F and 100°F (4°C and 38°C). The minimum applied thickness for protection of polyisocyanurate and polyurethane foam insulation is 1 in. (25 mm). The substrate to which Pyrocrete 239 is applied must first be primed with Pyroprime/Tie-Cote 775 WB.

2.2 Pyroprime/Tie-Cote 775 WB is a water based elastomeric coating that is applied by roller or brush to the lightly scratched, clean, dry surface of polyisocyanurate or polyurethane foam at the rate of approximately 192 ft^2/gallon (4.7 m^2/ℓ) to obtain a 0.005 in. (0.13 mm) thick dry film to promote adhesion of Pyrocrete to the polyurethane foam.

2.3 The polyurethane foam test substrate was spray applied to 3/4 in. (19 mm) thick plywood by Flexible Products Company personnel in Austin TX using their PP 241-25 foam system. Polyurethane foam produced with the PP 241-25 foam system was evaluated in a prior Approval program and found to have a flame spread index of 35 and a smoke developed index of 900 when tested per ASTM E84-94.

2.4 The proprietary formulations and specifications for the above materials are on file at FMRC.

III TESTS AND PROCEDURES

3.1 Tests conducted were as required by FMRC Standard 4975 (1974) - Fire Retardant Paints and Coatings over Combustible Surfaces.

3.2 FMRC Calorimeter Fire Tests

The fire tests were conducted using the FMRC Construction Materials Calorimeter which measures the maximum rate of fuel contribution or maximum heat release rate (HRR) of a sample assembly (coating and foam). For Approval under FMRC Standard 4975, the assembly must exhibit a HRR no greater than 150 Btu/ft^2/min (28.4 kW/m^2) in any 1 minute time frame, 140 Btu/ft^2/min (26.5 kW/m^2) in any 2 minute time frame or 130 Btu/ft^2/min (24.6 kW/m^2) in any 3 minute time frame during the 10 minute fire exposure. In addition, the coating must remain intact, must not fall away exposing the foam, and must provide sufficient resistance to thermal conductivity such that no more than 1% of the 48 x 48 in. (1200 x 1200 mm) area exposed to the test fire is decomposed during the test period.

IV TEST SAMPLES

4.1 FMRC Calorimeter Fire Test Samples

Two 4-1/2 by 5 ft. (1.4 by 1.5 m) test samples were constructed. The components and sequence of installation were as follows:

Sample No.1: Class 2 (flame spread index 35, smoke developed index 900) polyurethane foam was spray applied to 54 by 60 by 3/4 in. (1370 by 1525 by 19 mm) plywood.
Pyroprime 775 WB was applied with a brush to the lightly scratched polyurethane foam surface to produce a 0.007 to 0.008 in. (0.18 to 0.20 mm) thick wet film [0.005 in. (0.13 mm) dry film] and allowed to dry overnight.
Pyrocrete 239 was applied by trowel to the primed polyurethane foam surface at an average wet density of 37.2 pcf and a maximum thickness of 1.0 in.

Sample No.2: Identical to Sample No.1.

V RESULTS

5.1 FMRC Calorimeter Fire Tests

5.1.1 The calorimeter tests showed the test panels to have fuel contribution rates below the maximum permissible Standard 4975 rates. These rates and the Standard 4975 limits are noted below:

Maximum Average Rate of Fuel Contribution
for Various Time Intervals
Btu/ft^2/min (kW/m^2)

Time Interval	1 min	2 min	3 min
Class 1 Standard	150(28.4)	140(26.5)	130(24.6)
Sample No. 1	Not evaluated (least critical sample)		
Sample No. 2	119(22.5)	119(22.5)	119(22.5)

5.1.2 The coating remained intact during each test except for some surface spalling and did not fall away exposing the foam. The coating was removed from each sample after each test and the polyurethane foam examined for thermal decomposition. Thermal decomposition of the polyurethane foam did not occur on Sample No. 1. Thermal decomposition of the surface of the polyurethane foam occurred on Sample No. 2 over an area approximately the size of a quarter (less than 0.05 % of the sample surface).

VI CONCLUSIONS

6.1 Tests results indicate that Pyrocrete 239 cementitious coating used with Pyroprime/ Tie-Cote 775 WB primer meets the FMRC Standard 4975 (1974) Approval requirements for protection of polyisocyanurate and polyurethane foam insulations (spray applied or board stock) when installed as follows:

6.1.1 Pyroprime/Tie-Cote 775 WB primer is applied by roller or brush at 192 ft^2/gallon (4.7 m^2/ℓ) to a lightly scratched polyisocyanurate or polyurethane foam surface [0.005 in. (0.13 mm) thick dry film] and allowed to dry. Pyrocrete 239 is applied at a minimum wet density of 37 lb/ft^3 (590 kg/m^3) over the dry primer by spray or trowel to a minimum thickness of 1 in. (25 mm).

6.2 Tests show that the tested constructions in and of themselves would not create a need for automatic sprinklers.

6.3 The tested constructions meet the FMRC Approval criteria and when Approval is effective will be listed in the FMRC Approval Guide.

6.4 Approval is effective when the Approval Agreement is signed and received by FMRC.

6.5 Continued Approval will depend upon satisfactory field experience and periodic Quality Audit Inspections.

VII MARKING

7.1 The manufacturer shall mark each bag or pail with the manufacturer's name and product trade name. In addition, the bag or pail must be marked with the FMRC Approval Mark and the words "Subject to the conditions of Approval as a (Class 1 interior finish, primer) for the protection of polyurethane foam insulations when installed as described in the current edition of the FMRC Approval Guide".

7.2 Markings denoting FMRC Approval shall by applied by the manufacturer only within and on the premises of manufacturing locations that are under the FMRC Facilities and Procedures Audit Program.

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

VIII MANUFACTURER'S RESPONSIBILITIES

8.1 To assure compliance with his procedures in the field, the manufacturer shall supply to the roofer such necessary instruction or assistance required to produce the desired performance achieved in the tests.

8.2 The manufacturer shall notify FMRC of any planned change in the Approved product, prior to general sale or distribution, using Form 797, Approved Product Revision Report.

IX QUALITY AUDIT INSPECTION AND RE-EXAMINATION

9.1 Re-examination and manufacturing inspections will be conducted periodically on the Approved products at the Carboline Company manufacturing locations in St. Louis, MO, Metuchen, NJ, Xenia, OH, Lake Charles, LA and Calgary, Alberta, Canada to determine that the quality and uniformity of the materials have been maintained and will provide the same level of performance as originally Approved.

TESTS AND REPORT BY:

J. M. Goodwillie, Jr.
Senior Engineer - Materials Section

REPORT REVIEWED BY:

J. E. Gould
Assistant Manager - Materials Section