

Underwriters Laboratories Inc. (UL)  
333 Pfingsten Road  
Northbrook, IL 60062-2096

UL Standard for Safety for Tests for Fire Resistance of Building Joint Systems, UL 2079

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Revisions: This Standard contains revisions through and including March 10, 2006.

### **Summary of Topics**

***The revisions dated March 10, 2006, were issued to add an optional evaluation of firestops for water leakage (a W-Rating).***

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| 7-9 .....   | October 21, 2004 |
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| 19-24.....  | March 10, 2006   |
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**1**

## **UL 2079**

### **Standard for Tests for Fire Resistance of Building Joint Systems**

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**October 21, 2004**

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An effective date included as a note immediately following certain requirements is one established by Underwriters Laboratories Inc. and is not part of the ANSI Standard.

Revisions of this Standard will be made by issuing revised or additional pages bearing their date of issue. A UL Standard is current only if it incorporates the most recently adopted revisions, all of which are itemized on the transmittal notice that accompanies the latest set of revised requirements.

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## INTRODUCTION

### 1 Scope

1.1 These tests are applicable to joint systems of various materials and construction that are intended for use in linear openings between adjacent fire resistive structures.

1.2 The fire endurance ratings for joint systems are intended to register performance during the period of fire exposure and are not intended to be interpreted as having determined the acceptability of the joint systems for use before or after fire exposure. The intent of these methods is to develop data to assist others in determining the suitability of the joint systems where fire resistance is required.

1.3 These requirements are intended to evaluate the length of time that the types of joint systems specified in 1.1 will contain a fire during a predetermined test exposure. The test evaluates the joint system's resistance to heat and, in some instances, to a hose stream, while carrying an applied load if the assembly is load bearing. The method of testing also includes optional air leakage tests to determine the rate of air leakage through joint systems resulting from a specified air pressure difference applied across the surface of the joint systems.

1.4 Under these requirements a joint system is subjected to a standard fire exposure controlled to achieve specified temperatures throughout a specified time period. This exposure by itself is not intended to be representative of all fire conditions; conditions vary with changes in the amount, nature and distribution of fire loading, ventilation, compartment size and configuration, and heat sink characteristics of the compartment.

1.5 All joint systems are cycled through their intended range of movement prior to fire exposure to demonstrate the joint system's range of movement and the impact of the joint system during movement on the adjacent fire resistive structures. Joint systems are required to be loaded to their designed live load capacity during the fire test. For tests of wall-to-wall and head-of-wall joint systems, the fire test is followed by the application of a specified standard hose stream.

1.6 These requirements cover the measurement of the transmission through the joint system of heat and gases sufficiently hot to ignite cotton waste.

*1.7 Revised and relocated as 1.14 March 10, 2006*

1.8 These requirements provide a relative measure of fire performance of comparable assemblies under these specified fire exposure conditions. Any variation from the construction or conditions that are tested, such as method of assembly and materials, is not within the scope of this test method.

1.9 Tests for evaluating the suitability of poured or formed-in-place materials for use in joint systems under non-fire conditions are found in the Standard Test Method for Adhesion and Cohesion of Elastomeric Joint Sealants Under Cyclic Movement (Hockman Cycle), ASTM C 719-93.

1.10 Tests for evaluating the suitability of joint systems other than those with poured or formed-in-place materials under non-fire conditions are found in the Standard Test Method for Cyclic Movement and Measuring the Minimum and Maximum Joint Widths of Architectural Joint Systems, ASTM E 1399-91.

1.11 Tests for determining the hourly fire endurance ratings of walls and floors are found in the Standard for Fire Tests of Building Construction and Materials, UL 263. Standard UL 263 shall be permitted to be used to determine the hourly fire endurance rating of walls and floors with control joints.

1.12 Tests for determining the surface burning characteristics of building materials, based on the rate of flame spread, are found in the Standard for Test for Surface Burning Characteristics of Building Materials, UL 723.

1.13 The results of these tests represent one factor in assessing fire performance of joint systems. These requirements prescribe a standard fire exposure for comparing the performance of joint systems. Application of these test results to predict the performance of actual building construction requires careful evaluation of test data.

1.14 The method of testing also includes optional air leakage tests to determine the rate of air leakage through fire resistive joint systems resulting from a specified air pressure difference applied across the surface of the systems. The results obtained from the optional air leakage tests are expressed in cubic feet per minute (cubic meter per second) per lineal foot (lineal meter) of opening. The results are intended to develop data to assist authorities having jurisdiction, and others, in determining the acceptability of joint systems with reference to the control of air movement through the assembly.

1.7 revised and relocated as 1.14 March 10, 2006

1.15 The method of testing also includes optional water leakage tests to determine the ability of fire resistive joint systems to resist the passage of water under a three foot pressure head. This method does not evaluate the ability of uncured joint systems to resist such exposure.

1.15 added March 10, 2006

1.16 An L rating may also be established for a fire resistive joint system. The L rating is based on the amount of air leakage through the test sample.

1.16 added March 10, 2006

1.17 A W rating may also be established for a fire resistive joint system. The W rating is based on the water resistance of the test sample.

1.17 added March 10, 2006

## **2 General**

### **2.1 Units of measurement**

2.1.1 Values stated without parentheses are the requirement. Values in parentheses are explanatory or approximate information.

## 2.2 Undated references

2.2.1 Any undated reference to a code or standard appearing in the requirements of this standard shall be interpreted as referring to the latest edition of that code or standard.

## 3 Glossary

3.1 For the purpose of this standard the following definitions apply.

3.2 CONTROL JOINT – A device or designed feature that provides a continuous transition in linear openings within a fire resistive structure and that does not exceed a maximum joint width of 5/8 inch (16 mm). A control joint system consists of the device or designed construction feature but does not include the fire resistive structure in which it is installed.

3.3 FIELD SPLICE – The technique utilized at the point of installation to join two or more lengths of a joint system or a joint system component material.

3.4 JOINT SYSTEM – A device or designed construction feature that provides a continuous transition in linear openings between adjacent fire resistive structures. A joint system consists of the device or designed construction feature but does not include the fire resistive structure in which it is installed.

3.5 LINEAR OPENING – A discontinuity between or within fire resistive structures.

3.6 MANUFACTURED SPLICE – The technique utilized at the point of manufacture to join two or more lengths of a joint system component material.

3.7 MAXIMUM JOINT WIDTH – The greatest width to which the joint system is designed to extend taking into consideration all axes of movement.

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## 8 Head-of-Wall Joint Systems

8.1 Head-of-wall joint systems are designed for installation in vertical linear openings between wall and floor or roof structures. The floor or roof structure used for the test assembly is to extend a minimum of 12 inches (305 mm) beyond each surface of the wall structure.

8.2 The minimum length of the joint system exposed to fire is to be 36 inches (914 mm) if the length of the joint system exposed to fire is at least ten times greater than the maximum joint width. For joint systems having a length to maximum joint width ratio which is less than ten to one, the minimum length of the joint system exposed to fire is to be 9 feet (2.7 m).

8.3 Asymmetrical joint systems are to be tested from both sides unless the joint systems are designed for fire exposure on only one side or it is documented that the side with the lower fire endurance rating is tested.

## 9 Conditioning

9.1 When required to provide a condition representative of the anticipated construction conditions, the structure and joint system shall be conditioned prior to fire testing. The structure is not required to be conditioned with the joint system. The condition is to be established by storage in air having 50 percent relative humidity at 73°F (23°C). When conditioning to this level cannot be accomplished the test shall be conducted when the dampest portion of the structure and joint system have achieved equilibrium resulting from storage in air having 50 to 75 percent relative humidity at 73 ±5°F (23 ±3°C).

*Exception: When an equilibrium condition is not achieved within a 12-month conditioning period; or if the construction is such that hermetic sealing resulting from the conditioning has prevented drying of the interior of the structure or joint system, then the conditioning need be continued only until the structure has developed sufficient strength to retain the joint system securely in position.*

9.2 The relative humidity within hardened concrete shall be determined with a method that uses an electric sensing element. The relative humidity within a structure or joint system made of materials other than concrete shall be determined with an approved method such as one that uses an electric sensing element.

9.3 For wood construction, the moisture content of the wood shall not be greater than 13 percent as determined by an electrical resistance method.

9.4 If, during conditioning of the specimen, it becomes necessary to use accelerated drying techniques, it is the responsibility of the laboratory conducting the test to avoid procedures that will significantly alter the structural or fire endurance characteristics of the test assembly, or both, from those produced as a result of drying in accordance with the procedures specified in 9.1.

9.5 Within 72 hours prior to the fire test, information on the actual moisture content and distribution within the test assembly is to be obtained. If the moisture condition of the test assembly is capable of changing significantly from the 72 hour sampling condition prior to test, the sampling is to be made not later than 24 hours prior to the test. This information is to be included in the report. See Report of Results, Section 25.

9.6 Each joint system is to be subjected to movement cycling prior to the fire test. The joint system is to be installed at its nominal width. The movement cycling is to consist of any one of the conditions specified in Table 9.1. A movement cycle is to consist of the joint system width being nominal, maximum, minimum and then nominal.

**Table 9.1**  
**Conditions of test specimen cycling**

| Minimum number of cycles | Minimum cycling rate (cycles per minute) |
|--------------------------|------------------------------------------|
| 500                      | 1                                        |
| 500                      | 10                                       |
| 100                      | 30                                       |

9.7 The cycle range is to be the same as the movement capability, in direction and magnitude, for which the joint system is designed. Only those components of the joint system which are subject to movement need be cycled.

9.8 After movement cycling, the joint system is to be allowed to stabilize, untouched, at the maximum joint width position. After stabilization, the joint system is to be examined and any indication of stress, deformation or fatigue of the joint system is to be noted, photographed and reported.

9.9 The joint system is to be removed from the movement cycling apparatus, installed in the structure at the maximum joint width without allowing any alteration which will enhance its thermal performance, and fire tested within 96 hours after completion of the movement cycling.

*Exception: Joint systems to be evaluated for a W rating are to be removed from the movement cycling apparatus, installed in the structure at the maximum joint width without allowing any alteration which will enhance its water resistance or thermal performance, and Water Leakage testing shall be initiated within 96 hours after completion of the movement cycling. The joint systems shall then be reconditioned in accordance with sections 9.1 through 9.5 prior to fire testing.*

9.9 revised March 10, 2006

## **FIRE ENDURANCE TEST**

### **10 Test Furnace**

10.1 The construction details of the test furnace depend on the nature of the test to be conducted. Provisions are made for fuel burners, gas exhaust, observation ports and devices for monitoring and controlling the furnace conditions. The furnace is to be equipped with an adequate number of burners arranged in such a way as to provide uniform fire exposure of the test assembly and joint system.

10.2 The furnace lining shall consist of materials with densities less than 62 lb/ft<sup>3</sup>(1000 kg/m<sup>3</sup>). The lining materials shall have a minimum thickness of 2 inches (50 mm) and shall constitute at least 70% of the internally exposed surface of the furnace.

## 22 Air Leakage Rate Calculation

22.1 The barometric pressure, temperature and relative humidity of the supply air are to be measured and recorded. The air supply flow values are to be corrected to standard temperature and pressure (STP) conditions for calculation and reporting purposes.

22.2 The air leakage ( $Q$ ) through the joint system at each temperature exposure is to be expressed as the difference between the total metered air flow ( $Q_t$ ) and the extraneous chamber leakage ( $Q_e$ ). The air leakage rate ( $q$ ) through the joint system is to be expressed as the quotient of the air leakage ( $Q$ ) divided by the overall length of the joint system in the test assembly.

## OPTIONAL WATER LEAKAGE TEST

### 22A Test Sample

22A added March 10, 2006

22A.1 Each representative construction type of a fire resistive joint system for which the water leakage rating is desired is to be tested. Test sample sizes are to be the same as those specified for fire testing in Sections 5 through 8 as appropriate. The sample shall be conditioned as described in Section 9 both before and after completion of the water leakage test.

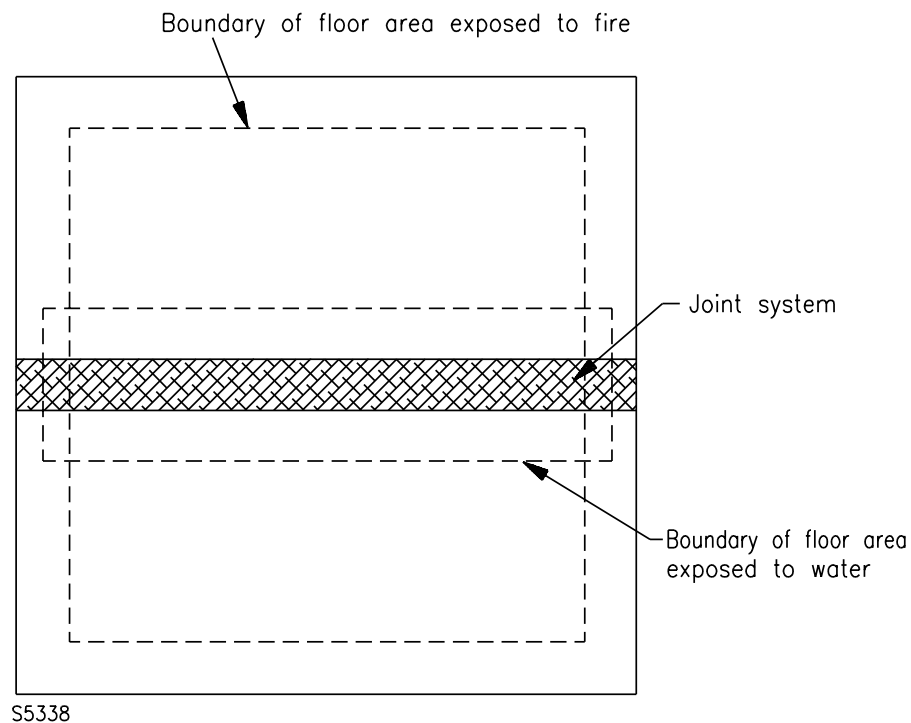
### 22B Test Chamber

22B added March 10, 2006

22B.1 The water leakage test chamber is to consist of a well-sealed vessel sufficient to maintain pressure with one open side against which the test assembly is sealed. The leakage test chamber is to have the ability to place water within the chamber. When the test method requires a pressure head greater than provided by the water within the test chamber, the test chamber is to be provided with means to attach a pressurized pneumatic or hydrostatic supply.

22B.2 The width of the test chamber must be equal to or greater than the exposed length of the test sample. See Figure 22B.1.

**Figure 22B.1**  
**Boundary of floor area exposed to fire and water**



22B.3 When a pneumatic supply is being used, the water leakage test chamber is to be provided with at least one static pressure tap to measure pressure within the test chamber. The pressure tap is to be located a minimum of 1 in (25 mm) above the top surface of the water placed inside the water leakage test chamber.

22B.4 The temperature of the test fixture is to be within a range of 50 to 90°F (10 to 32°C).

22B.5 When the test method requires a pressure head greater than provided by the water within the test chamber, the air pressure within the water leakage test chamber is to be measured at a minimum frequency of 15 seconds. The pressure within the water leakage test chamber is to be measured by means of a manometer or equivalent transducer capable of reading pressure within an accuracy of 1% of the specified pressure.

## 22C Test Setup

22C added March 10, 2006

22C.1 Joint systems are to be installed as specified in 4.1.

22C.2 The water leakage test chamber is to be sealed to the test sample. Nonhardening mastic compounds, pressure-sensitive tape or rubber gaskets with clamping devices are permitted to be used to seal the water leakage test chamber to the test assembly.

22C.3 Water, with a permanent dye, is to be placed in the water leakage test chamber. The water is to cover the joint systems to a minimum depth of 6 in (152 mm).

22C.4 The top of the joint system is to be sealed by whatever means necessary when the top of the joint system is to be immersed under water. The seal is to prevent passage of water into the joint system.

22C.5 The water leakage test chamber is to be pressurized using pneumatic or hydrostatic pressure when the test method requires a pressure head greater than that provided by the water inside the water leakage test chamber.

22C.6 A white indicating medium is to be placed immediately below the fire resistive joint system.

22C.7 The minimum pressure within the water leakage test chamber shall be 3 feet of water (1.3 psig) applied for a minimum of 72 hours. The pressure head shall be measured at the horizontal plane at the top of the water seal.

22C.8 Subsequent to the water leakage test, and conditioning as specified in Section 4.2, the joint system shall be tested as specified in 4 and Section 5.

## 22D Recorded Test Data

22D added March 10, 2006

22D.1 The leakage of water through the fire resistive joint system is to be noted by the presence of water or dye on the indicating media or on the underside of the test sample.

## FIRE ENDURANCE RATING

### 23 Conditions of Acceptance

23.1 During the tests, the construction shall have complied with the following conditions:

a) For joint systems designed to be load bearing, the joint system shall have sustained the applied load during the rating period.

b) Transmission of heat through the joint system shall not have raised the temperature at the hottest point more than 325°F (181°C) above its initial temperature during the rating period. Additionally, for joint systems having a maximum width equal to or greater than 6 inches (152 mm), the temperature rise as determined by the average of all values recorded by thermocouples placed over the joint system shall not have increased by more than 250°F (139°C). Also, for floor-to-wall and head-of-wall joint systems, transmission of heat through the joint system shall not have raised the temperature of the structure 1 inch (25 mm) from the joint system more than 325°F (181°C) above its initial temperature during the rating period.

- c) For tests of wall-to-wall and head-of-wall joint systems, the joint system shall have withstood the hose stream test without developing any opening that permits a projection of water from the stream beyond the unexposed surface.
- d) The integrity of the joint system shall be maintained to prohibit ignition of the cotton waste pad.

## 24 Correction

24.1 When the indicated resistance period of the joint system is 1/2 hour or longer as determined by maximum temperature rise on the unexposed surface, it shall be increased or decreased by the following correction to compensate for significant variation of the measured time-temperature curve from the standard time-temperature curve within the limits of 12.7. The correction is expressed by the following formula:

$$C = \frac{2 I (A - A_s)}{3 (A_s + L)}$$

*in which:*

*C is the correction in the same units as I,*

*I is the indicated fire resistance period,*

*A is the area under the curve of measured average furnace temperature for the first three-fourths of the indicated period,*

*A<sub>s</sub> is the area under the standard time-temperature curve for the same part of the indicated period, and*

*L is the lag correction in the same units as A and A<sub>s</sub> [54°F-hours (30°C-hours); 3240°F-minute (1800°C-minute)].*