



Member of the FM Global Group

Approval Standard for Profiled Steel Panels for Use as Decking in Class 1 Insulated Roof Construction

Class Number 4451

June 2012

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Foreword

The FM Approvals certification mark 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 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

- 1.1.1 This standard states Approval requirements for profiled steel panels for use as roof decking in Class 1 insulated roof construction.
- 1.1.2 Approval criteria include, but are not limited to, performance requirements, labeling and marking requirements, examination of manufacturing facility(ies), audit of quality assurance procedures, and a surveillance program.

1.2 Scope

- 1.2.1 This standard applies to all profiled steel panels intended for use as roof decking in Class 1 insulated roof construction. This standard also applies to the interaction of accessory components with the steel deck. These accessory components include the products used to secure the deck to the structure, the methods of deck side laps securement and the insulation and fasteners located above the roof deck. Each steel roof deck Approval must include an FM Approved above deck roof system qualified in accordance with FM Standards 4454, 4470, 4471, 4475, 4476 or 4477.

1.3 Basis for Requirements

- 1.3.1 The requirements of this standard are based on experience, research and testing. The advice of manufacturers, users, trade associations, jurisdictions and/or loss control specialists was also considered.
- 1.3.2 The requirements of this standard reflect tests and practices used to examine characteristics of profiled steel panels as roof decking for the purpose of obtaining Approval. Profiled steel panels having characteristics not anticipated by this standard may be FM Approved if performance equal, or superior, to that required by this Standard is demonstrated, or if the intent of the standard is met. Alternatively, profiled steel panels which meet all of the requirements identified in this Standard may not be FM Approved if other conditions which 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 shall be performed to evaluate
- the suitability of the product;
 - the performance of the product as specified by the manufacturer and required by FM Approvals; and as far as practical,
 - the durability and reliability of the product.
- 1.4.2 An examination of the manufacturing facilities and audit of quality control procedures is made to evaluate the manufacturer's ability to consistently produce the product which is examined and

tested, and the marking procedures used to identify the product. These examinations may be repeated as part of FM Approvals' product surveillance program.

1.5 Basis for Continued Approval

Continued Approval is based upon:

- production or availability of the product as currently FM Approved;
- the continued use of acceptable quality assurance procedures;
- satisfactory field experience;
- compliance with the terms stipulated in the Approval report;
- satisfactory re-examination of production samples for continued conformity to requirements; and
- satisfactory Surveillance Audits conducted as part of FM Approvals' product surveillance program.

Also, as a condition of retaining Approval, manufacturers may not change a product or service without prior authorization by FM Approvals.

1.6 Effective Date

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 of this standard is June 30, 2013 for compliance with all requirements.

1.7 System of Units

Units of measurement used in this Standard are United States (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. Appendix A lists the selected units and conversions to SI units for measures appearing in this standard. Conversion of U.S. customary units is in accordance with the American National Standards Institute (ANSI)/Institute of Electrical and Electronics Engineers (IEEE)/American Society for Testing Materials (ASTM) SI 10-97, "Standard for Use of the International System of Units (SI): The Modern Metric System."

1.8 Applicable Documents

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

American Iron and Steel Institute (AISI)

- *North American Specification for the Design of Cold-Formed Steel Structural Members, 2007 Edition*, AISI S100-2007, Including Supplement 2 (February 2010), AISI S100-2007

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- *Approval Standard for Single-Ply, Polymer-Modified Bitumen Sheet, Built-Up Roof (BUR) and Liquid Applied Roof Assemblies for use in Class 1 and Noncombustible Roof Deck Construction, FM Standard 4470*
- *Evaluating the Simulated Wind Uplift Resistance of Roof Assemblies Using Static Positive and/or Negative Differential Pressures, ANSI/FM Approvals 4474*
- *Approval Standard for Class 1 Fire Ratings of Insulated Wall or Roof/Ceiling Panels, Interior Finish Materials or Coatings and Exterior Wall System, FM Standard 4880.*
- *Test Method for Drivability Evaluation of Fasteners*
- *Test Method for Corrosion Resistance Testing for Steel Roof Deck Coatings*
- *Test Method for Pull Out Tests for Fastener/Roof Deck Combinations and Pull Through Tests for Fastener/Stress Plate or Batten Bar Combinations using Tensile Loading*
- *Test Method for Determining the Pull Out / Pull -Over Resistance of Fasteners for use with Steel Roof Decking*
- *Test Method for Determining the Foot Traffic Resistance and Bearing Capacity of Insulation*
- *Test Method for Determining the Side Lap Crimping and Interlocking Resistance when Used with Steel Roof Decking*

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- *Wind Design, FM Global Property Loss Prevention Data Sheet 1-28*
- *Roof Deck Securement and Above-Deck Roof Components, FM Global Property Loss Prevention Data Sheet 1-29*

National Fire Protection Association (NFPA)

- *Standard Method of Fire Tests for Determining the Heat Release Rate of Roofing Assemblies with Combustible Above-Deck Roofing Components, NFPA 276*

1.9 Definitions

For purposes of this standard, the following terms apply:

Arc Spot Weld - A type of securement whereby the steel deck is joined to the supporting steel structural member through heat fusion.

Side Lap Crimping and Interlocking – A mechanical securement achieved by crimping adjacent sheets of steel deck panels along the specially designed side laps.

Crack – During wind uplift testing, when an insulation is stressed to the point that it separates from itself while continuing to maintain the applied uplift pressure without catastrophic failure of the test assembly.

Crease - During wind uplift testing, when insulation is stressed to the point that it bends at a sharp, defined angle, without breaking. Often a crack will form on the opposite face of the insulation board.

Deck - The deck is the structural component of the roof assembly to which the roof system is secured.

Designer - The licensed professional responsible for the content of the drawings and specifications from which the steel deck is to be constructed.

Fasteners - A mechanical securement device used alone or in combination with a stress distributor to secure various components of a roof assembly.

Insulation - Insulation is any of a variety of materials designed to reduce the flow of heat, either from or into a building.

Minor delamination – In wind uplift testing, an area approximately 1% of the test sample. For a 12 x 24 ft (3.7 x 7.3 m) test an area of approximately 3 ft² (0.28 m²); for a 5 x 9 ft (1.5 x 2.7 m) test approximately 0.5 ft² (0.05 m²) or less, whereby two adhered components which are intended to be in contact are not in contact.

Owner's Designated Representative for Construction - The owner or the entity that is responsible to the owner for the overall construction of the project, including its planning, quality and completion; usually the general contractor, the construction manager or similar authority at the job site.

Rated Load - The uplift load resulting from a windstorm that a roof assembly must resist. The rated load is equal to two times the service load. The rated load is equal to the rating requested for FM Approval; e.g. the rated load is 90 psf (4.3 kPa) for a Class 1-90 rating.

Roof Assembly - A roof assembly is a system of interacting roof components (including the roof deck) designed to weatherproof and, normally, to insulate a building's top surface.

Roof Cover - The exterior surface of a roof assembly.

Roof System - A system of interacting roof components (not including the roof deck) designed to weatherproof and, normally, to insulate a building's top surface.

Span – The distance between deck supports measured center to center.

Steel Roof Deck – Profiled steel panel used as a structural component to support a roof system.

Service Wind Load – The uplift load resulting from a windstorm that a roof assembly must resist. The service load is used for bending stress calculations and is equal to one half of the rated load in psf (kPa).

Structure - The structure is the building framework to which the roof deck is fastened.

Wind Uplift - Wind uplift is the force generated by wind on a roof assembly or components in a roof assembly resulting from wind-induced pressure.

2 GENERAL INFORMATION

2.1 Product Information

Steel roof deck is supplied as sheets or panels. Materials employed in the manufacture of steel roof deck shall consist of cold rolled carbon or stainless steel panels with a minimum yield point of 33 ksi (230 MPa) and a minimum tensile strength of 45 ksi (310 MPa). The minimum steel design thickness shall be 0.0276 in. (0.70 mm). The uncoated minimum steel thickness delivered to a job site shall not be less than 95% of the steel design thickness at any location (exception: lesser thickness due to cold forming is permitted at bends).

2.2 Approval Application Requirements

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

Materials Director
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; and
- A set of manufacturing drawings for each gauge and profile, sales brochures/literature, installation instructions and maintenance procedures;
- The number and location of manufacturing facilities;
- The wind uplift rating(s) desired, or expected, for example: Class 1-60, 1-75, etc.;