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Examination Standard for Class 1 Conveyor Belting

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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 Class 1 conveyor belting. The establishment of such a classification is used in determining acceptable fire protection requirements applicable to specific installations.

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 the performance requirements for establishing a classification for horizontal, inclined, and vertical conveyor belts made from plastics, fibers, and natural and synthetic rubbers used to transport materials in commercial or industrial applications.

1.2.2. This standard examines the ability of conveyor belting to limit fire spread by measuring its resistance of self-sustaining fire propagation. This standard also examines surface buildup of static electricity, friction, and the adverse effects on fire performance caused by ultraviolet (UV) and/or water exposure and mechanical wear.

1.2.3. This standard is not intended to determine the suitability for all end-use conditions of this product. Conditions such as strength, elongation, durability, impact resistance, operating temperature range, corrosion resistance, etc., are not evaluated as part of this certification examination.

1.2.4. This standard provides a means for determining the sprinkler protection requirements needed strictly due to the flammability characteristics of the conveyor belting. The effect of conveying combustible materials, enclosure housings constructed of combustible material or the presence of ordinary combustibles near or under the conveyor belt have not been considered. The sprinkler protection requirements when these conditions exist are not included or determined by this standard.

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 organizations. 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 conveyor belting 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 may be conducted 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. 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 assurance 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 agencies product surveillance program.

1.6. EFFECTIVE DATE

The effective date of this examination 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 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. 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*

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

ANSI/FM 4910, *Cleanroom Materials Flammability Test Protocol*.

BS EN 14973, *Conveyor belts for use in underground installations. Electrical and flammability safety requirements*

ISO 284, *Conveyor belts — Electrical conductivity — Specification and test method*

1.9. TERMS AND DEFINITIONS

For purposes of this standard, the following terms apply:

Class 1 Conveyor Belting	Conveyor belting material that meets certification test requirements as non-fire propagating material and all other conditions of this standard. These materials show no adverse effects on their fire propagation properties after extended UV, water exposure and mechanical wear tests. The materials may be used in totally enclosed, partially open, or open system applications.
Class 1 (U) Conveyor Belting	Conveyor belting material that meets certification test requirements as a non-fire propagating material and shows no adverse effects on its fire propagation properties after extended water exposure and mechanical wear and exhibits suitable anti-static electricity properties. The materials may be used in totally enclosed system applications or where conditions are wet but there is no exposure to sunlight, such as underground mine tunnels.
Class 1 (TE) Conveyor Belting	Conveyor belting material that meets certification test requirements as a non-fire propagating material and exhibits suitable anti-static electricity properties. These materials show no adverse effects on their fire propagation properties from mechanical wear. However, they show adverse effects on their fire propagation properties from extended UV and /or water exposure. Use of these materials is restricted to totally enclosed systems where extended water and UV exposure is minimal or nonexistent.
Conveyor Belt	A material handling product used to transport a wide variety of materials, usually of the raw bulk type. Belts vary in width and length. They are generally made from natural and synthetic rubbers and plastic.
Chemical Heat Release Rate (CHRR)	The actual heat release rate during the fire propagation process. It is determined from the generation rates of carbon monoxide and carbon dioxide.
Fire Propagation Index (FPI)	A measure of the fire propagation tendency of a material. It is the ratio of the heat flux provided by the flame off the surface of the material and the material's thermal response parameter (TRP).
Heat Flux	The rate of heat flow measured across a given surface.
Non-Fire Propagating	The ability of a material to resist flame propagation and to limit the spread of fire within the ignition zone.
Open System	A conveyor system with no housing or hood to protect the conveyor belting or conveyed material from weather conditions such as rain, dew and sunlight.
Partially Open System	A conveyor system having an enclosure with continuous openings along the sides or floor. A conveyor with a weather hood or no floor would be an example of a partially open system.

Thermal Response Parameter (TRP)	A property of a material describing its reaction to heat in terms of ignition temperature, thermal conductivity, density and specific heat; i.e. a measure of the ability for thermal wave penetration into a material.
Totally Enclosed System	A conveyor system having an enclosure that has no continuous openings along the sides or floor and serves to minimize or eliminate exposure of the conveyor belting or conveyed material to potentially harmful weather conditions such as rain, dew and sunlight. Occasional openings such as doors or inspection hatches are permitted. Elevated or grade level structures or tubes, subgrade tunnels, mines, and other underground applications are examples of totally enclosed systems.

2. GENERAL INFORMATION

2.1. PRODUCT INFORMATION

2.1.1. Conveyor belts, typically manufactured in laminated layers from plastics, fibers, and natural and synthetic rubbers, are used to transport a wide variety of materials. Past experience has shown that they are capable of providing a sufficient combustible loading, in and of themselves, which allows for fire to spread from one area to another, even in cases where the conveyed product and enclosing structure, if provided, are noncombustible.

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;
- General assembly drawings, complete set of manufacturing drawings, materials list, anticipated marking format, piping and electrical schematics, nameplate format, brochures, sales literature, spec. sheets, installation, operation and maintenance 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. REQUIREMENTS FOR SAMPLES FOR EXAMINATION

2.3.1. Following authorization of a certification examination, the manufacturer shall submit samples for examination and testing. Sample requirements will be determined by the certification agency following a review of the preliminary information.

2.3.2. Requirements for samples may vary depending on design features, results of prior or similar testing, and results of any foregoing tests.

2.3.3. The manufacturer shall submit samples representative of production.

2.3.4. It is the manufacturer's responsibility to provide any necessary test fixtures, such as those which may be required to evaluate the conveyor belts.

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. MARKINGS

3.2.1. 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.

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

3.2.3. 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.

3.2.4. All markings shall be legible and durable.

3.3. MANUFACTURER'S INSTALLATION AND OPERATION INSTRUCTIONS

3.3.1. 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.

3.4. OBSERVATION OF TEST SAMPLE PRODUCTION

3.4.1. At the discretion of the certification agency, their representative may witness the production of conveyor belting to be evaluated.

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.

4. PERFORMANCE REQUIREMENTS

In order to qualify as a Class 1 Conveyor Belt, each conveyor belt shall satisfy all of the following performance criteria.

The certification examination includes 1) observation of test sample manufacture, 2) flammability characterization of the conveyor belt 3) electrical conductance test, 4) testing to determine the effects of mechanical wear on flammability characterization, 3) testing to determine the effects of UV and/or water exposure on flammability characterization, 6) drum friction test, and 7) other tests as noted. A complete review of installation specifications and, at the discretion of the certification agency, inspection of one or more field installations shall be conducted to assure, as far as possible, the practicality and reliability of product installation.

When different materials or polymers are used in the construction of the top and bottom surfaces, the above tests may be required for both surfaces to verify that both surfaces meet the requirements of this standard.

4.1. FLAMMABILITY CHARACTERIZATION

4.1.1. Requirement

The flammability characterization of conveyor belting materials is used to determine whether they can be classified as Class 1. Based on these characteristics, a material Fire Propagation Index (FPI) can be determined. Conveyor belts samples with a resulting FPI ≤ 7, shall be termed non-fire propagating and are candidates for certification recognition. Conveyor belt samples with a resulting FPI > 7, shall be termed propagating and are not candidates for certification recognition.

4.1.2. Test/Verification

ANSI/FM 4910, *Cleanroom Materials Flammability Test Protocol*.

4.2. ANTI-STATIC ELECTRICITY TEST

4.2.1. Requirement

The maximum electrical resistance of conveyor belting shall be tested in order to ensure that the material is sufficiently conductive to drain off electrical charges that may form on its surface while in use. The measured electrical resistance shall not exceed 3 × 108 ohms on either surface of the conveyor belting being tested.

4.2.2. Test/Verification

BS EN 14973:2015 ‘‘Conveyor belts for use in underground installations. Electrical and flammability safety requirements’’, Section 5 or ISO 284 (2025), ‘‘Conveyor belts — Electrical conductivity — Specification and test method’’ The conveyor belting sample shall be placed on a sheet of insulating material. An annular brass electrode connected to ground, or the low voltage terminal of a measuring instrument shall be placed on the sample. A cylindrical brass electrode connected to the high voltage terminal shall be placed on the sample and within the annular electrode. Voltage is applied for 1 minute and the resistance is measured.

4.3. ACCELERATED AGING TEST

4.3.1. Requirement

The Accelerated Aging Test shall be conducted to determine the effect caused by UV and/or water exposure and mechanical wear on the fire performance characteristics of conveyor belting. The sample shall be aged (weathered) for 1000 hours in an Ultraviolet Weathering Cabinet in accordance with ASTM G154, *Standard Practice for Operating Fluorescent Ultraviolet (UV) Lamp Apparatus for Exposure of Materials*. The aged samples shall then be tested to determine the FPI.

If the FPI obtained after the Accelerated Aging Test is conducted is not greater than the allowable limits per Table 1 and less than or equal to 7, then certification recognition can be extended, provided that the performance requirements as detailed in paragraphs 4.1 and 4.2 are also met.

Table 1 – Allowable Percent Increase

Initial FPI	Allowable percentage increase after accelerated aging
FPI ≤ 2.0	20%
2.0 < FPI ≤ 4.0	10%
4.0 < FPI ≤ 6.6	5%
FPI > 6.6	0%

4.3.2. Test/Verification

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

ANSI/FM 4910, *Cleanroom Materials Flammability Test Protocol*

4.4. DRUM FRICTION TEST

4.4.1. Requirement

Drum friction tests shall be conducted to determine the temperature of the drum surface and to monitor the belt for flaming or glowing. There shall be no flame or glow of the conveyor belting during or after the test. Additionally, the maximum temperature of the drum surface shall be reported.

4.4.2. Test/Verification

BS EN 14973:2015 ‘‘Conveyor belts for use in underground installations. Electrical and flammability safety requirements’’, Section 6.3. This test simulates the condition of a ‘‘locked’’ conveyor belting over a rotating drum. Samples of conveyor belting are held in tension around half of a steel drum surface. The steel drum is rotated at constant speed until the conveyor belting breaks. Observations include recording the presence or absence of flame or glow, the maximum temperature of the drum surface; and the amount of time elapsed until the sample breaks.

5. MANUFACTURER'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 reexamination 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 MODIFICATIONS

5.3.1. All certified conveyor belting shall be manufactured with the identical raw materials, additives, and processes as originally tested.

5.3.2. 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.

5.3.3. The manufacturer shall determine the suitability of the conveyor belting for specific end-use conditions such as strength, elongation, durability, impact resistance, operating temperature range, corrosion resistance, and other product characteristics not evaluated as part of the certification examination.

6. BIBLIOGRAPHY

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