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

Class Number 4950

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Foreword

This standard is intended to verify that the products and services described will meet stated conditions of performance, safety and quality useful to the ends of property conservation. The purpose of this standard is to present the criteria for examination of various types of products and services.

Examination in accordance with this standard shall demonstrate compliance and verify that quality control in manufacturing shall ensure a consistent and reliable product.

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1. INTRODUCTION

1.1 Purpose

1.1.1 This standard states testing and certification 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.

1.1.2 Testing and certification criteria may include performance requirements, marking requirements, examination of manufacturing facility(ies), audit of quality assurance procedures, and a surveillance program.

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 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 (ultraviolet [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 NFPA 51B.

1.3 Basis for Requirements

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

1.3.2 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 certification.

1.4 Basis for Certification

Certification 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 shall be performed to evaluate:

- the suitability of the product;
- the performance of the product as specified by the manufacturer and required for certification;
- 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. Subsequent surveillance may be required by the certification agency in accordance with the certification scheme to ensure ongoing compliance.

1.5 Basis for Continued Certification

The basis for continual certification may include the following based upon the certification scheme and requirements of the certification agency:

- production or availability of the product as currently certified;
- the continued use of acceptable quality control procedures;
- compliance with the terms stipulated by the certification;
- satisfactory re-examination of production samples for continued conformity to requirements; and
- satisfactory surveillance audits conducted as part of the certification agency's product surveillance program.

1.6 Effective Date

The effective date of this certification standard mandates that all products tested for certification after the effective date shall satisfy the requirements of this standard.

The effective date of this standard is eighteen (18) months after the publication date of the standard 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. The first value stated shall be regarded as the requirement. The converted equivalent value may be approximate. Conversion of U.S. customary units is in accordance with ANSI/IEEE/ASTM SI 10.

1.8 Normative References

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the cited edition applies:

ANSI/IEEE/ASTM SI 10 American National Standard for Metric Practice

ANSI/FM 4950 American National Standard for Evaluating Welding Pads, Welding Blankets and Welding Curtains for Hot Work Operations

ASTM G154, Standard Practice for Operating Fluorescent Ultraviolet (UV) Lamp Apparatus for Exposure of Nonmetallic Materials

NFPA 51B, Standard for Fire Prevention During Welding, Cutting and Other Hot Work

1.9 Terms and 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 or other FR material 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 or other FR material 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 or other FR material 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 certifying 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 Certification Application Requirements

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

- a complete list of all models, types, sizes, and options for the products or services being submitted for certification consideration;
- anticipated marking format, brochures, sales literature, spec. sheets, installation, and operation procedures.
- 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 Certification Examination Requirements

2.3.1 Following authorization of a certification examination, the manufacturer shall submit samples for examination and testing based on the following:

- product trade name or designation,
- general description,
- intended usage and certification category,
- complete list of all components, raw material suppliers, reinforcements, additives, formulations (if applicable), manufacturing procedures, equipment and production requirements,
- safety data sheets, if applicable;
- production of samples submitted for testing shall be witnessed by a representative of the certification agency. As an alternative, samples may be selected from stock randomly by a representative of the certification agency.

2.3.2 The manufacturer shall submit samples representative of production.

2.3.3 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 15 in. + 1 in. x 21 in. + 1 in. (380 mm + 25 mm x 530 mm + 25 mm).

2.3.4 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 15 in. + 1 in. x 21 in. + 1 in. (380 mm + 25 mm x 530 mm + 25 mm).

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 certification examination results may further define the limits of the final certification.

3.2. Physical or Structural Features

3.2.1 Welding blankets, pads and curtains are fabricated from the material compounds and raw materials list indicated in the manufacturer's audit manual. Various yarns are woven into fabrics and then processed, oven cured and cleaned according to specifications pertinent to the target end product.

3.3 Markings

3.3.1 Marking on the product or, if not possible due to size, on its packaging or label accompanying the product, shall include the following information:

- name and address of the manufacturer or marking traceable to the manufacturer;
- date of manufacture or code traceable to date of manufacture or lot identification;
- model number, size, rating, capacity, etc., as appropriate.

When hazard warnings are needed, the markings should be universally recognizable.

3.3.2 The model or type identification shall correspond with the manufacturer's catalog designation and shall uniquely identify the certification agency's mark of conformity.

3.3.3 The certification agency's mark of conformity shall be displayed visibly and permanently on the product and/or packaging as appropriate and in accordance with the requirements of the certification agency. The manufacturer shall exercise control of this mark as specified by the certification agency and the certification scheme.

3.3.4 All markings shall be legible and durable.

3.4 Manufacturer's Installation and Operation Instructions

3.4.1 The manufacturer shall

- prepare instructions for the installation, maintenance, and operation of the product;
- provide facilities for repair of the product and supply replacement parts, if applicable; and
- provide services to ensure proper installation, inspection, or maintenance for products of such nature that it would not be reasonable to expect the average user to be able to provide such installation, inspection, or maintenance.

3.5 Calibration

3.5.1 Each piece of equipment used to verify the test parameters shall be calibrated within an interval determined on the basis of stability, purpose, and usage. A copy of the calibration certificate for each piece of test equipment is required. The certificate shall indicate that the calibration was performed against working standards whose calibration is certified and traceable to an acceptable reference standard and certified by an ISO/IEC 17025 accredited calibration laboratory. The test equipment shall be clearly identified by label or sticker showing the last date of the calibration

and the next due date. A copy of the service provider's accreditation certificate as an ISO/IEC 17025 accredited calibration laboratory should be available.

3.5.2 When the inspection equipment and/or environment is not suitable for labels or stickers, other methods such as etching of control numbers on the measuring device are allowed, provided documentation is maintained on the calibration status of thus equipment.

3.6 Test Methodology

3.6.1 Welding Pads and Welding Blankets

3.6.1.1 Each material submitted for certification 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 as described in ANSI FM 4950 for Evaluating Welding Pads, Welding Blankets and Welding Curtains for Hot Work Operations Appendix B-Section 4 and Section 5.

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

3.6.1.2 Following the tests shown in 3.6.1.1, all samples shall be subjected to the charring embrittlement test. as described in ANSI FM 4950 for Evaluating Welding Pads, Welding Blankets and Welding Curtains for Hot Work Operations Appendix C.

3.6.1.3 Upon completion of the tests shown in 3.6.1.1 and 3.6.1.2 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 as described in ANSI FM 4950 for Evaluating Welding Pads, Welding Blankets and Welding Curtains for Hot Work Operations Appendix D.

3.6.1.4 Upon completion of the accelerated weathering test, each test specimen shall be subjected to the corresponding test in the most applicable orientation deemed critical.

3.6.1.5 Upon completion of the tests shown in 3.6.1.4, all samples shall be subjected to the charring embrittlement test.

3.6.2. Welding Curtains

3.6.2.1. Each material submitted for certification shall be subjected to the following test procedures:

- Fire and thermal resistance test as described in ANSI FM 4950 for Evaluating

Welding Pads, Welding Blankets and Welding Curtains for Hot Work Operations Appendix B-Section 4.

- Paper ignition test as described in ANSI FM 4950 for Evaluating Welding Pads, Welding Blankets and Welding Curtains for Hot Work Operations Appendix B-Section 5.

3.6.2.2. Upon completion of the test shown in 3.6.2.1 a new, previously untested specimen shall be subjected to the accelerated weathering test as described in ANSI FM 4950 for Evaluating Welding Pads, Welding Blankets and Welding Curtains for Hot Work Operations Appendix D.

3.6.2.3. Upon completion of the accelerated weathering test, the test specimen shall be subjected to one of the test procedures, that is deemed most critical, shown in 3.6.2.1.

4. PERFORMANCE REQUIREMENTS

4.1 Fire and Thermal Resistance Test

4.1.1 Requirement

To demonstrate the ability of a horizontally placed welding pad, welding blanket or vertically hung welding curtain to resist flame propagation and burn-through and exhibit temperature transmission limitation properties.

4.1.1.1 Welding Pad – In order to qualify as a certified 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 the test shown below.

4.1.1.2 Welding Blanket – In order to qualify as a certified 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 the test shown below.

4.1.1.3 Welding Curtain – In order to qualify as a certified 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.

4.1.2 Test/Verification

4.1.2.1 ANSI FM 4950 for Evaluating Welding Pads, Welding Blankets and Welding Curtains for Hot Work Operations Appendix B-Section 4.

4.2 Paper Ignition Test

4.2.1 Requirement

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

4.2.1.1 Welding Pad – In order to qualify as a certified 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 the test shown below.

4.2.1.2 Welding Blanket – In order to qualify as a certified 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 the test shown below.

4.2.1.3 Welding Curtain – In order to qualify as a certified 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.

4.2.2 Test/Verification

4.2.2.1 ANSI FM 4950 for Evaluating Welding Pads, Welding Blankets and Welding Curtains for Hot Work Operations Appendix B-Section 5.

4.3 Charring Embrittlement Test

4.3.1 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.

4.3.2 Tests/Verification

4.3.2.1 ANSI FM 4950 for Evaluating Welding Pads, Welding Blankets and Welding Curtains for Hot Work Operations Appendix C-Section 1.

4.4 Accelerated Weathering Test

4.4.1 Requirement

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.

The test arrangement used to obtain this data shall be the accelerated weathering test and the apparatus for testing welding pads, blankets and curtains.

For further information please reference ASTM G154, Standard Practice for Operating Fluorescent Ultraviolet (UV) Lamp Apparatus for Exposure of Nonmetallic Materials.

4.4.2 Tests/Verification

4.4.2.1 ANSI FM 4950 for Evaluating Welding Pads, Welding Blankets and Welding Curtains for Hot Work Operations Appendix D-Section 1.

5. MAMUFACTURER'S REQUIREMENTS

5.1 Demonstrated Quality Control Program

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

- Design quality is determined during the examination and tests and may be documented in the certification report.
- Continued conformance to this standard is verified by the certifier's surveillance program.
- Quality of performance is determined by field performance and by periodic re-examination and testing.

5.1.2 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.

5.1.3 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.

5.1.4 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.

5.1.5 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 critical documents, identified in the certification report, may be required to be reported to, and authorized by the certification agency prior to implementation for production.
- Records of all revisions to all certified products shall be maintained.

5.2 Surveillance Audit

5.2.1 An audit of the manufacturing facility may be part of the certification agencies surveillance requirements 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 ensure a uniform product consistent with that which was tested and certified.

5.2.2 Certified products or services shall be produced or provided at, or provided from, location(s) disclosed as part of the certification examination. Manufacture of products bearing a certification mark is not permitted at any other location prior to disclosure to the certification agency.

5.3 Product Modification

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

5.4 Manufacturing and Production Tests

In process inspections are performed per the manufacturers process quality control procedures.

6. BIBLIOGRAPHY

ISO/IEC 17025, *General Requirements for the Competence of Testing and Calibration Laboratories*.