Approval Standard for Welding Pads, Welding Blankets and Welding Curtains for Hot Work Operations

Class Number 4950

July 2014

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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1. INTRODUCTION

1.1 Purpose

This standard states Approval requirements for welding pads, welding blankets and welding curtains for use in hot work operations. These items are intended to be used as fire resistant covers that prevent the ignition of combustibles due to welding, cutting and other hot work operations.

1.2 Scope

1.2.1 This standard sets performance requirements for welding pads, welding blankets and welding curtains used as a means of preventing the ignition of combustibles during welding, cutting and other hot work operations.

1.2.2 The fire performance of a fire resistant cover depends on the type of welding function to which it will be subjected. In general, welding pads, welding blankets and welding curtains are evaluated on their ability to:

- prevent burn through of the material and provide adequate protection for adjacent combustibles from possible sources of ignition;
- limit temperature transmission through the material to a degree that will prevent ignition to underlying combustibles;
- resist melting, dripping or deformation so as to prevent sparks from spreading outside of confined and protected areas;
- maintain their flexibility, durability and structural integrity when charred areas are subjected to 90° bends;
- maintain their fire and temperature rise resistance properties when subjected to accelerated weathering tests intended to simulate exposure to light and water (ultra violet [uv] and condensation, respectively) conditions.

1.2.3 This standard is not intended to determine the suitability for all end use conditions of a product. Conditions under which welding pads, welding blankets and welding curtains are used vary widely. For example, these materials may be subjected to environments not anticipated by this standard. It is the responsibility of the end user to determine the suitability of the welding pad, welding blanket or welding curtain for the specific hot work operation.

1.2.4 This standard does not address the issue of toxicity or out-gassing of the materials when they are subjected to molten or other fire conditions resulting from hot work operations.

1.2.5 The use of the materials evaluated to this standard does not take the place of or eliminate the need to observe other hot work precautions such as the issuance of hot work permits, fire watches or the need to practice other safety precautions recommended in FM Global Property Loss Prevention Data Sheet 10-3 or NFPA 51B.

1.3 Basis for Requirements

1.3.1 The requirements of this standard are based on experience, research and testing and/or the standards of FM Approvals and other organizations. The advice of manufacturers, users, trade associations and loss control specialists was also considered.

1.3.2 Meeting the requirements qualifies a product as an FM Approved welding pad, welding blanket or

welding curtain, as appropriate, for hot work operations. Requirements prohibit component substitution without prior authorization by FM Approvals.

1.3.3 The requirements of this standard reflect tests and practices used to examine characteristics of welding pads, welding blankets and welding curtains for hot work operations for the purpose of obtaining FM Approval. These requirements are intended primarily as guides and strict conformity is not always mandatory. Welding pads, welding blankets and welding curtains having characteristics not anticipated by this standard may be Approved if performance equal or superior to that required by this standard is demonstrated, or if the intent of the standard is met. Alternatively, welding pads, welding blankets and welding curtains that meet all the requirements identified in this standard may not be Approved if other conditions that adversely affect performance exist or if the intent of this standard is not met.

1.4 Basis for Approval

Approval is based upon satisfactory evaluation of the product and the manufacturer in the following major areas:

1.4.1 Examination and tests on production samples to evaluate

- the suitability of the product;
- the proper operation and performance of the product as specified by the manufacturer and required by FM Approvals and,
- the durability and reliability of the product.

1.4.2 An examination of the manufacturing facilities and audit of quality control procedures to evaluate the manufacturer's ability to consistently produce the product as examined and tested, and the marking procedures used to identify the product. These examinations are repeated as part of the FM Approvals follow-up Facilities and Procedures Audit program.

1.5 Basis for Continued Approval

Continued Approval is based upon:

- production or availability of the product as Approved;
- the continued use of acceptable quality control procedures;
- satisfactory field experience;
- compliance with the terms stipulated in the Approval Agreement; and
- re-examination, if deemed necessary, of production samples for continued conformity to requirements.

1.6 Effective Date

1.6.1 The effective date of an Approval Standard mandates that all products tested for Approval after the effective date shall satisfy the requirements of that standard. Products FM Approved under a previous edition shall comply with the new version by the effective date or else forfeit Approval. The effective date shall apply to the entire Approval Standard, or, where so indicated, only to specific paragraphs of the standard.

1.6.2 The effective date for this standard is July 30, 2014 for compliance with all requirements.

1.7 System of Units

Units of measurement are U.S. customary units. These are followed by their arithmetic equivalents in International System (SI) units, enclosed in parentheses. Appendix B lists the selected units for qualities dealt with in testing these products; conversions to SI units are included. Conversion of U.S. customary units is in accordance with ANSI/IEEE/ASTM SI 10-97, *Standard for Use of the International System of Units (SI): The Modern Metric System.*

1.8 Applicable Documents

The following are standards, test methods and practices referenced in this standard:

American Society for Testing and Materials (ASTM) G-53 -96, *Standard Practice for Operating Light and Water Exposure Apparatus (Fluorescent UV-Condensation Type) for Exposure of Nonmetallic Materials*

FM Global Property Loss Prevention Data Sheet 10-3, *Hot Work Management* (10/2006)

National Fire Protection Association (NFPA) 51B, *Standard for Fire Prevention During Welding, Cutting and Other Hot Work* (2003)

FM Approvals Test Procedure Class Number 4950: FM Approvals Fire and Thermal Resistance Test

FM Approvals Test Procedure Class Number 4950: FM Approvals Paper Ignition Test

FM Approvals Test Procedure Class Number 4950: FM Approvals Charring Embrittlement Test

FM Approvals Test Procedure Class Number 4950: Accelerated Weathering Test

1.9 Definitions

For purposes of this standard, the following terms apply:

Charring	the formation of a carbonaceous residue as the result of pyrolysis or incomplete combustion.
Fill	the yard running selvage to selvage at the right angle of the warp. Also commonly referred to as the cross machine direction.
Hot work	any work involving burning, welding, or similar operations that produces sparks, flames or heat that is capable of initiating fires or explosions.
Ignition	the initiation of continuance of combustion.
Molten substance	metals in their liquified, elevated temperature state, as well as related non-metallic substances such as slag, dross and salt, handled at elevated temperatures.

Warp	the yarn running lengthwise in a woven fabric. Also commonly referred to as the machine direction.
Welding blanket	a heat resistant fabric designed to be placed in the vicinity of a hot work operation. Intended for use in horizontal applications with light to moderate exposures such as that resulting from chipping, grinding, heat treating, sand blasting and light horizontal welding. Designed to protect machinery and prevent the ignition of combustibles such as wood that are located adjacent to the underside of the blanket.
Welding curtain	a heat resistant fabric designed to be placed in the vicinity of a hot work operation. Intended for use in vertical applications with light to moderate exposures such as that resulting from chipping, grinding, heat treating, sand blasting and light horizontal welding. Designed to prevent sparks from escaping a confined area.
Welding pad	a heat resistant fabric designed to be placed directly under a hot work operation such as welding or cutting. Intended for use in horizontal applications with severe exposures such as that resulting from molten substances or heavy horizontal welding. Designed to prevent the ignition of combustibles that are located adjacent to the underside of the pad.

2. GENERAL INFORMATION

2.1 Product Information

2.1.1 One of the leading sources of ignition in industrial fires and explosions are sparks and other products of combustion resulting from hot work operations. Numerous safe practice guidelines exist addressing this issue; however, hot work operations continue to be a leading cause of industrial fires and explosions. This test standard was developed as a means of assessing and Approving heat resistant fabrics and covers that are frequently used to protect combustibles in the immediate vicinity of the hot work. The use of materials evaluated in this standard is not intended to replace any of the currently established and recognized safe practices but is intended to supplement any such guidelines.

2.1.2 The term hot work encompasses a wide range of operations but is generally used to describe welding and its allied processes such as, but not limited to, cutting, heat treating, grinding, chipping, molten splash, sand blasting, thawing pipe, powder driven fasteners, hot riveting and any other similar application that produces a spark, flame or heat that can become a source of ignition.

2.2 Approval Application Requirements

To apply for an Approval examination the manufacturer, or its authorized representative, should submit a request to

Manager, Building Materials
FM Approvals
1151 Boston-Providence Turnpike
PO Box 9102
Norwood, MA 02062
U.S.A.

The manufacturer shall provide the following preliminary information with any request for Approval consideration:

- A complete list of all models, types, sizes, and options for the products or services being submitted for Approval consideration;
- the number and location of manufacturing facilities.
- All documents shall identify the manufacturer's name, document number or other form of reference, title, date of last revision, and revision level. All documents shall be provided with English translation.

2.3 Requirements for Samples for Examination

2.3.1 All welding pads, welding blankets and welding curtains FM Approved under this standard shall be manufactured within authorized manufacturing facilities.

2.3.2 For each material submitted for examination, the following product information shall be provided:

- product trade name or designation,
- general description,
- intended usage and Approval category,
- complete list of all components, raw material suppliers, reinforcements, additives, formulations (if applicable), manufacturing procedures, equipment and production requirements, and
- Safety Data Sheets, if applicable
- Production of samples submitted for testing shall be witnessed by a representative of FM Approvals. As an alternative, samples may be selected from stock randomly by a representative of FM Approvals.

2.3.3 The manufacturer shall submit samples representative of production. Any decision to use data generated using prototypes is at the sole discretion of FM Approvals.

2.3.4 Welding Pads and Welding Blankets - A minimum of eight (8) samples shall be needed for each material that is tested. Four (4) samples shall be taken with the warp (machine) direction parallel to the long dimension of the sample and four (4) samples shall be taken with the fill (cross machine) direction perpendicular to the long dimension. Samples shall be permitted to be taken from the same piece of cloth; however, individual samples shall be taken from different areas of the same cloth that are separated by a minimum of 1 ft (0.3 m). As an alternative, the samples may be taken from separate pieces of cloth. All test samples shall be 12 in. ± 1 in. x 18 in. ± 1 in. (0.31m±25mmx 0.46m±25 mm).

2.3.5 Welding Curtains - A minimum of two (2) samples shall be needed for each material that is tested. They shall be taken with the warp (machine) direction parallel to the long dimension of the sample. Samples shall be permitted to be taken from the same piece of cloth; however, individual samples shall be taken from different areas of the same cloth that are separated by a minimum of 1 ft (0.3 m). As an alternative, the samples may be taken from separate pieces of cloth. All test samples shall be 12 in.±1in.x18in. ±1 in. (0.31m±25mmx 0.46m±25 mm).

2.4 Approval Categories

2.4.1 Due to the variance in the severity of the different types of hot work operations, it is not always practical for manufacturers to provide a single product for all anticipated uses and environments nor do all manufacturers provide products for every type of application. As a result, this document establishes three distinct categories with specific acceptance criteria for each of the applications most likely to be encountered. The three categories offered in this standard result in Approval recognition as welding pads, welding blankets and welding curtains.

2.4.2 *Welding pads* are intended to be used for the most severe hot work operations. They are typically placed horizontally directly under the hot work operation and subjected to molten substances. In order to prevent the molten substances from igniting combustibles located under the welding pad, the welding pad must be capable of resisting burn through caused by contact with the molten substance as well as possessing temperature transmission limiting properties that will keep temperatures on the underside of the welding pad from reaching temperatures that can ignite typical combustibles. For the purpose of developing this standard, a typical combustible found under a welding pad was assumed to be paper having an ignition temperature of 500°F (260°C).

2.4.3 *Welding blankets* are intended to be used for hot work operations that are less severe than those anticipated for welding pads. They are used in horizontal applications and provide protection for equipment and combustibles located in the vicinity of the hot work operation but are not expected to be subjected to molten substances. In order to provide protection for equipment and prevent ignition of combustibles located under the welding blanket, the welding blanket must be capable of resisting burn through caused by contact with sparks, flames and heat resulting from light to moderate hot work operations. In addition, they must also possess temperature transmission limiting properties that will keep temperatures on the underside of the welding blanket from reaching levels that can ignite typical combustibles. For the purpose of developing this standard, a typical combustible found under a welding blanket was assumed to be wood. A limiting temperature of 500°F (260°C) has been selected as representative of temperatures associated with the endothermic phase of the thermal degradation of wood.

2.4.4 *Welding curtains* are intended to be used for hot work operations that are similar to those anticipated for welding blankets except that welding curtains are designed to be used in vertical applications. They provide protection for combustibles located in the vicinity of the hot work operation by preventing sparks and other sources of ignition from escaping a confined area. Welding curtains must be capable of resisting melting, burning, burn through and deformation caused by contact with sparks, flames and heat resulting from light and moderate hot work operations. Welding curtains must also remain flexible and dimensionally stable at all times thereby preventing sparks from spreading outside the intended confined area.

2.5 Other Information

2.5.1 Welding pads are exposed to the most severe test conditions and have the strictest acceptance criteria. As such, samples that meet the performance criteria as welding pads shall be considered to have qualified for use as welding blankets. They shall be qualified for use as welding curtains provided that they maintain their flexibility and dimensional stability and do not melt or deform.

2.5.2 Welding blankets and welding curtains are exposed to similar test conditions, with the welding blanket having the more critical acceptance criteria. As such, welding blankets shall be considered to have qualified for use as welding curtains provided that they maintain their flexibility and dimensional stability and do not melt or deform.

2.5.3 Welding pads, welding blankets and welding curtains that meet the criteria contained in this standard shall not be limited in size as it pertains to the length or width of the finished product provided they are of seamless construction. Seams provided along the outer perimeter of the item shall be allowed.

2.5.4 Welding pads, welding blankets and welding curtains that incorporate a seamed construction to join two or more individual pieces together shall be assessed. If the seam construction is judged to be consistent with the field of the material, no additional testing shall be required. If the construction of the seam is judged to be different from the field of the material, additional tests shall be conducted on samples that incorporate the particular type of seam for which Approval is desired. In these cases, the seam shall be located such that it will be exposed to the most critical location and orientation as deemed by FM Approvals. The seamed and non-seamed areas of the samples shall meet all criteria contained in this standard.

2.6 Test Apparatus

2.6.1 The test apparatus consists of a Victor P/N 0200-0220 VCM 200 Portable Cutting Machine mounted on the upper surface of a 48 in. x 30 in. (1.2 m x 0.75 m) cart. The automatic oxy-acetylene cutting machine travels on a track fixed on the upper surface.

2.6.2 A slot, 4 in. x 14 in. (100 mm x 350 mm) is cut into the upper surface. The slot is located 8 in. (200 mm) from the edge so that the sparks can fall to the lower surface which is located 21 in. (0.5 m) below the cutting operation.

2.6.3 Fire resistant fabric, backed by pieces of plywood, shall be placed attached to two sides of the cart to form an enclosure to limit sparks and other products of the hot work operation from spreading beyond the test area. One of the sides shall be located at the end where the cutting machine is located while in the pre-test position and be perpendicular to the direction of travel. The other side shall be parallel to the direction of travel. The remaining two sides shall remain open to view the test as it is conducted. The lower shelf shall contain a cut-out, 11 in. ± ¼ in. x 17 in. ± ¼ in. (280 mm±6mm x 432 mm±6mm) for use during the Paper Ignition Test.

3. GENERAL REQUIREMENTS

3.1 Review of Documentation

3.1.1 During the initial investigation and prior to physical testing, the manufacturer's specifications and details shall be reviewed to assess the ease and practicality of installation and use. The Approval investigation shall define the limits of the Approval.

3.2 Markings

3.2.1 Each individual welding pad, welding blanket and welding curtain shall bear a permanent label or marking showing the manufacturer’s name, model number or trade name, the FM Approval Mark and the words ‘‘APPROVED WELDING [PAD, BLANKET or CURTAIN]’’ as appropriate].

3.2.2 Labels or markings denoting FM Approval shall be applied by the manufacturer only within and on the premises of manufacturing locations that are under the FM Approvals Surveillance Audit Program.

3.3 Manufacturer’s Installation and Operation Instructions

The manufacturer shall supply written information with each welding pad, welding blanket or welding curtain indicating the limitations of Approval for each category of heat resistant fabric and the types of hot work applications to which it has been FM Approved.

3.4 Calibration

All examinations and tests performed in evaluation to this standard shall use calibrated measuring instruments traceable and certified to acceptable national standards.

3.5 Test Sample Preparation

3.5.1 Prior to conducting tests for evaluation as a welding pad, welding blanket or welding curtain, samples shall be conditioned at 73°F±5°F (23°C±3°C) at 50% (±5%) relative humidity for a period of not less than 72 hours. All samples shall be tested within 2 hours of removal from the conditioning area.

4. PERFORMANCE REQUIREMENTS

4.1 Test Requirements

4.1.1 Welding Pads and Welding Blankets

4.1.1.1 Each material submitted for Approval shall be subjected to the following tests in accordance with the Test Procedures for Fire and Thermal Resistance Testing and Paper Ignition Testing to make an attempt to determine the most critical test orientation.

Sample 1	Fire and Thermal Resistance Test -warp direction parallel to the long dimension
Sample 2	Fire and Thermal Resistance Test -fill direction perpendicular to the long dimension
Sample 3	Paper Ignition Test -warp direction parallel to the long dimension
Sample 4	Paper Ignition Test-fill direction perpendicular to the long dimension

4.1.1.2 Following the tests shown in 4.1.1.1, all samples shall be subjected to the Charring Embrittlement Test.

4.1.1.3 Upon completion of the tests shown in 4.1.1.1 and 4.1.1.2 above, an attempt will be made to determine which of the four (4) test specimen(s) is (are) the most critical. A new, previously untested sample of each test specimen(s) that is (are) deemed to be critical shall be subjected to the Accelerated Weathering Test.

4.1.1.4 Upon completion of the Accelerated Weathering Test, each test specimen shall be subjected to the corresponding test in the most applicable orientation deemed critical.

4.1.1.5 Upon completion of the tests shown in 4.1.1.4, all samples shall be subjected to the Charring Embrittlement Test.

4.1.2 Welding Curtains

4.1.2.1 Each material submitted for Approval shall be subjected to the following Test Procedures:

- FM Approvals Test Procedure Class Number 4950: FM Approvals Fire and Thermal Resistance Test
- FM Approvals Test Procedure Class Number 4950: FM Approvals Paper Ignition Test
- FM Approvals Test Procedure Class Number 4950: FM Approvals Charring Embrittlement Test

4.1.2.2 Upon completion of the test shown in 4.1.2.1 a new, previously untested specimen shall be subjected to the Accelerated Weathering Test.

4.1.2.3 Upon completion of the Accelerated Weathering Test, the test specimen shall be subjected to the Test Procedures shown in 4.1.2.1.

4.2 Fire and Thermal Resistance Test – Welding Pads

In order to qualify as an FM Approved welding pad, the welding pad must exhibit its ability to protect typical combustibles located directly underneath it from igniting when subjected to molten substances by satisfying the performance criteria for each of the tests shown below.

4.2.1 Requirement

To demonstrate the ability of a horizontally placed welding pad to resist flame propagation and burn through and exhibit temperature transmission limitation properties.

4.2.2 Test/Verification

The test arrangement used to obtain this data shall be the FM Approvals Apparatus for Testing Welding Pads, Blankets and Curtains. Performance shall be considered satisfactory if all samples meet the following conditions:

- there shall be no burn through of the pad;
- no individual thermocouple placed on the underside of the pad shall exceed 500°F (260°C);
- exposed areas that exhibit charring shall not crack when subjected to the Test Procedure for Assessing Charring Embrittlement.

4.3 Paper Ignition Test – Welding Pads

4.3.1 Requirement

To demonstrate the ability of a horizontally placed welding pad to resist flame propagation and burn through and exhibit temperature transmission limitation properties.

4.3.2 Tests/Verification

The test arrangement used to obtain this data shall be the FM Approvals Apparatus for Testing Welding Pads, Blankets and Curtains. Performance shall be considered satisfactory if all samples meet the following condition:

- there shall be no sign of ignition on any surface of the paper

4.4 Charring Embrittlement Test – Welding Pads

4.4.1 Requirement

Upon completion of the Test Procedure for Fire and Thermal Resistance Testing and Paper Ignition Testing, the test specimen (Welding Pads and Welding Blankets only) shall be subjected to the Charring Embrittlement Test. The purpose of the test is to expose the specimen to simulated folding actions likely to occur during normal usage.

4.4.2 Tests/Verification

The test apparatus consists of a smooth 1 in. ± 1⁄16 in. (25 mm ± 2 mm) diameter steel rod 24 in.±2in. (610 mm ± 51 mm) long supported on each end, an eye hook, an ‘‘S’’ hook and a ball clip (or equivalent).

Prior to subjecting the specimen to this procedure, all slag or molten metal shall be carefully removed from the sample in a manner that will not damage the fabric.

Upon completion of the above, the specimen shall be examined for evidence of cracking of the charred material and the development of through openings. Performance shall be considered satisfactory if all samples meet the following condition:

- exposed areas that exhibit charring shall not crack

4.5 Accelerated Weathering Test – Welding Pads

4.5.1 Requirement

To demonstrate the ability of a horizontally placed welding pad to resist flame propagation and, burn through and exhibit temperature transmission limitation properties after exposure to accelerated weathering conditions.

The Accelerated Weathering Test shall be used to determine the effect caused by water and ultraviolet (UV) exposure on the fire performance characteristics of the product. This test is intended to simulate the deterioration caused by water such as rain or dew and the ultraviolet energy of sunlight. It is not intended to simulate the deterioration caused by localized weather phenomena such as atmospheric pollution, biological attack or salt water exposure.

4.5.2 Tests/Verification

The test arrangement used to obtain this data shall be the Accelerated Weathering Test and the FM Approvals Apparatus for Testing Welding Pads, Blankets and Curtains.

Samples shall be placed in the accelerated weathering test apparatus and conditioned for 1000 hours (+ 72 hrs, -0 hrs). The cycle time shall be 8 hours (± 0.1 hrs) UV at 140°F±5°F (60°C±3°C) followed by 4 hours of condensation at 122°F±5°F (50°C±3°C).

Performance shall be considered satisfactory if the sample meets the conditions shown in this section after being exposed to 1000 hours of accelerated weathering and then subjected to the Test for Evaluating Welding Pads, Blankets and Curtains (both the Fire and Thermal Resistance Test and the Paper Ignition Test)

4.6 Fire and Thermal Resistance Test – Welding Blankets

In order to qualify as an FM Approved welding blanket, the welding blanket must exhibit its ability to prevent equipment and combustibles located directly underneath it from igniting when subjected to sparks, flames and heat resulting from light to moderate welding by satisfying the performance criteria for each of the tests shown below.

4.6.1 Requirement

To demonstrate the ability of a horizontally placed welding pad to resist flame propagation and burn through and exhibit temperature transmission limitation properties.

4.6.2 Test/Verification

The test arrangement used to obtain this data shall be the FM Approvals Apparatus for Testing Welding Pads, Blankets and Curtains. Performance shall be considered satisfactory if all samples meet the following conditions:

- there shall be no burn through of the blanket;
- no individual thermocouple placed on the underside of the pad shall exceed 500°F (260°C);
- exposed areas that exhibit charring shall not crack when subjected to the Test Procedure for Assessing Charring Embrittlement. The areas that have been exposed to any molten metal or slag along the centerline of the burn pattern shall be excluded from this requirement.

4.7 Paper Ignition Test – Welding Blankets

4.7.1 Requirement

To demonstrate the ability of a horizontally placed welding pad to resist flame propagation and burn through and exhibit temperature transmission limitation properties.

4.7.2 Tests/Verification

The test arrangement used to obtain this data shall be the FM Approvals Apparatus for Testing Welding Pads, Blankets and Curtains. Performance shall be considered satisfactory if all samples meet the following conditions:

- discoloration of the paper shall be permitted;
- any burn holes in the paper shall be limited such that a 1 in. (25 mm) diameter sphere can not pass through the opening without making contact with the periphery of the burn area.

4.8 Charring Embrittlement Test – Welding Blankets

4.8.1 Requirement

Upon completion of the Test Procedure for Fire and Thermal Resistance Testing and Paper Ignition Testing, the test specimen (Welding Pads and Welding Blankets only) shall be subjected to the Charring Embrittlement Test. The purpose of the test is to expose the specimen to simulated folding actions likely to occur during normal usage.

4.8.2 Tests/Verification

The test apparatus consists of a smooth 1 in. ± 1⁄16 in. (25 mm ± 2 mm) diameter steel rod 24 in.±2in. (610 mm ± 51 mm) long supported on each end, an eye hook, an ‘‘S’’ hook and a ball clip (or equivalent).

Prior to subjecting the specimen to this procedure, all slag or molten metal shall be carefully removed from the sample in a manner that will not damage the fabric.

Upon completion of the above, the specimen shall be examined for evidence of cracking of the charred material and the development of through openings. Performance shall be considered satisfactory if all samples meet the following condition:

- exposed areas that exhibit charring shall not crack. The areas that have been exposed to any molten metal or slag along the centerline of the burn pattern shall be excluded from this requirement

4.9 Accelerated Weathering Test – Welding Blankets

4.9.1 Requirement

To demonstrate the ability of a horizontally placed welding blanket to resist flame propagation and, burn through and exhibit temperature transmission limitation properties after exposure to accelerated weathering conditions.

The Accelerated Weathering Test shall be used to determine the effect caused by water and ultraviolet (UV) exposure on the fire performance characteristics of the product. This test is intended to simulate the deterioration caused by water such as rain or dew and the ultraviolet energy of sunlight. It is not intended to simulate the deterioration caused by localized weather phenomena such as atmospheric pollution, biological attack or salt water exposure.

4.9.2 Tests/Verification

The test arrangement used to obtain this data shall be the Accelerated Weathering Test and the FM Approvals Apparatus for Testing Welding Pads, Blankets and Curtains.

Samples shall be placed in the accelerated weathering test apparatus and conditioned for 1000 hours (+ 72 hrs, -0 hrs). The cycle time shall be 8 hours (± 0.1 hrs) UV at 140°F±5°F (60°C±3°C) followed by 4 hours of condensation at 122°F±5°F (50°C±3°C).

Performance shall be considered satisfactory if the sample meets the conditions shown in this section after being exposed to 1000 hours of accelerated weathering and then subjected to the Tests for Evaluating Welding Pads, Blankets and Curtains.

4.10 Welding Curtains

In order to qualify as an FM Approved welding curtain, the welding curtain must exhibit its ability to provide protection for combustibles located in the vicinity of the hot work operation from igniting when subjected to sparks and other sources of ignition, to maintain its flexibility and dimensional stability.

4.10.1 Requirement

The ability of a vertically placed welding curtain to resist melting, burning, burn through and deformation caused by contact with sparks, flames and heat resulting from light and moderate hot work operations.

4.10.2 Test/Verification

The test arrangement used to obtain this data shall be the FM Approvals Apparatus for Testing Welding Pads, Blankets and Curtains. Performance shall be considered satisfactory if all samples meet the following conditions:

- there shall be no melting, burning or burn through on the curtain;
- when hung vertically, it shall remain flexible such that a minimum 2 in. (51 mm) of slack can be laid flat on the floor at all times

4.10.3 Evaluating Welding Curtains After Exposure to Accelerated Weathering.

4.10.3.1 Requirement

The ability of a vertically placed welding curtain to resist melting, burning, burn through and deformation caused by contact with sparks, flames and heat resulting from light and moderate hot work operations after exposure to accelerated weathering conditions.

4.10.3.2 Test/Verification

The test arrangement used to obtain this data shall be the Accelerated Weathering Test and the FM Approvals Apparatus for Testing Welding Pads, Blankets and Curtains.

Performance shall be considered satisfactory if the sample meets the following conditions after being exposed to 1000 hours of accelerated weathering and then hung vertically and subjected to the FM Approvals Apparatus for Testing Welding Pads, Blankets and Curtains.

Performance shall be considered satisfactory if all samples meet the following conditions:

- there shall be no melting, burning or burn through on the curtain;
- when hung vertically, it shall remain flexible such that a minimum 2 in. (51 mm) of slack can be laid flat on the floor at all times

5. OPERATIONS REQUIREMENTS

A quality assurance program is required to assure that subsequent product produced by the manufacturer shall present the same quality and reliability as the specific samples examined. Design quality, conformance to design, and performance are the areas of primary concern.

- Design quality is determined during the examination and tests and is documented in the Approval Report.
- Continued conformance to this standard is verified by the Surveillance Audit
- Quality of performance is determined by field performance and by periodic re-examination and testing.

5.1 Demonstrated Quality Control Program

5.1.1 The manufacturer shall demonstrate a quality assurance program which specifies controls for at least the following areas:

- existence of corporate quality assurance guidelines;
- incoming quality assurance, including testing;
- in-process quality assurance, including testing;
- final inspection and tests;
- equipment calibration;
- drawing and change control;
- packaging and shipping; and
- handling and disposition of non-conforming materials.

5.1.2 Documentation/Manual

There should be an authoritative collection of procedures/policies. It should provide an accurate description of the quality management system while serving as a permanent reference for implementation and maintenance of that system. The system should require that sufficient records are maintained to demonstrate achievement of the required quality and verify operation of the quality system.

5.1.3 Records

To assure adequate traceability of materials and products, the manufacturer shall maintain a record of all quality assurance tests performed, for a minimum period of two years from the date of manufacture.

5.1.4 Drawing and Change Control

The manufacturer shall establish a system of product configuration control that shall allow no unauthorized changes to the product. Changes to FM Approved products or to critical documents, identified in the Approval Report, must be reported to, and authorized by, FM Approvals prior to implementation for production.

- The manufacturer shall assign an appropriate person or group to be responsible for, and require that, proposed changes to FM Approved products be reported to FM Approvals before implementation. The manufacturer shall notify FM Approvals of changes in the product or of persons responsible for keeping FM Approvals advised by means of FM Approvals' Form 797, FM Approved Product/Specification-Tested Revision Report or Address/Main Contact Change Report.

- Records of all revisions to all FM Approved products shall be maintained.

5.2 Surveillance Audit Program

An audit of the manufacturing facility is part of the Approval investigation to verify implementation of the quality assurance program. Its purpose is to determine that the manufacturer's equipment, procedures, and quality program are maintained to insure a uniform product consistent with that which was tested and FM Approved.

These surveillance audits shall be conducted periodically, but at least annually, by FM Approvals or its representatives.

FM Approved products or services shall be produced, or provided, at, or from the location(s) audited by FM Approvals and as specified in the Approval Report. Manufacture of products bearing the Approval Mark is not permitted at any other location without prior written authorization by FM Approvals.

5.3 Manufacturer's Responsibilities

The manufacturer shall notify FM Approvals of changes in product construction, components, raw materials, physical characteristics, coatings, component formulation or quality assurance procedures prior to implementation.

APPENDIX A: UNITS OF MEASUREMENT

LENGTH:
in. –‘‘inches’’, ft –‘‘feet’’
(mm –‘‘millimeters’’), (m -‘‘meters’’)
mm = in. × 25.4, m=ft × 0.3048

AREA:
in^2 –‘‘square inches’’, ft^2 –‘‘square feet’’
(mm^2 –‘‘square millimeters’’)
(m^2 –‘‘square meters’’)
$mm^2 = in^2 \times 6.4516 \times 10^2$
$m^2 = ft^2 \times 0.0929$

VELOCITY:
ft/s –‘‘feet per second’’
(m/s –‘‘meters per second’’)
m/s = ft/s × 0.3048

HEAT:
Btu –‘‘British thermal units’’
(kW/h –‘‘kilowatt hours’’)
kW/h = Btu × 0.000293

PRESSURE:
psi –‘‘pounds per square inch’’
(kPa –‘‘kilopascals’’)
kPa = psi × 6.8948

TEMPERATURE:
°F –‘‘degrees Fahrenheit’’
(°C –‘‘degrees Celsius’’)
°C=(°F – 32) × 5/9

APPENDIX B: FM APPROVALS CERTIFICATION MARKS

FM Approvals certifications marks are to be used only in conjunction with products or services that have been Approved by FM Approvals and in adherence with usage guidelines.

FM APPROVED mark:
Authorized by FM Approvals as a certification mark for any product that has been FM Approved. There is no minimum size requirement for the mark, but it must be large enough to be readily identifiable. The mark should be produced in black on a light background, or in reverse on a dark background.

Cast-On FM Approvals marks:
Where reproduction of the FM Approved mark described above is impossible because of production restrictions, use these modified versions of the FM Approved mark. There is no minimum size requirement for the mark, but it must be large enough to be readily identifiable.

FM Approved Mark with ‘‘C’’ only:
Authorized by FM Approvals as a certification mark for any product that has been evaluated by FM Approvals in accordance with Canadian codes and standards. There is no minimum size requirement for the mark, but it must be large enough to be readily identifiable. The mark should be produced in black on a light background, or in reverse on a dark background.

FM Approved mark with ‘‘C’’ and ‘‘US’’:
Authorized by FM Approvals as a certification mark for any product that has been evaluated by FM Approvals in accordance with US and Canadian codes and standards. There is no minimum size requirement for the mark, but it must be large enough to be readily identifiable. The mark should be produced in black on a light background, or in reverse on a dark background.

FM Approvals Certification Marks

USAGE GUIDELINES

All FM Approvals certification marks are the sole property of FM Approvals LLC (“FM Approvals”) and are registered or the subject of applications for registration in the United States and many other countries. They are for use only according to these guidelines.

FM Approvals certification marks may be used only on FM Approved products and related product packaging, in advertising material, catalogs and news releases.

Use of FM Approvals certification marks on such material is not a substitute for use of the complete FM Approvals certification mark on FM Approved products and/or product packaging.

No FM Approvals certification mark or aspect thereof may be incorporated as part of a business name, Internet domain name, or brand name/trademark for products/product lines. This includes both design aspects (the FM Approvals “diamond,” etc.) and word aspects (“FM,” “Approved,” etc.). The use of any FM Approvals certification mark as a trademark is strictly prohibited.

The Approval Standard number or class number may not be incorporated as part of a business name, Internet domain name, or brand name/trademark for products/product lines. For example, a company may not say “ABC Company’s 4100 Fire Door is FM Approved”; the proper terminology is, “ABC Company’s Fire Door is FM Approved per Approval Standard 4100.”

FM Approvals certification marks, except for the FM Approvals Quality System Registration mark, may not be used on business stationery/cards/signage because this could mischaracterize the relationship with FM Approvals. Additionally, these items should not reference any FM Approvals certification mark.

Products or services may not be marketed under any mark or name similar to “FM Global,” “FM Approvals” or any of the FM Approvals certification marks. Further, products or services may not be marketed to imply a relationship beyond the scope of any Approval made by FM Approvals.

When an FM Approvals certification mark is used in advertising material or on product packaging, all material must reflect the specific circumstances under which the product was FM Approved. The material must clearly differentiate between products that are FM Approved and those that are not, and may not, in any way, imply a more substantial relationship with FM Approvals.

A company may not reference the intent to submit a product for Approval or the expectation that a company will have a certain product FM Approved in the future. For example, a company may not state, “Approval by FM Approvals pending” or “Approval by FM Approvals applied for.”

FM Approvals certification marks should not be preceded or followed by a qualifier that indicates a degree of certification or acceptability. For example, “exceeds,” “first” or “only” may not be used to qualify any FM Approvals certification mark.

Only original artwork issued by FM Approvals should be used. The FM Approvals certification marks should not be altered in any way other than to resize the artwork proportionately. Unacceptable uses of the marks include, but are not limited to, adding/deleting wording or artwork, reducing the artwork to an illegible size, animation or distortion.

The text of the FM Approvals certification marks may not be translated into any language other than English.

FM Approvals certification marks must appear in a size and location that is readily identifiable, but less prominent than the name of the owner of the certification or the manufacturer/seller/distributor of the certified products.