COMMERCIAL TESTING COMPANY
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Standard Test Method for
Surface Burning Characteristics of Building Materials

ASTM E84–23c

Mirror

Report Number 23–12167

Test Number 5949–4536
December 18, 2023

Contra Vision North America, Inc.
Atlanta, Georgia

Commercial Testing Company

(Authorized Signature)

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INTRODUCTION

This report is a presentation of results of a surface flammability test on a material submitted by Contra Vision North America, Inc., Atlanta, Georgia.

The test was conducted in accordance with the ASTM International fire-test-response standard E84–23c, *Surface Burning Characteristics of Building Materials*, sometimes referred to as the Steiner tunnel test. ASTM E84 is an American National Standard (ANSI) and has been approved for use by agencies of the Department of Defense. The ASTM E84 test method is the technical equivalent of UL No. 723. The test is applicable to exposed interior surfaces such as walls and ceilings. The test is conducted with the specimen in the ceiling position with the surface to be evaluated face down toward the ignition source. Thus, specimens shall either be self-supporting by its own structural quality, held in place by added supports along the test surface, or secured from the back side.

This standard is used to measure and describe the response of materials, products, or assemblies to heat and flame under controlled conditions, but does not by itself incorporate all factors required for fire-hazard or fire-risk assessment of the materials, products, or assemblies under actual fire conditions.

PURPOSE

The purpose of the test is to provide only the comparative measurements of surface flame spread and smoke development of materials with that of select grade red oak and fiber–reinforced cement board, Grade II, under specific fire exposure conditions with the smoke area of heptane used to establish the smoke-developed index. The test exposes a nominal 24-foot long by 20-inch wide test specimen to a controlled air flow and flaming fire adjusted to spread the flame along the entire length of a red oak specimen in 5½ minutes. During the 10-minute test duration, flame spread over the specimen surface are measured and recorded. Test results are calculated relative to red oak, which has an arbitrary rating of 100, and fiber–reinforced cement board, Grade II, as referenced in Annex A3 of E84, which has a rating of 0. The 100 smoke-developed index is calculated using the smoke area of heptane.

The test results are expressed as Flame Spread Index and Smoke-Developed Index. The Flame Spread Index is defined in ASTM E176 as "a number or classification indicating a comparative measure derived from observations made during the progress of the boundary of a zone of flame under defined test conditions." The Smoke-Developed Index, a term specific to ASTM E84, is defined as "a number or classification indicating a comparative measure derived from smoke obscuration data collected during the test for surface burning characteristics." There is not necessarily a relationship between the two measurements.

The method does not provide for measurement of heat transmission through the surface tested, the effect of aggravated flame spread behavior of an assembly resulting from the proximity of combustible walls and ceilings, or classifying a material as noncombustible solely by means of a Flame Spread Index.

The zero reference and other parameters critical to furnace operation are verified on the day of the test by conducting a 10–minute test using 1/4–inch fiber–reinforced cement board, Grade II, as referenced in Annex A3 of E84. Periodic tests using NOFMA certified 23/32–inch select grade red oak flooring provide data for the 100 flame spread reference with heptane providing data for calculating the 100 smoke-developed index. These procedures are more fully described in Section 7of the E84 Standard.

TEST SAMPLE

The test sample, selected by the client, was identified as **Mirror**, a PET film with a thickness of 0.003 inch. Three test panels, each measuring two feet wide by eight feet in length, were prepared by adhering the material to 1/4-inch thick fiber-cement board complying with ASTM Specification C1186 (Grade II) and passing ASTM Test Method E136 as referenced in Annex A3 of E84. The sample was applied to the smooth side of the cement board using the self-adhering properties of the sample and rolled with a segmented roller. This method of sample preparation is described in E2404, Standard Practice for *Specimen Preparation and Mounting of Textile, Paper or Polymeric (Including Vinyl) and Wood Wall or Ceiling Coverings, Facings and Veneers, to Assess Surface Burning Characteristics*, Section 8.2 *Wall or Ceiling Coverings*

Intended to be Applied Directly to a Noncombustible Wall or Ceiling Surface. After dead-stacking overnight, the prepared panels were transferred to storage racks and conditioned to equilibrium in an atmosphere with the temperature maintained at 71 ± 2°F and the relative humidity at 50 ± 5 percent. For testing, the panels were placed end-to-end on the ledges of the tunnel furnace and the test conducted with no auxiliary support mechanism.

TEST RESULTS

The test results, calculated on the basis of observed flame propagation and the integrated area under the recorded smoke density curve, are presented below. The Flame Spread Index obtained in E84 is rounded to the nearest number divisible by five. Smoke-Developed Indices are rounded to the nearest number divisible by five unless the Index is greater than 200. In that case, the Smoke-Developed Index is rounded to the nearest 50 points. The rounding procedures are more fully described in Sections 9.1, 9.2, and X3 of the E84 Standard. The flame spread and smoke development data are presented graphically at the end of this report.

Test Specimen	Flame Spread Index	Smoke-Developed Index
Fiber-Reinforced Cement Board, Grade II	0	0
Red Oak Flooring	100	—
Heptane, (HPLC) Grade	—	100
Mirror	**5**	**10**

OBSERVATIONS

Specimen ignition over the burners occurred at 0.35 minute. Surface flame spread was observed to a maximum distance of 1.56 feet beyond the zero point at 2.02 minutes. The maximum temperature recorded during the test was 561°F. For information purposes, the actual (unrounded) Flame Spread and Smoke-Developed Indices were 7.4 and 8.2 respectively.

CLASSIFICATION

The Flame Spread Index and Smoke-Developed Index values obtained by ASTM E84 tests are frequently used by code officials and regulatory agencies in the acceptance of interior finish materials for various applications. The most widely accepted classification system is described in the National Fire Protection Association publication NFPA 101 *Life Safety Code*, where:

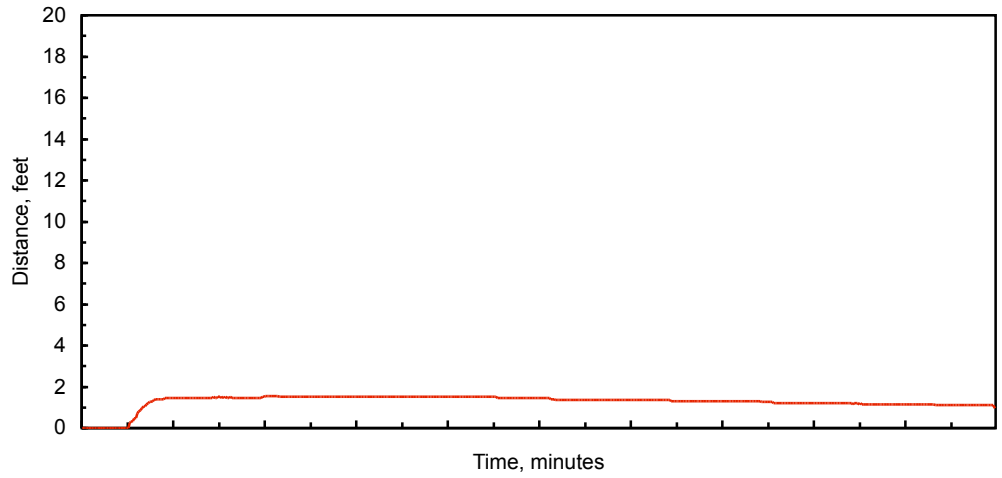
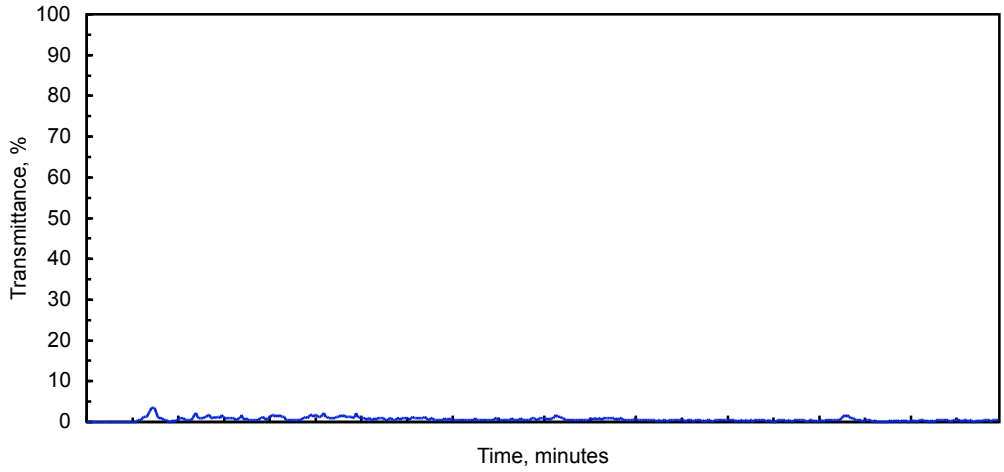
Class A	0 – 25 Flame Spread Index	0 – 450 Smoke-Developed Index
Class B	26 – 75 Flame Spread Index	0 – 450 Smoke-Developed Index
Class C	76 – 200 Flame Spread Index	0 – 450 Smoke-Developed Index

Class A, B, and C correspond to Type I, II, and III respectively in other codes. They do not preclude a material being otherwise classified by the authority of jurisdiction.

Commercial Testing Company, Inc. is an ISO/IEC 17025 accredited testing laboratory whose scope includes ASTM E84. National Voluntary Laboratory Accreditation Program – NVLAP Lab Code: 100120-0

ASTM E 84 TEST DATA

Client: Contra Vision North America, Inc.
Test Number: 5949-4536
Material Tested: Mirror
Date: December 18, 2023

Test Results:

Time to Ignition	=	00.35 minutes
Maximum Flamespread Distance	=	01.56 feet
Time to Maximum Spread	=	02.02 minutes
Flame Spread Index	=	5
Smoke Developed Index	=	10