



CAN/ULC-S115-2018

STANDARD METHOD OF FIRE TESTS OF FIRESTOP SYSTEMS



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STANDARD METHOD OF FIRE TESTS OF FIRESTOP SYSTEMS

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STANDARD METHOD OF FIRE TESTS OF FIRESTOP SYSTEMS

PREFACE

This is the Fifth Edition of the Standard Method of Fire Tests of Firestop Systems, CAN/ULC-S115.

This Edition of the Standard was developed by the ULC Standards Task Group on Firestop Systems and has been formally approved by the ULC Standards Committee on Fire Tests.

This Standard has been developed in compliance with the requirements of the Standards Council of Canada (SCC) for accreditation of a Standards Development Organization.

Only metric SI units of measurement are used in this Standard. If a value for measurement is followed by a value in other units in parentheses, the second value may be approximate. The first stated value is the requirement.

Appendix A, identified as Informative, is for information purposes only.

In Canada, there are two official languages, English and French. All safety warnings must be in French and English. Attention is drawn to the possibility that some Canadian authorities may require additional markings and/or installation instructions to be in both official languages.

The Fifth Edition of this National Standard of Canada is based on, and now supersedes, the Fourth Edition.

Attention is drawn to the possibility that some of the elements of this Canadian standard may be the subject of patent rights. ULC Standards shall not be held responsible for identifying any or all such patent rights.

Requests for interpretation of this Standard should be sent to ULC Standards. The requests should be worded in such a manner as to permit a “yes” or “no” answer based on the literal text of the requirement concerned.

This CAN/ULC-S115 Standard is under continuous maintenance, whereby each revision is approved in compliance with the requirements of SCC for accreditation of a Standards Development Organization. In the event that no revisions are issued for a period of four years from the date of publication, action to revise, reaffirm, or withdraw the standard shall be initiated.

Comments or proposals for revisions on any part of the Standard may be submitted at any time. Proposals should be submitted via a Proposal Request in the On-Line Collaborative Standards Development System (CSDS) at <https://csds.ul.com/canada>.

This Standard is intended to be used for conformity assessment.

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1 SCOPE

1.1 This method of test is applicable to firestop systems with or without penetrating items such as cables, cable trays, conduits, ducts and pipes. These firestop systems are intended for use in openings in fire resistive wall and floor assemblies and membranes forming part of an assembly required to have a fire resistance rating and linear openings between adjacent fire resistive floor assemblies, wall assemblies or both.

1.2 Tests conducted in conformance with this method will record firestop performance during the fire-test exposure under laboratory conditions; but such tests shall not be construed as determining suitability of the firestop system for use after exposure to fire.

1.3 The test method allows for the testing of the resistance of firestop systems to an external force simulated by a hose stream. However, this method shall not be construed as determining the performance of the firestop systems during actual fire conditions when subjected to forces such as failure of cable support systems and falling debris.

1.4 Provisions are included to allow for testing with a pressure differential between the furnace chamber and the exterior.

1.5 It is the intent that tests made in conformity with these test methods will develop data to enable regulatory bodies to determine the suitability of firestop systems for use in assemblies where fire resistance of a specified duration is required.

1.6 Provisions are included to allow for optional air leakage testing to determine the air leakage rate through test specimens resulting from a specified air pressure difference applied across the surface of the test specimens. The results of this test are intended to develop data to assist in determining the acceptability of firestop systems with reference to the control of air movement.

NOTE: Tests for air leakage are performed under laboratory conditions. In actual usage, results may vary because of installation and/or environmental conditions. See Appendix A, Subsection A6.

1.7 For the purpose of this Standard, a firestop system (fire stop) refers to a specific construction consisting of:

- A Any device intended to close off an opening or penetration during a fire;
- B Material(s) that fill an opening in a wall or floor assembly where penetration is by cables, cable trays, conduits, ducts and pipes along with their means of support through the wall or floor opening;
- C Material(s) that fill an opening in a wall assembly where penetration is by electrical and non-electrical outlet boxes along with their means of support in the wall assembly;

NOTE: Examples of non-electrical outlet boxes are for the supply and waste water to/from washing machines, the air exhaust from dryers, gas outlet boxes, or other devices that create an opening in the assembly.

- D Material(s) and construction intended for use in linear openings between adjacent fire resistive structures.

1.8 This test method is also applicable to perimeter joint firestop systems located between a fire resistance rated floor and a rated or non-fire resistance rated exterior wall.

2 SIGNIFICANCE AND USE

2.1 This test method shall be used to determine the performance of a firestop system with respect to a standard time-temperature fire exposure during which a pressure differential may be maintained between the furnace chamber and the exterior. It may also be used to determine performance with respect to a standard hose stream test.

2.2 Five ratings may be established for each firestop system (F, FT, FH, FTH and L).

F rating is based upon flame occurrence on the unexposed surface.

FT rating is based upon a temperature rise criterion and flame occurrence on the unexposed surface.

FH rating is based upon flame occurrence on the unexposed surface and satisfactory performance during the hose stream test.

FTH rating is based upon a temperature rise criterion, flame occurrence on the unexposed surface and satisfactory performance during the hose stream test.

L rating is based upon the volume of air flowing, per unit of time, through the openings around the test specimen under a specified pressure difference.

The rating of a firestop system applies to its use in the specific assembly of materials, penetrations and floors or walls in which it was tested.

2.3 The firestop systems are intended for use in accordance with provincial or municipal building regulations that are based on the National Building Code of Canada.

3 REFERENCE PUBLICATIONS

3.1 The documents shown below are referenced in the text of this Standard. Unless otherwise stated elsewhere in this Standard such reference shall be considered to indicate the edition and/or revisions of the document available at the date on which the Committee approved this ULC Standard.

Documents Published by the American Society for Testing and Materials (ASTM International)
100 Barr Harbour Drive, PO Box C700, West Conshohocken, PA 19428-2959 U.S.A.
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www.astm.org

- ASTM E1399/E1399M-97 (Reapproved 2017), Standard Test Method for Cyclic Movement and Measuring the Minimum and Maximum Joint Widths of Architectural Joint Systems
- ASTM E2307-15, Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using Intermediate-Scale, Multi-story Test Apparatus

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- CSA C22.1-15, Canadian Electrical Code, Part I, Safety Standard for Electrical Installations
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- National Building Code of Canada, 2015

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www.ulc.ca/ulcstandards

- CAN/ULC-S101-14, Standard Methods of Fire Endurance Tests of Building Construction and Materials

4 GLOSSARY

NOTE: Terms used in this Standard are defined as follows:

FIELD SPLICE — the technique utilized at the point of installation to join two or more lengths of a joint firestop system or its component material.

FIRESTOP SYSTEM(S) (FIRE STOP) — a system consisting of a material, component and means of support used to fill gaps between fire separations or between fire separations and other assemblies, or used around items that wholly or partially penetrate a fire separation. (Refer to Clause 1.7)

FIRESTOP SYSTEM COMPONENT — a component that has been tested as a part of a firestop system.

NOTE: The components of a firestop system include the firestop material, as well as any penetrating items, and their means of support and the surrounding wall or floor.

JOINT FIRESTOP SYSTEM — a firestop system that provides a seal along a continuous linear opening between two fire-resistance rated assemblies, or bounded by a fire-resistance rated assembly, to prevent the spread of fire.

NOTE: Closed, or “blank” penetrations, intended to accommodate future or abandoned penetrations for example, are not considered to be joints for the purposes of this Standard.

MANUFACTURED SPLICE — the technique utilized at the point of manufacture to join two or more lengths of a joint firestop system material.

MAXIMUM JOINT WIDTH — the greatest width to which the joint firestop system is designed to extend, taking into consideration all axes of movement.

MINIMUM JOINT WIDTH — the narrowest width to which the joint firestop system is designed to accommodate.

MOVEMENT CAPABILITY — the range of movement that a joint firestop system is designed to accommodate without diminishing its fire resistive performance.

MOVEMENT CYCLE — the continual repetitious movement between the minimum and maximum joint width positions.

NOTE: The initial position is the nominal joint width and the three movement cycle positions are the maximum joint width, minimum joint width and the nominal joint width.

NOMINAL JOINT WIDTH — the width of the linear opening specified in practice and in which the joint firestop system is installed.

PERIMETER JOINT — the linear opening located between an adjacent exterior wall assembly and floor assembly.

TEST ASSEMBLY — the wall or floor assembly into which the test specimen(s) is (are) mounted or installed.

TEST SPECIMEN — the example of the firestop system being tested that is constructed in the test laboratory.

THROUGH-PENETRATION FIRESTOP SYSTEM — a firestop system that seals the opening around penetrating items, such as cables, cable trays, conduits, ducts, and pipes, which pass through the entire assembly.

5 CONTROL OF FIRE TESTS

5.1 TIME-TEMPERATURE CURVE

5.1.1 The fire exposure within the furnace shall be controlled to conform to the standard time-temperature curve in CAN/ULC-S101 and as shown in Figure 1. The points on the curve that determine its character are given in Appendix A, Table A1.

5.2 FURNACE TEMPERATURE MEASUREMENTS AND CONTROL

5.2.1 The temperature of the test exposure shall be deemed to be the average temperature obtained from the readings of thermocouples symmetrically distributed to show the temperature near all parts of the test assembly. The furnace chamber volume shall exceed 0.40 m³. A minimum of three thermocouples shall be used with at least one thermocouple per 2 m² of floor test specimen surface and at least one thermocouple per 1 m² of wall test specimen surface. The thermocouples shall be distributed to show the temperature near all parts of the test assembly.

5.2.2 The thermocouple leads shall be of a diameter not greater than 1.02 mm and shall be enclosed in sealed, porcelain tubes 19 mm in outside diameter and 3.2 mm in wall thickness, or, as an alternative in the case of base metal thermocouples, enclosed in sealed, standard 21.3 mm outside diameter black wrought steel or black wrought iron pipe. The exposed length of the pyrometer tube and thermocouple in the furnace chamber shall be not less than 305 mm. Other types of protecting tubes or pyrometers may be used that, under test conditions, give the same readings within the limit of accuracy that applies for furnace-temperature measurements.

5.2.3 For floors, the junction of the thermocouples shall be placed 305 mm away from the exposed face of the test assembly at the beginning of the test and, during the test, shall not touch the test assembly as a result of its deflection. In the case of walls, the junction of the thermocouples shall be 150 mm away from the exposed face of the test assembly.

5.2.4 The temperatures shall be read at intervals not exceeding 1 min during the fire test.

5.2.5 The accuracy of the furnace control shall be such that the area under the time-temperature curve, obtained by averaging the results from the thermocouple readings, is within 10 % of the corresponding area under the standard time-temperature curve for fire tests of 1 h or less duration, within 7.5 % for those over 1 h and not more than 2 h, and within 5 % for tests exceeding 2 h in duration.

5.2.6 For additional furnace temperature thermocouple requirements for joint firestop systems, see Subsection 10.1, Furnace Temperatures.

5.3 UNEXPOSED SURFACE TEMPERATURE MEASUREMENTS

5.3.1 At least one thermocouple of the welded junction type shall be placed at each of the following locations on the unexposed surface of the test specimen and floor or wall test assembly as shown in Figure 2:

- A At a point on the surface of the test specimen, 25 mm from one of each type of through-penetrating item;
- B At a point on the surface of the firestop system material at the periphery of the test specimen;
- C At a point on the surface of the firestop system material approximately equidistant from two penetrating items and groups of items, and approximately equidistant from the penetrating item or group of penetrating items and the periphery of the test specimen;
- D At a point on any frame installed around the perimeter of the opening;
- E At a point on the unexposed surface of the wall or floor test assembly at least 100 mm from any opening;
- F On each type of through-penetrating item at a point 25 mm from the unexposed surface of the firestop system material. If the through-penetrating item is insulated or coated on the unexposed side, the thermocouple shall be located on the exterior surface of the insulation or coating. If the coating or insulation does not extend the full length of the penetrating item on the unexposed side, an additional thermocouple shall be installed on the penetrating item 25 mm beyond the termination of the insulation or coatings;
- G At points on the unexposed surface of the test specimen deemed to be most susceptible to temperature rises (not shown in Figure 2);
- H Where the grouping of through-penetrating items or the placement of the firestop material does not permit the installation of the thermocouple pad specified in Clause 5.3.3, the size or shape of the thermocouple pad can be modified to accommodate the shape available. Alternatively, the thermocouple may be relocated to a nearby position where similar temperature rise conditions are expected to exist. (Not shown in Figure 2.);
- I Except for outlet boxes, for membrane penetration firestop system that only penetrates the exposed surface of the assembly, thermocouples shall be placed at a minimum of two points on the unexposed surface directly opposite to the opening on the exposed side. If the area opposite to the opening of the exposed surface is not sufficiently large to locate two thermocouples, one thermocouple at the center of the projected area shall be used. If the penetrating item is less than 152 mm (6 in) in diameter, a minimum of one thermocouple shall be used. Thermocouples shall also be placed at a minimum of two points on the unexposed surface, at least 51 ± 25 mm (2 ± 1 in) below the top of the wall. The two points shall be located a maximum of 76 mm (3 in) laterally at each side from the center of the opening.

5.3.2 If the firestop system material is being tested alone, without penetrating items, thermocouples shall be placed at point B as indicated in Figure 2 and at the midpoint of the unexposed surface of the firestop system material.

5.3.3 Temperatures on the unexposed surface of the firestop system components shall be measured with thermocouples placed under flexible, oven-dry pads. The properties of these pads shall meet the requirements specified in Subsection 5.4, Thermocouple Pads. The pads shall be held firmly against the surface of the firestop system component and shall fit closely about the thermocouples. The thermocouple junction shall be positioned under the centre of the pad. The thermocouple leads under the pads shall be of a diameter not greater than 1.02 mm and shall be electrically insulated with heat-resistant and moisture-resistant coverings.

5.3.4 Temperatures on the penetrating items shall be measured with thermocouples placed under flexible, oven-dry pads. The thermocouple bead shall be held firmly against the penetrating item. The thermocouple leads shall be of a diameter not greater than 0.635 mm and shall be electrically insulated with heat-resistant and moisture-resistant coverings. The pads as described above shall be held firmly against the penetrating item and shall fit closely about the thermocouples.

5.3.5 Temperature readings shall be taken at intervals not exceeding 5 min, until a reading exceeding 100 °C has been obtained at any one point. Thereafter, if the readings are taken more frequently at the discretion of the testing organization, the intervals shall not be less than 1 min.

5.4 THERMOCOUPLE PADS

5.4.1 The pads used in measurements of temperature of unexposed surfaces of test specimens shall be of suitable inorganic material and shall exhibit the following properties:

Length and width,	50 ± 1 mm
Thickness,	10 ± 1 mm
Density,	500 ± 10 kg/m ³
Thermal Conductivity at 65 °C	0.055 ± 0.003 W/(m·K)

5.4.2 The thickness measurement shall be under the light load of a 13 mm diameter anvil head micrometer without compression of the pad.

5.4.3 The pads shall be sufficiently soft so that, without breaking, they may be shaped to contact over the whole surface against which they are placed.

5.5 PRESSURE DIFFERENTIAL

5.5.1 The pressure differential between the exposed and unexposed surfaces of the test assembly shall be measured as described in Clauses 5.5.2 through 5.5.7 and Subsection 5.6, Unique Pressure Condition.

5.5.2 Except as required in Subsection 5.6, Unique Pressure Condition, the pressure differential between the exposed and unexposed surfaces of the test assembly shall be a minimum of 2.5 Pa with the higher pressure on the exposed (furnace) side at an elapsed time of 5 min (see Clause 8.1.3) and maintained for the duration of the test period. The pressure sensing probes shall be as shown in either Figure 3 or Figure 4.

5.5.3 The pressure shall be measured using an instrument(s) capable of reading pressure with an accuracy of 1.25 Pa. The instrument(s) shall be located to minimize "stack" effects caused by vertical runs of pressure tubing between the furnace probe(s) and instrument(s) location.