



*Member of the FM Global Group*



**American National Standard  
for  
Evaluating Welding Pads,  
Welding Blankets and  
Welding Curtains for Hot  
Work Operations**

**ANSI FM 4950-2024**

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# Foreword

NOTE: This foreword is introductory only and is not part of American National Standard/FM Approvals 4950.

This standard is intended to verify that the products described will meet stated conditions of performance and quality. The purpose of this Standard is to present the criteria for evaluating various types of welding blankets, pads and curtains to be used as guidance for manufacturers, users and authorities having jurisdiction.

This American National Standard has been developed by the canvass method of standards development of the American National Standards Institute (ANSI). FM Approvals is an ANSI-accredited standards developing organization (SDO).

Approval of an American National Standard requires verification by ANSI that the principles of openness and due process have been followed and that a consensus of those directly and materially affected by the standard has been achieved. Consensus requires that all views and objections be considered, and that a concerted effort made toward their resolution. Consensus is established when, in the judgment of the ANSI Board of Standards Review, substantial agreement has been reached.

The American National Standards Institute does not develop standards nor will it in any circumstances give an interpretation of any American National Standard. Requests for interpretations of this test standard should be addressed to FM Approvals.

ANSI regulations require that this American National Standard shall be revised, reaffirmed or withdrawn within five years of the date of publication.

ANSI FM 4950 was originally published in 2007, re-affirmed in February 2013, and updated in 2024. Changes are as follows:

- Removed date reference from NFPA 51B, *Standard for Fire Prevention During Welding, Cutting and Other Hot Work*;
- American Society for Testing and Materials (ASTM) G53 96 was updated to American Society for Testing and Materials (ASTM) G154
- Corrected typographical errors;
- Added US Customary units along with SI units.

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## 1. INTRODUCTION

### 1.1 Purpose

This standard states test 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 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 NFPA 51B, or whenever Hot Work precautions are required.

### 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 other national and international 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.

### 1.4 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*.

## 2. APPLICABLE DOCUMENTS

### 2.1 Applicable Documents

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

American Society for Testing and Materials (ASTM) G154, *Standard Practice for Operating Light and Water Exposure Apparatus (Fluorescent UV-Condensation Type) for Exposure of Nonmetallic Materials*

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

Test Method for Evaluating Welding Pads, Blankets and Curtains (Appendix B)

Test Method for Assessing Charring Embrittlement (Appendix C)

### 2.2 Glossary

<i>Charring</i>	The formation of a carbonaceous residue as the result of pyrolysis or incomplete combustion.
<i>Fill</i>	The yarn running selvage to selvage at right angle to the warp. Also commonly referred to as the cross machine direction.
<i>Hot work</i>	Any work involving burning, welding, cutting or similar operations that produces sparks, flames or heat that is capable of initiating fires or explosions.
<i>Ignition</i>	The initiation or continuance of combustion.
<i>Molten substance</i>	Metals in their liquified, elevated temperature state, as well as related non-metallic substances such as slag, dross and salt, handled at elevated temperatures.
<i>Warp</i>	The yarn running lengthwise in a woven fabric. Also commonly referred to as the machine direction.
<i>Welding blanket</i>	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.
<i>Welding curtain</i>	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.
<i>Welding pad</i>	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.

### 3. GENERAL REQUIREMENTS

#### 3.1 Background

- 3.1.1 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 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.
- 3.1.2 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.

#### 3.2 Categories

- 3.2.1 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 are welding pads, welding blankets and welding curtains.
- 3.2.2 *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).
- 3.2.3 *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.
- 3.2.4 *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.

### 3.3 Requirements

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

- product trade name or designation,
- general description,
- intended usage and category,
- safety data sheets, if applicable

3.3.2 Prior to conducting tests for evaluation as a welding pad, welding blanket or welding curtain, samples shall be conditioned at  $73^{\circ}\text{F} \pm 5^{\circ}\text{F}$  ( $23^{\circ}\text{C} \pm 3^{\circ}\text{C}$ ) at 50% ( $\pm 5\%$ ) 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.

3.3.3 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 12 in.  $\pm$  1 in. x 18 in.  $\pm$  1 in. (0.31m  $\pm$  25mm x 0.46 m  $\pm$  25 mm).

3.3.4 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 12 in.  $\pm$  1in. x 18in.  $\pm$  1 in. (0.31 m  $\pm$ 25 mm x 0.46 m  $\pm$  25 mm).

## 4. TEST REQUIREMENTS

### 4.1 Welding Pads and Welding Blankets

- 4.1.1 Each material shall be subjected to the following tests in accordance with the Test Method for Evaluating Welding Pads, Blankets and Curtains (Appendix B).
- 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
- 4.1.2 Following the tests shown in 4.1.1, all samples shall be subjected to the Test Method for Charring Embrittlement (see Appendix C).
- 4.1.3 Upon completion of the tests shown in 4.1.1 and 4.1.2 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 (see Appendix D).
- 4.1.4 Upon completion of the Accelerated Weathering Test, each test specimen shall be subjected to the corresponding test in the most applicable orientation deemed critical.
- 4.1.5 Upon completion of the tests shown in 4.1.4, all samples shall be subjected to the Test Method for Charring Embrittlement.

### 4.2 Welding Curtains

- 4.2.1 Each material shall be subjected to the Test Method for Evaluating Welding Pads, Blankets and Curtains (Appendix B).
- 4.2.2 Upon completion of the test shown in 4.2.1 a new, previously untested specimen shall be subjected to the Accelerated Weathering Test (see Appendix D).
- 4.2.3 Upon completion of the Accelerated Weathering Test, the test specimen shall be subjected to the Test Method for Evaluating Welding Pads, Blankets and Curtains.

### 4.3 Other Information

- 4.3.1 Based on the test procedures contained in this document, 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.
- 4.3.2 Based on the test procedures contained in this document, 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.
- 4.3.3 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.



4.3.4 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. In these cases, the seam shall be located such that it will be exposed to the most critical location and orientation during testing. The seamed and non-seamed areas of the samples shall meet all criteria contained in this standard.

## 5. PERFORMANCE REQUIREMENTS

### 5.1 Welding Pads

In order to qualify as a 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.

#### 5.1.1 Test Method for Evaluating Welding Pads, Welding Blankets and Welding Curtains

##### A. Requirement

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

##### B. Test/Verification

The test arrangement used to obtain this data shall be the Welding Pads, Blankets and Curtains Test Apparatus (see Appendix B, Figures B-1 and B-2).

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

##### *Fire and Thermal Resistance Test*

- 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 Method for Assessing Charring Embrittlement. (See Appendix C).

##### *Paper Ignition Test*

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

#### 5.1.2 Test Method for Evaluating Welding Pads, Blankets and Curtains After Exposure to Accelerated Weathering.

##### A. Requirement

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.

##### B. Test/Verification

The test arrangement used to obtain this data shall be the Accelerated Weathering Test (Appendix D) and the Test Method for Evaluating Welding Pads, Blankets and Curtains (see Appendix B).

Performance shall be considered satisfactory if the sample meets the conditions shown in paragraph 5.1.1 after being exposed to 1000 hours of accelerated weathering and then subjected to the Test Method for Evaluating Welding Pads, Blankets and Curtains (both the Fire and Thermal Resistance Test and the Paper Ignition Test).

### 5.2 Welding Blankets

In order to qualify a 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.

#### 5.2.1 Test Method for Evaluating Welding Pads, Blankets and Curtains

##### A. Requirement

The ability of a horizontally placed welding blanket to resist flame propagation and burn-through, and exhibit temperature transmission limitation properties.

##### B. Test/Verification

The test arrangement used to obtain this data shall be Welding Pads, Blankets and Curtains Test Apparatus (see Appendix B, Figures B-1 and B-2). Performance shall be considered satisfactory if all

samples meet the following conditions:

*Fire and Thermal Resistance Test*

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

*Paper Ignition Test*

- 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.

5.2.2 Test Method for Evaluating Welding Pads, Blankets and Curtains After Exposure to Accelerated Weathering.

A. Requirement

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.

B. Test/Verification

The test arrangement used to obtain this data shall be the Accelerated Weathering Test (Appendix D) and the Welding Pads, Blankets and Curtains Test Apparatus (see Appendix B, Figures B-1 and B-2).

Performance shall be considered satisfactory if the sample meets the conditions shown in paragraph 5.2.1 after being exposed to 1000 hours of accelerated weathering and then subjected to the Test Method for Evaluating Welding Pads, Blankets and Curtains (both the Fire and Thermal Resistance Test and the Paper Ignition Test).

### 5.3 Welding Curtains

In order to qualify as a 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.

5.3.1 Test Method for Evaluating Welding Pads, Welding Blankets and Welding Curtains

A. 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.

B. Test/Verification

The test arrangement used to obtain this data shall be Welding Pads, Blankets and Curtains (see Appendix B, Figures B-1 and B-2).

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

5.3.2 Test Method for Evaluating Welding Pads, Blankets and Curtains After Exposure to Accelerated Weathering.

A. 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.

B. Test/ Verification

The test arrangement used to obtain this data shall be the Accelerated Weathering Test (Appendix D) and

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