

ULC Subject C263(e)-M1988



**CRITERIA FOR USE IN
EXTENSION OF DATA
FROM FIRE ENDURANCE TESTS**

UNDERWRITERS' LABORATORIES OF CANADA

ULC Subject C263(e)-M1988

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EXTENSION OF DATA
FROM FIRE ENDURANCE TESTS**

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B.P. Murphy (Secretary, ..	Underwriters' Laboratories of Canada, Ontario.

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This document is the first in a series of publications which will cover various aspects of the design of structures for fire resistance. The purpose of this document is to elaborate upon the principles involved in the extension of data obtained from fire resistance tests and to enable a potential user to correctly identify whether a proposed design modification will result in a higher, lower or similar fire **endurance** compared to that of the original assembly tested.

Other documents will be developed which will address procedures for quantified interpolation and extrapolation of data obtained from standard fire resistance tests and procedures for theoretical design of structures for fire resistance based on material properties.

Units of measurements used in this Standard are in SI units.



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UNDERWRITERS' LABORATORIES OF CANADA

General Offices and Testing Station 7 CROUSE ROAD, SCARBOROUGH, ONTARIO M1R 3A9 Telephone (416) 757-3611 Telex 06-963643 Fax (416) 757-9540

In Replying
Please Refer to

ULC Subject C263(e)-M1988

CRITERIA FOR USE IN

EXTENSION OF DATA

FROM FIRE ENDURANCE TESTS

PREFACE

This is the First Edition of ULC Subject C263(e) entitled, Criteria for Use in Extension of Data from **Fire Endurance** Tests.

This Edition has been formally approved by the ULC Committee on Fire Tests.

The "fire resistance" requirement is employed in the National Building Code of Canada to regulate the division of a building into fire compartments by physical barriers (called fire separations) which resist the spread of fire from one compartment to another. It is also employed to regulate building elements which maintain the structural integrity of these fire separations.

For many years the National Building Code of Canada has provided for the establishment of fire resistance ratings by subjecting model construction assemblies, representative of the construction to be employed, to a test as presently described by CAN4-S101-M82 "Standard Methods of **Fire Endurance** Tests of Building Construction and Materials". Fire resistance ratings may also be developed from information provided in Chapter 2, Fire Performance Ratings of the Supplement to the National Building Code of Canada, utilizing a collection of data concerning generic materials, based upon the performance of these materials in various assemblies when subjected to the requirements of the standard fire **endurance** test.

It has also become the practice to assess the theoretical fire performance of construction assemblies from reasoning based on data obtained from the standard fire **endurance** test. Such assessment has thus far been confined to assemblies obtained by substituting elements having a different form, mass or dimension. It has entailed an engineering evaluation of the effect of substitution on the results of the fire test.

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1. SCOPE

1.1 This document is based on generally accepted principles involving the extension of test data using simple considerations. The acceptance of these principles and their application is based substantially on what might be termed "an analogous worst case proposition" together with the consideration of precepts such as Ten Rules of **Fire Endurance**. (See Appendix A).

1.2 These principles are applicable to assemblies subject to temperature conditions represented by the standard time-temperature curve described in CAN4-S101M.

1.3 The extension of test data using numerical techniques based on empirical data is not covered in this document.

1.4 This document does not cover assemblies obtained by the substitution of one proprietary material for another proprietary material, or use of materials for which fire test data are not presently available.

NOTE: A generic material is one for which a nationally recognized Standard exists. A proprietary material is one whose fire performance characteristics are determined in consideration of a formulation or process of production that is proprietary.

1.5 This document does not purport to be comprehensive in its treatment of possible non-proprietary modifications of tested assemblies. Any proposed modification that is not specifically covered in the Standard may have a significant effect on the fire **endurance** of the original tested assembly, and consequently, should be assessed by engineering evaluation or test.

1.6 In order to apply some of the principles contained in the criteria described in this document, reference to the original fire test report will be necessary.

2. REFERENCE PUBLICATIONS

2.1 This document refers to the following publications and edition:

CAN4-S101-M82 - Standard Methods of **Fire Endurance** Tests of Building Construction and Materials.

3. GLOSSARY

NOTE: Terms used in this document that are in Bold Print are defined as follows:

3.1 **COMPOSITE** (as applied to structural elements) - An interaction between structural elements which is to be taken into account in the evaluation of the load capacity of the structure.

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3.2 FIRE ENDURANCE - A measure of elapsed time during which a building element continues to exhibit fire resistance under specified conditions of test and performance. As applied to elements of building, it shall be measured by the methods and to the criteria defined in CAN4-S101M.

3.3 FIRE RESISTANCE - The property of a building element to withstand fire or to provide protection against fire; as applied to elements of buildings, it is characterized by the ability to either confine the fire or continue to perform a given structural function, or both.

3.4 FIRE RESISTANCE RATING - The assigned time in hours or fraction thereof that a building element will withstand the passage of flame and the transmission of heat when exposed to fire under specified conditions of test and performance criteria, or as determined by extension or interpretation of information derived therefrom.

3.5 FIRE RESISTIVE - Having fire resistance.

3.6 FORM UNITS - A profiled sheet of steel used as a permanent form for a poured concrete floor or roof slab.

3.7 NON-COMPOSITE (as applied to structural elements) - In the evaluation of the load capacity of an assembly, structural interaction between contiguous elements is assumed not to exist.

3.8 SPECIFIED LOAD (as applying to structural elements) - The test load applied to the element or the intended maximum design load condition anticipated in the field.

3.9 TRANSFER - Inclusion in a tested assembly of a structural element that has been tested in a different assembly.

3.10 ULTIMATE CAPACITY (as applying to structural elements) - The load carrying capacity of an element based on properties specific to the material of the element.

4. EXTENSION OF DATA FROM FIRE RESISTANCE TESTS

4.1 INTRODUCTION

4.1.1 The methods and procedures set forth in this document relate to the further consideration of the data pertaining to the performance of a particular test sample construction subjected to a standard fire test conducted in accordance with the Standard CAN4-S101M.

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4.1.2 The description of the specific combination of elements which is represented by the test sample construction typically forms part of the test report and for the purpose of this document the test sample construction shall be referred to as the test specimen. The test specimens which are the subject of this document are categorized as follows:

- A Floor and ceiling;
- B Roof and ceiling;
- C Beam;
- D Wall and partition; and
- E Column.

4.1.3 The simplest application of the test data obtained from a standard fire test occurs when the test specimen duplicates the actual building element for which a specific fire resistance is required. More frequently, however, it is necessary to make a number of compromises in the representation in the test of the actual building element, beginning with the fact that in most cases the test specimen is smaller than the building element it is intended to represent.

4.2 CRITERIA FOR THE EVALUATION OF CHANGES

4.2.1 The evaluation of the effect of the modification or substitution of components in a test specimen, shall be made using the same criteria or conditions of acceptance as set out in the Standard CAN4-S101M and followed in the establishment of the fire resistance rating of the original test specimen.

4.2.2 The criteria or conditions of acceptance for the evaluation of modified test specimens, shall be in accordance with Table 1 which specifies the appropriate clause numbers of CAN4-S101M.

4.3 GENERALLY ACCEPTED PRINCIPLES INVOLVING THE EXTENSION OF TEST DATA

4.3.1 General

4.3.1.1 Table 2 provides an index of the clauses pertaining to the particular extensions discussed in this document.

TABLE 1
CONDITIONS OF ACCEPTANCE
(Clause Numbers taken from CAN4-S101M)

CRITERION	FLOOR OR ROOF & CEILING		BEAM		BEAM PROTECTION	WALL		COLUMN	COLUMN PROTECTION
	Restrainted	Unrestrained	Restrainted	Unrestrained		Load Bearing	Non- Load Bearing		
Strength ^a	11.5.2	11.6.2	12.4.2	12.4.2	-	7.3.2 7.3.3	-	9.4.1	-
Integrity ^b	11.5.2	11.6.2	-	-	-	7.3.2 7.3.3	8.2.3 8.2.3	-	-
Heat Transmission	11.5.3	11.6.3	-	-	-	7.3.4	8.2.4	-	-
Special Temperature Limitations	11.5.4 11.5.5 11.5.6	11.6.4 11.6.5 11.6.6 11.6.7	12.4.3	13.3.3 13.3.4	14.3.1	-	-	-	10.5.1
 Strength - The ability to sustain the applied load. Integrity - The ability to inhibit the passage of flame, hot gasses or hose stream.									