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APPROVAL REPORT

RUDOLF HENSEL HENSOMASTIK 5 KS ABLATIVE TYPE FLAME RETARDANT CABLE COATING

Prepared for:

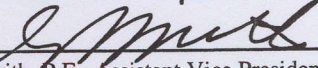
Rudolf Hensel GmbH
Lauenburger Landstr.11
D-21039 Bornsen
Germany

Project ID: 3018997

Class: 3971

Date of Approval:

Authorized by:

August 30, 2004

George A. Smith, P.E., Assistant Vice President

FM Approvals
1151 Boston-Providence Turnpike
P.O. Box 9102
Norwood, MA 02062

**RUDOLF HENSEL HENSOMASTIK 5KS ABLATIVE
TYPE FLAME RETARDANT CABLE COATING**

from

**Rudolf Hensel GmbH
Lauenburger Landstr.11
D-21039 Bornsen
Germany**

I INTRODUCTION

- 1.1 Rudolf Hensel requested FM Approval of their Hensomastik 5 KS flame retardant cable coating. The coating can be applied by brush, roller, or airless spray to prevent the propagation of fire along electrical cables to protect the functionality of the cables. It is applied at a minimum dry coating thickness of 1/16 in. (1.6 mm).
- 1.2 The Hensomastik 5 KS is a fire retardant, asbestos-free, non-toxic, flexible, ablative coating. The coating is white in appearance before and after curing.
- 1.3 As the product contains water, precautions should be taken to ensure that any storage, transportation or application of the material is done at temperatures above freezing and in accordance with the manufacturer's instructions.
- 1.4 The coating is intended to prevent flame spread in conductors when exposed to a moderate fire source that might occur from arcs or sparks falling or occurring in the cable tray, or from fire exposure of combustible trash or foreign material around the cable(s) in grouped or in a single or layered tray condition. The coating is not intended to maintain cable protection under severe and extended fire exposure conditions.
- 1.5 When applied according to the manufacturer's instructions, the protective coating does not of itself require electrical de-rating.
- 1.6 This Report may be reproduced only in its entirety and without modification.
- 1.7 **Standard:**

Title	Class Number	Date
Draft Approval Standard – Flame Retardant Coating for Grouped Electrical Cables	3971	March, 1990

- 1.8 **Listings:** This coating meets the Class 3971 requirements and will appear in the Approval Guide under the heading "Fire Protective Coatings for Grouped Electrical Cables" as follows:

Rudolf Hensel GmbH Lauenburger Landstr. 11 D-21039 Bornsen, Germany

Hensomastik 5 KS ablative cable coating. Recommended dry coating thickness is 1/16 in. (1.6 mm).

- 1.9 Sixty-five (65 ft) (19.8 m) of 2/0 AWG, Cu, 600V, THHN cable was supplied to Rudolf Hensel from FM Approvals. The coating and all test cable preparation was conducted by Rudolf Hensel and the finished cable samples were sent back to FM Approvals for testing.

II DESCRIPTION

- 2.1 Surfaces to be coated with the Hensomastik 5 KS must be clean and free from oil, grease, and dirt prior to cable coating application.
- 2.2 The most effective application of this coating is by airless equipment or brush. The coating dries to the touch in 6 to 8 hours and cures thoroughly in 24 to 48 hours, depending on cable temperature, ambient temperature, and relative humidity. Minimum required thickness for dry coating is 1/16 in (1.6 mm).
- 2.3 After curing, the coating remains sufficiently pliable so that individual cables may be removed from a grouping if necessary; and the damaged portion of the protective coating may be repaired by spraying. The coating has good adhesive properties and will stick readily to vertical and overhead surfaces. When exposed to flame, it does not melt or drip, but merely intumesces or ablates.

III MARKINGS

The Rudolf Hensel Hensomastik 5 KS Cable Coating is available in 44 lbs (20 kg) plastic buckets. The product name, batch number, product code number and the Approval Mark of FM Approvals are stenciled on the bucket. Application instructions are sent with each product shipment.

IV EXAMINATION AND TESTS

- 4.1 Four strips of Hensomastik 5 KS Cable Coating, 18 in. (457 mm), 3 in. (76 mm) wide and 1/16 in. (1.59 mm) thick were prepared and conditioned at room temperature. Two specimens were clamped vertically and parallel ½ in. (13 mm) apart to expose 17 in. (432 mm) from the free (lower) end. A Bunsen burner with a 2 in. (51 mm) total flame height with a 1 in. (25 mm) inner core is positioned vertically under the free end of one specimen for a two minute period with the flame cone just touching the specimen. Examination at the end of the fire exposure period showed that no flames impinged above the 3 in. (76 mm) gauge mark. There was some disintegration of the specimen below the 3 in. (76 mm) gauge mark when handled by squeezing lightly between the thumb and two fingers.
- 4.2 The test outlined in paragraph 4.1 was repeated with the second set of specimens and the results were similar. These test results satisfy Approval requirements which allow no degradation of specimen above the 3 in. (76 mm) gauge mark and no scorching or burning above the 17 in. (432 mm) gauge mark.

- 4.3 Six 3 ft (0.9 m) long samples of 2/0, 600 V, 90°C, THHN jacketed, 285 ampere rated (National Electrical Code) copper cables were given a high potential check of 1000 V, plus 200 percent of rated voltage for one minute. The cables were wrapped tightly in aluminum foil and the potential applied between the foil and the copper conductor and any leakage current in milliamps was recorded for each cable sample. Cables were then coated with the Hensomastik 5 KS coating according to the manufacturer's instructions and, after the recommended curing time, this high potential test was repeated to ensure no change or damage occurred to the cable insulation prior or during coating. (This test is also repeated after the fire tests described below as a means of determining any coating breakdown).
- 4.4 Three 3 ft (0.9 m) long cables coated with the Hensomastik 5 KS were individually heated electrically with 150 percent of rated current (428A) until the copper conductor stabilized at 190°F (88°C). A flame from a Meker gas burner was adjusted to give an overall flame height of 5 in. (127 mm) with a 3 in. (76 mm) inner cone (natural gas) and applied to the horizontally positioned cable for two minutes with the tip of the inner cone touching the bottom of the coated cable. At the end of a two minute flame exposure, there was simultaneous burner flame cutoff and electrical shutdown. All flaming extinguished immediately. After cooling, the charred and scorched area exposed to the burner flame was measured and found to be 3 to 4 in. (76 to 102 mm) in length. This satisfies Approval requirements that burning shall not continue longer than one minute after flame cutoff and the burned (exposed area) shall not exceed 9 in. (228 mm) in length.
- 4.5 Results on the second and third cables exposed to the test described in paragraph 4.4 were similar. These three cables were then given a repeat of the high potential test described in paragraph 4.3 and current leakage averaged 0.60 milliamps. This satisfies the Approval requirement that leakage current shall not exceed 5.0 milliamps when measured between the conductor and the outer jacket during this high potential test.
- 4.6 A 3 ft (0.9 m) length of cable coated with Hensomastik 5 KS was subjected to a saltwater test consisting of 8 hours submerged alternating with 16 hours drying in a 24 hours span in a 1 percent saltwater solution over a 30 day period with the water temperature at 150°F (66°). At the end of this period, the sample was allowed to dry for 36 hours. There was no disintegration or deterioration of the coating. The cable sample was then subject to the fire tests described in paragraph 4.4 and the required high potential test; the results of these test were satisfactory.
- 4.7 Two 3 ft (0.9 m) lengths of cable coated with Hensomastik 5 KS were subjected to alternating temperatures of 160°F (71°C) and -40°F (-40°C) for 24 hours over a two week duration. At the end of this accelerated aging test period, the cables were subjected to the test described in paragraph 4.4 and the high potential test. The results of these tests were satisfactory.
- 4.8 For the Ampacity test, a cable coated with the Hensomastik 5 KS coating was supplied with a 28 AWG chromel-alumel thermocouple imbedded beneath the cable jacket to the bare copper conductors. This cable assembly was subjected to its rated current carrying capacity of 285A (according to the National Electrical Code) until the temperature indicated by the thermocouple stabilized at 140°F (60°C). This temperature is below the 90°C maximum temperature rating of the cable jacket material. No electrical de-rating is necessary when a cable is sprayed with Hensomastik 5 KS according to the manufacturer's recommendations.

V FACILITIES AND PROCEDURES AUDIT

The company manufacturing this product 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 Approved. The facilities and quality control procedures in place have been found to be satisfactory to manufacture product identical to that examined and as described in this report.

VI CONCLUSION

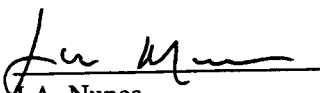
- 6.1 Since a duly signed Master Agreement is on file for this customer, Approval is effective as of the date of this report.
- 6.2 Continued Approval will depend on satisfactory field experience and periodic Facilities and Procedures Audit.

ORIGINAL TEST DATA: Project Data Record 3018997

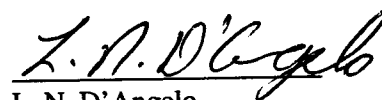
ATTACHMENTS: None

EXAMINATION AND TESTS BY: J.A. Nunes

REPORT BY:


J.A. Nunes
Engineer
Materials Group

REVIEWED BY:


L. N. D'Angelo
Technical Team Manager
Materials Group