American National Standard
for Evaluating

A) Insulated Wall or Wall & Roof/Ceiling Assemblies
B) Plastic Interior Finish Materials
C) Plastic Exterior Building Panels
D) Wall/Ceiling Coating Systems
E) Interior or Exterior Finish Systems

ANSI FM 4880-2001(R2007)

December 2007

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Foreword

NOTE: This foreword is introductory only and is not part of American National Standard FM 4880.

This standard is intended to be used to evaluate the fire performance of insulated wall or wall and roof/ceiling assemblies, plastic interior finish materials, plastic exterior building panels, wall/ceiling coating systems and interior or exterior finish systems in wall or wall and roof/ceiling constructions. The standard covers the applicable constructions installed to maximum heights of 30 or 50 ft (9.1 or 15.2 m) or unlimited heights when exposed to an ignition source simulating a building fire as described herein.

Appendix A to this American National Standard is informative and is not part of the requirements of the standard. Appendixes B, C and D are test procedures and are informative for the performance of the tests and associated pass/fail criteria.

ANSI/FM 4880 was originally published in April 2001 and re-affirmed in December 2007. Changes are as follows:

- Updated all references and applicable documents to their latest dates of issue;
- Updated Figure B-1;
- Substituted the appropriate NFPA test methods for the former UBC test methods which are no longer available;
- General editorial changes

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# TABLE OF CONTENTS

1. INTRODUCTION ................................................................................................................ ...................... 1
   1.1 Purpose .................................................................................................................... ............................ 1
   1.2 Scope ...................................................................................................................... .............................. 1
   1.3 Basis for Requirements ..................................................................................................... ................... 1
   1.4 System of Units ............................................................................................................ ........................ 1

2. GENERAL INFORMATION......................................................................................................... ............ 2
   2.1 Product Information/Applicatio ........................................................................................................... 2
   2.2 Requirements ....................................................................................................................................... 3

3. APPLICABLE DOCUMENTS AND GLOSSARY ................................................................................... 3
   3.1 Applicable Documents ....................................................................................................... .................. 3
   3.2 Terminology ................................................................................................................ ......................... 3

4. GENERAL REQUIREMENTS........................................................................................................ .......... 4
   4.1 Markings ................................................................................................................... ........................... 4
   4.2 Instructions ............................................................................................................... ........................... 4
   4.3 Drawings/Formulations/Specifications Required ................................................................................ 4
   4.4 Insulated Panel Joint Changes .............................................................................................................. 4

5. PERFORMANCE REQUIREMENTS.................................................................................................... ... 4
   5.1 Flammability Characterization .............................................................................................. ............... 4
   5.2 25 ft (7.6 m) High Corner Test ............................................................................................................ 5
   5.3 50 ft (15.2 m) High Corner Test .......................................................................................................... 5
   5.4 Room Test .................................................................................................................. .......................... 6

APPENDIX A: CONVERSION OF MEASUREMENT UNITS ................................................................... 7
APPENDIX B: FLAMMABILITY CHARACTERIZATION ....................................................................... 8
   B-1. Test Procedure ................................................................................................................ 8
   B-2. Screening (optional) ....................................................................................................... 9
   B-3. References ................................................................................................................ 11

APPENDIX C: 25 FT (7.6 M) HIGH CORNER TEST ............................................................................... 12
   C-1. Corner Test Structure ..................................................................................................... 12
   C-2. Sample Mounting ........................................................................................................... 12
   C-3. Procedure ................................................................................................................. 13

APPENDIX D: 50 FT (15.2 M) HIGH CORNER TEST ............................................................................. 15
   D-1. Corner Test Structure ..................................................................................................... 15
   D-2. Sample Mounting ........................................................................................................... 16
   D-3. Procedure ................................................................................................................. 16
1. INTRODUCTION

1.1 Purpose

This standard states the test requirements for insulated wall or wall and roof/ceiling assemblies, plastic interior finish materials, plastic exterior building panels, wall/ceiling coating systems and interior or exterior finish systems for use in wall or wall and roof/ceiling constructions.

1.2 Scope

1.2.1 This standard sets performance requirements for insulated wall or wall and roof/ceiling assemblies, plastic interior finish materials, plastic exterior building panels, wall/ceiling coating systems and interior or exterior finish systems in wall or wall and roof/ceiling constructions installed to maximum heights of 30 or 50 ft (9.1 or 15.2 m) or unlimited heights when exposed to an ignition source simulating a building fire as described in this Standard.

1.2.2 The performance of insulated wall or wall and roof/ceiling assemblies, plastic interior finish materials, plastic exterior building panels, wall/ceiling coating systems or interior or exterior finish systems depends in part on the fasteners, adhesives or other accessories used in their installation and the substrate over which they are installed. It is therefore necessary to evaluate the components of the construction and include them in the constructions tested.

1.2.3 This standard evaluates insulated wall or wall and roof/ceiling assemblies, plastic interior finish materials, plastic exterior building panels, wall/ceiling coating systems and interior or exterior finish systems for their performance in regard to fire.

1.2.4 This standard is intended to evaluate only those hazards investigated, and is not intended to determine suitability for the end use of a product.

1.2.5 The results of tests conducted under the controlled conditions required by this standard shall not be used to describe or appraise performance under actual fire conditions. Actual fire conditions vary widely.

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 national and international organizations. The advice of manufacturers, users, trade associations and loss control specialists has also been considered.

1.3.2 The requirements of this standard reflect tests and practices used to examine characteristics of insulated wall or wall and roof/ceiling assemblies, plastic interior finish materials, plastic exterior building panels, wall/ceiling coating systems and interior or exterior finish systems.

1.4 System of Units

Units of measurement are U.S. customary units. These are followed by their arithmetic equivalents in International System (SI) units, enclosed in parentheses. Appendix A lists some of the selected units used in testing these products; conversions to SI units are included. Conversion of U.S. customary units is in accordance with ANSI/IEEE/ASTM SI 10-97, Standard for Use of the International System of Units (SI):
The Modern Metric System.

2. GENERAL INFORMATION

2.1 Product Information/Application

2.1.1 Insulated wall or wall and roof/ceiling panels are supplied in the form of field or factory fabricated assemblies which are connected to one another and to the substrate with various types of closures and joint treatments. The panels consist of an insulating core material (usually rigid plastic foam or glass fiber batts) faced with aluminum (foil), steel, gypsum wallboard, plastic, masonry or other cementitious materials. They are secured to a structural framework or designed as load bearing members. They are installed to reduce heat (and sound) transmission through wall, floor/ceiling or roof/ceiling constructions and in many cases to protect a structure and its contents from the weather. They are not intended as long-term fire barriers. Roof assemblies consisting of individual components are tested with the maximum core thickness and the minimum facing thickness.

2.1.2 Plastic interior finish materials are usually supplied in sheet form. They shall be permitted to be reinforced or unreinforced, thermoplastic or thermoset plastics. They are usually installed over combustible materials such as thermoplastic or thermoset plastic foams or noncombustible materials such as masonry block, brick, precast concrete or gypsum board where a smooth washable surface is required to comply with sanitary requirements. They are not intended as fire barriers. They are usually secured through the substrate over which they are installed to a structural framework or directly to the substrate and are therefore not designed as load bearing members. Plastic interior finish materials are tested at the maximum thickness and over the most critical substrate.

2.1.3 Plastic exterior building panels are usually supplied in corrugated or flat sheet form. They shall be permitted to be reinforced or unreinforced, thermoplastic or thermoset plastics. They are not usually installed over a backing but are sometimes installed over either a combustible or non-combustible insulation. They are not intended as fire barriers. They are usually fastened directly to or through insulation to a structural framework and are therefore not designed as load bearing members. Plastic exterior building panels are tested at the maximum thickness and over the most critical substrate.

2.1.4 Wall/ceiling coating systems include fire retardant treated cellulose, mineral or glass fiber insulations and intumescent paints and mastics for use as interior finishes or insulation to reduce heat or sound transmission through a wall or ceiling assembly. They are applied over combustible or noncombustible substrates by trowel, brush, spray or roller usually by installers licensed or approved by the coating manufacturer. The protection afforded to combustible substrates is generally proportional to the thickness of the application but the coatings are not intended as fire barriers. Wall/ceiling coating systems are tested at the minimum thickness and over the most critical substrate.

2.1.5 Interior and exterior finish systems usually consist of gypsum or metal lathe mechanically fastened to the building framework followed by plastic foam insulation secured to the lathe with adhesive or mechanically fastened through the lathe to the building framework. For exterior finish systems, the insulation is usually coated with cementitious weather resistant coatings reinforced with glass fibers or glass fabric. For interior finish systems, the cementitious coating may not be weather resistant and is sometimes applied directly to the lathe. Neither exterior nor interior finish systems are intended to be load bearing members or fire barriers. Interior and exterior finish systems are tested with the minimum coating thickness and the maximum insulation thickness over the most critical substrate.
2.2 Requirements

2.2.1 Insulated wall or wall and roof/ceiling assemblies, plastic interior finish materials, plastic exterior building panels, wall/ceiling coating systems or interior or exterior finish systems shall satisfy the following performance criteria.

2.2.2 The examination shall include: 1) flammability characterization of combustible components, 2) 25 ft (7.6 m) high corner test (see 5.1.1 for exception), 3) 50 ft (15.2 m) high corner test [optional for acceptance to heights in excess of 30 ft (9.14 m)] and 4) room test. A complete review of installation specifications shall be performed.

3. APPLICABLE DOCUMENTS AND GLOSSARY

3.1 Applicable Documents

The following are standards, test methods and practices referenced in this standard.

3.1.1 National Fire Protection Association, NFPA, 1 Batterymarch Park, Quincy, MA 02169

3.1.2 International Organization for Standardization, Case Postale 56, CH1211 Geneva 20, Switzerland.


3.2 Terminology

For purposes of this standard, the following terms apply:

inert faced
Faced with a material which is considered noncombustible (steel, aluminum, gypsum, wall board, masonry, etc.).

roof/ceiling assemblies
Building panels that are installed to form (1) the finished ceiling of a building or room or (2) the roof of a building and the finished ceiling of the space immediately beneath the roof.
### 4. GENERAL REQUIREMENTS

#### 4.1 Markings

Each package, container or bill of lading for bulk shipments of insulated wall or wall and roof/ceiling assemblies, foam system components for insulated panels, plastic interior finish materials, plastic exterior building panels, wall/ceiling coating system components or interior or exterior finish system components shall bear the manufacturer’s name and product identification.

#### 4.2 Instructions

Printed installation instructions shall be provided by the manufacturer detailing the necessary installation procedures to be followed by installers.

#### 4.3 Drawings/Formulations/Specifications Required

The manufacturer shall provide assembly drawings, materials lists, brochures, sales literature, and specification sheets for each insulated wall or wall and roof/ceiling assembly, foam system component for insulated panels, plastic interior finish material, plastic exterior building panel, wall/ceiling coating system component or interior or exterior finish system component.

#### 4.4 Insulated Panel Joint Changes

Acceptance of alternate joint geometries between insulated wall or wall and roof/ceiling assemblies shall be permitted to be based on a comparison of the results of room tests of insulated panels with the alternate joint geometry and insulated panels using the previously tested joint geometry.

### 5. PERFORMANCE REQUIREMENTS

#### 5.1 Flammability Characterization

5.1.1 Requirement:

For acceptance to the maximum height of 30 ft (9.1 m) of inert faced thermoset plastic foam core panels without a 25 ft (7.6 m) High Corner Test, the bare thermoset plastic foam core of the panels shall have a convective flame spread parameter (FSPc) of less than or equal to 0.39 \(s^{1/2}\). A successful 25 ft (7.6 m) High Corner Test is required for all other assemblies covered by this
standard.

For plastic or other combustible components of assemblies covered by this standard, the heat release rate (HRR) at 50 kW/m², critical heat flux for ignition (q''cr), thermal response parameter (TRP) and convective flame spread parameter (FSPc) shall be determined and reported.

Note: These tests are conducted to establish a base from which requests for formulation revisions are evaluated.

For metal faced panels with noncombustible cores, when tested for combustibility in the 50 KW Flammability Apparatus at an applied heat flux of 50 kW/m² in air enriched to 40% oxygen: 1) visible flaming of the sample shall not occur for 15 minutes or until mass loss from the sample has ceased, if mass loss from the sample has not ceased by 15 minutes or until visible vapors have ceased to be generated by the sample if generation of visible vapors has not ceased by 15 minutes; and 2) the running 15 second average heat release rate (HRR) shall be no greater than 125 kW/m² as determined by CO and CO₂ production during the test.

5.1.2 Test/Verification:

Flammability Characterization using a 50 kW Scale Flammability Apparatus as described in Appendix B (also explained in ASTM E2058-03).

5.2 25 ft (7.6 m) High Corner Test

5.2.1 Requirement:

For acceptance to the maximum height of 30 ft (9.1 m), assemblies covered by this standard shall not support a self-propagating fire which reaches any of the limits of the 25 ft (7.6 m) high corner test structure as evidenced by flaming or material damage. A 25 ft (7.6 m) High Corner Test is not required for inert faced thermoset plastic foam core panels if the thermoset plastic foam core has a convective flame spread parameter of less than 0.39 s⁻¹/² as determined in 5.1 above.

5.2.2 Test/Verification:

25 ft (7.6 m) High Corner Test as described in Appendix C.

5.3 50 ft (15.2 m) High Corner Test

5.3.1 Requirement:

For acceptance to the maximum height of 50 ft (15.2 m), assemblies covered by this standard shall have met the requirements for acceptance to the maximum height of 30 ft (9.1 m) and shall not support a self-propagating fire which reaches any of the limits of the 50 ft (15.2 m) high corner test structure as evidenced by flaming or material damage.

For acceptance with no height restriction, assemblies covered by this standard shall have met the requirements for acceptance to the maximum height of 30 ft (9.1 m). The assembly shall not support a self-propagating fire which reaches any of the limits of the 50 ft (15.2 m) high corner test structure as evidenced by flaming or material damage and shall not support a self-propagating fire which extends along the eaves or ceiling of the 50 ft. (15.2 m) high test structure as evidenced by flaming or material damage.

5.3.2 Test/Verification:

50 ft (15.2 m) High Corner Test as described in Appendix D.
5.4 Room Test

5.4.1 Requirement:

For acceptance, assemblies covered by this standard shall be subjected to a fire test conducted in accordance with either 1) NFPA 286-2006; 2) NFPA 265-2007 or 3) ISO 9705 room test.

5.4.1.1 When tested in accordance with NFPA 286, a complete discussion of the sample performance shall be provided and shall include the following:

a) Flame spread to the ceiling during the initial exposure
b) Burning to the outer extremities of walls or ceilings
c) Presence of burning droplets on the floor that persist in burning for 30 seconds or more
d) Visibility information in the fire test room
e) Other pertinent details with respect to fire growth
f) Melting or dripping of materials

5.4.1.2 When tested in accordance with NFPA 265, a complete discussion of the sample performance shall be provided and shall include the following:

a) Flame spread to the ceiling during the 40 kW exposure
b) Presence of burning droplets on the floor that persist in burning for 30 seconds or more
c) Visibility information in the fire test room
d) Other pertinent details with respect to fire growth

5.4.1.3 When tested in accordance with ISO 9705, an assembly shall:

a) not support a self propagating fire which extends to the outer extremities of the test area within the 20 minute test as evidenced by flaming or material damage (including charring of core materials)
b) not generate excessive smoke during the test period, and
c) sustain the applied load, if any, for the duration of the test period.

5.4.2 Test/Verification:


ISO 9705, Fire Tests - Full-Scale Room Test for Surface Products.
# APPENDIX A: CONVERSION OF MEASUREMENT UNITS

<table>
<thead>
<tr>
<th>Category</th>
<th>Unit</th>
<th>Conversion Formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>LENGTH</td>
<td>in. - ‘inch’</td>
<td>mm = in. × 25.40</td>
</tr>
<tr>
<td></td>
<td>(mm - ‘millimeter’)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ft - ‘feet’</td>
<td>m=ft × 0.3048</td>
</tr>
<tr>
<td></td>
<td>(m - ‘meter’)</td>
<td></td>
</tr>
<tr>
<td>PRESSURE</td>
<td>psi - ‘pounds per square inch’</td>
<td>kPa = psi × 6.895</td>
</tr>
<tr>
<td></td>
<td>(kPa - ‘kilopascal’)</td>
<td></td>
</tr>
<tr>
<td>HEAT</td>
<td>Btu - ‘British thermal unit’</td>
<td>J = Btu × 1055</td>
</tr>
<tr>
<td></td>
<td>(J - ‘joule’)</td>
<td></td>
</tr>
<tr>
<td>TEMPERATURE</td>
<td>°F - ‘degree Fahrenheit’</td>
<td>°C=(°F -32) × 5/9</td>
</tr>
<tr>
<td></td>
<td>(°C - ‘degree Celsius’)</td>
<td></td>
</tr>
<tr>
<td>MASS</td>
<td>lb - ‘pound’</td>
<td>kg=lb × 0.4536</td>
</tr>
<tr>
<td></td>
<td>(kg - ‘kilogram’)</td>
<td></td>
</tr>
<tr>
<td>FORCE</td>
<td>lbf - ‘pound force’</td>
<td>N = lbf × 4.448</td>
</tr>
<tr>
<td></td>
<td>(N - ‘newton’)</td>
<td></td>
</tr>
<tr>
<td>TORQUE or MOMENT</td>
<td>lbf-ft - ‘pound force feet’</td>
<td>N-m = lbf-ft × 1.356</td>
</tr>
</tbody>
</table>
APPENDIX B: FLAMMABILITY CHARACTERIZATION

B-1. Test Procedure

B-1.1 A series of measurements is made in a 50 kW Scale Flammability Apparatus (Figure B-1, also explained in ASTM E2058-03) to determine the material flammability properties of the sample. Chemical heat of combustion ($\Delta H_{ch}$), convective heat of combustion ($\Delta H_c$), effective heat of gasification ($L_e$), critical heat flux for ignition ($q''_{cr}$), chemical heat release rate ($Q''_{ch}$), thermal response parameter (TRP), and convective flame spread parameter (FSPc) are determined.

B-1.2 TRP and $q''_{cr}$ are determined by coating 4 by 4 in. (100 by 100 mm) by maximum 4 in. (100 mm) thick specimens of the sample with lamp black or other high absorptivity selective coating, exposing the coated surfaces of several specimens to known radiant heat fluxes in the bottom portion of the apparatus and recording the time to piloted ignition. The inverse square root of the time to ignition is plotted against the applied external radiant heat flux. The intercept on the applied heat flux axis is defined as $q''_{cr}$ (the value of the external heat flux at or below which the sample can no longer achieve piloted ignition during the 15 minute exposure). The inverse of the slope at large external heat fluxes is defined as TRP (a measure of the thermal inertia of the material).

B-1.3 $L_e$, $\Delta H_{ch}$ and $\Delta H_c$ are determined by measuring mass loss and heat generation rate history during exposure of a 4 × 4 in. (100 × 100 mm) by maximum 4 in. (100 mm) thick specimen of the sample coated as above in the apparatus to an external heat flux of 50 kW/m². $\Delta H_{ch}$ is obtained by measuring $Q''_{ch}$ by CO/CO₂ generation at the applied external heat flux, time integrating to obtain the total energy released and dividing by the total mass lost. $\Delta H_c$ is obtained by measuring the sensible heat release rate, time integrating to obtain the total energy released and dividing by the total mass lost. $L_e$ is obtained from $\Delta H_{ch}$, $Q''_{ch}$ and the net heat flux which is assumed to be the difference between external heat flux (50 kW/m²) and $q''_{cr}$ as follows:

$$L_e = \frac{\Delta H_{ch} (50 - q''_{cr})}{Q''_{ch}}$$

B-1.4 FSPc (a function of the velocity of fire propagation) is determined from $\Delta H_c$, $L_e$, $q''_{cr}$ and TRP as follows:

$$FSPc = \frac{[(\Delta H_c/L_e) (50-q''_{cr})]}{TRP}$$
B-2. Screening (optional)

B-2.1 Flammability characterization may be used for screening candidate materials prior to testing in the 25 ft (7.6 m) High Corner Test.

B-2.2 Results of previous 25 ft (7.6 m) high corner tests correlate well with the $FSP_c$ values calculated from measurements made in a 50 kW Scale Flammability Apparatus on the corner tested materials. Figure B-2 plots the normalized extent of fire propagation ($l_p/l_t$) for a number of materials previously tested in the 25 ft (7.6 m) corner test versus $FSP_c$ values calculated from measurements made in an FM Approvals 50 kW Scale Flammability Apparatus on the same materials ($l_p$ is the average fire propagation length along the eaves and $l_t$ is the total length available for fire propagation in the corner test).
B-2.3 The data in Figure B-2 are well represented by the power fit least squares regression given in the upper right-hand corner of the figure. The shaded area indicates FSP\textsubscript{c} values within 10\% of the FSP\textsubscript{c} value of 0.43 s\textsuperscript{-1/2}, which is the dividing line between materials that were successful in the 25 ft (7.6 m) corner test and those that were not.

B-2.4 For screening purposes, successful results in the corner test are indicated for materials with FSP\textsubscript{c} values less than or equal to 0.39 s\textsuperscript{-1/2} unsuccessful results in the corner test are indicated for materials with FSP\textsubscript{c} values greater than or equal to 0.47 s\textsuperscript{-1/2} and uncertain results in the corner test are indicated for materials with FSP\textsubscript{c} values between 0.39 and 0.47 s\textsuperscript{-1/2}.

\[ l_p/l_t = 0.82 \times FSP_{c}^{0.25} \]

Figure B-2. Fire Propagation Length in 25-ft Corner Test Versus Convective Flame Spread Parameter
B-3. References


APPENDIX C: 25 FT (7.6 M) HIGH CORNER TEST

C-1. Corner Test Structure

C-1.1 The wall framework consists of columns and horizontal girts to which sample wall panels or sample coating or finish substrates are attached. The roof/ceiling framework consists of steel bar joists and metal furring strips to which sample ceiling or roof/ceiling assemblies, sample coating or finish substrates or a standard ceiling are attached.

C-1.1.1 The east (long) wall frame is 51 ft 6 in. (15.70 m) long, the south (short) wall frame is 39 ft 3 in. (11.96 m) long. The distance between the concrete floor and the bottom of the ceiling furring strips is 24 ft 9 in. (7.54 m).

C-1.1.2 The ceiling frame extends 31 ft 6 in. (9.60 m) west from the east wall along the entire length of the wall. Additional ceiling framing extends 15 ft 9 in. (4.80 m) north from the westernmost 7 ft 9 in. (2.36 m) of the south wall.

C-1.1.3 For tests intended to evaluate wall assemblies only, 0.0179 in. (0.045 mm) thick corrugated steel form deck shall be secured to the underside of the ceiling frame furring strips and 1 in. (25 mm) perlite roof insulation installed between the furring strips over the form deck.

C-1.1.4 For tests intended to evaluate ceiling assemblies only, 0.0179 in. (0.045 mm) thick corrugated steel form deck shall be installed over the entire inside surfaces of both wall frames with the long dimension vertical. Two layers of 1/2 in. (13 mm) thick gypsum wallboard shall be installed over the form deck full height out to 12 ft (3.66 m) from the corner created by the intersection of the walls, 36 in. (915 mm) from the ceiling down from 12 ft (3.66 m) out to 16 ft (4.88 m) and 12 in. (305 mm) from the ceiling down from 16 ft (4.88 m) out to 38 ft (11.58 m) on the south wall and 50 ft (15.24 m) on the east wall.

C-2. Sample Mounting

C-2.1 To provide an uninterrupted test surface, samples are installed on the inside of the corner test structure. For many test constructions, this will result in the unconventional location of structural members.

C-2.2 0.0179 in. (0.045 mm) thick corrugated steel form deck shall be installed over the entire inside surfaces of both wall frames and the entire bottom surface of the ceiling frame with the long dimension vertical on both walls and parallel to the south wall on the ceiling. Where interlocking insulated panels with minimum 0.0179 in. (0.045 mm) thick steel or aluminum facers are to be installed, the form deck may be omitted.

C-2.3 Samples shall be mounted to cover the wall frames full height out to 20 ft (6.10 m) from the corner created by the intersection of the sample walls and half height from the ceiling down from 20 ft (6.10 m) out to 38 ft (11.58 m) on the south wall and 50 ft (15.24 m) on the east wall. 5/8 in. (16 mm) thick gypsum wallboard (Type X core) shall be mounted to cover the remaining lower sections of both walls. Samples or a standard ceiling (see 1.1.3) shall be mounted to cover the ceiling frame in the 30 by 50 ft (9.14 by 15.24 m) area adjacent to the east wall and in the 15 by 8 ft (4.57 by 2.44 m) area adjacent to the last 8 ft (2.44 m) of the south wall.
C-2.3.1 Interlocking insulated panels with minimum 0.0179 in. (0.045 mm) thick steel or aluminum facers shall be through fastened directly to the wall and ceiling (if applicable) framing at intervals typical of actual practice. The long dimension of wall panels shall be vertical unless the panels are normally installed in actual practice with their long dimension horizontal. The long dimension of roof/ceiling assemblies shall be parallel to the south wall.

C-2.3.2 Interlocking insulated panels with plastic facings shall be through fastened through the steel form deck to the steel wall and ceiling (if applicable) framing at intervals typical of actual practice. The long dimension of wall panels shall be vertical unless the panels are normally installed in actual practice with their long dimension horizontal. The long dimension of roof/ceiling panels shall be parallel to the south wall.

C-2.3.3 Insulations with less than 0.0179 in. (0.045 mm) thick steel or aluminum facers, plastic interior finish panels, plastic exterior panels and substrates for interior or exterior finish systems or wall/ceiling coating systems shall be installed over 2x2 in. (51x51 mm) wood furring strips fastened through the steel form deck to the steel wall and ceiling (if applicable) framing. The spacing and orientation of furring strips and securement to the furring strips shall be typical of actual practice. Interior or exterior finish systems or wall/ceiling coating systems shall be installed over the installed substrate in a manner typical of actual practice.

C-2.4 Panel end joints and panel joints at both ceiling/wall intersections shall be covered with 0.0239 in. (0.61 mm) thick sheet metal closures.

C-3. Procedure

C-3.1 Test samples shall be installed on the test structure as required above and allowed to cure for up to 28 days.

C-3.2 20 ga. (0.81 mm) Chromel-Alumel thermocouples shall be installed at the locations indicated in Figure C-1, 1 in. (25 mm) from the test assembly wall and ceiling surfaces.
C-3.3 Within 1 hour of the start of the test, 750 ±10 lb (340 ±4.5 kg) of 42 by 42 in. (1065 by 1065 mm) conditioned oak pallets shall be checked for moisture and weight. Moisture content shall be 6 ±1% as measured by a resistance type moisture meter. The pallets shall be stacked maximum 5 ft (1.5 m) high at the intersection of the assembly walls, 1 ft (305 mm) from each wall. Pallets necessary to meet the mass requirement that would result in violation of the maximum height shall be placed vertically adjacent to the north side of the pallet stack in contact with the stack or the next pallet.

C-3.4 The stack of pallets shall be ignited using two cellucotton rolls soaked in 8 oz. (0.24 L) of gasoline in a plastic bag placed inside the bottom pallet in the stack. The test shall continue for 15 minutes after ignition of the gasoline soaked cellucotton or until flames reach any of the limits of the corner test structure, whichever occurs first.

C-3.4.1 Thermocouple readings shall be recorded during the test at intervals not exceeding 10 seconds.

C-3.4.2 A video recording of the test structure shall be made prior to, during and after the test.

C-3.4.3 Photographs of the test structure shall be taken prior to the test, at maximum one minute intervals during the test, and after the smoke has cleared and the test assembly has cooled.

C-3.4.4 Detailed observations of the test structure shall be written and/or recorded before the test, during the test, and after the smoke has cleared and the test assembly has cooled.

C-3.5 Venting through the walls or roof/ceiling shall not occur during the test. The graphs of the thermocouple readings shall be inspected for locations with sudden temperature drops if venting is suspected. Confirmation of venting shall be made by examination of the test structure after termination of the test and cooling of the test structure.
APPENDIX D: 50 FT (15.2 M) HIGH CORNER TEST

D-1. Corner Test Structure

The wall framework consists of vertical and horizontal steel framing to which sample wall panels or sample coating or finish substrates are attached. The roof/ceiling framework consists of a grid of steel framing to which sample ceiling or roof/ceiling assemblies, sample coating or finish substrates or a standard ceiling are attached.

Both wall frames are 20 ft (6.10 m) long forming a 90 degree angle where they intersect. The distance between the concrete floor and bottom of the ceiling framing grid is 50 ft 0 in. (15.24 m). See Figure D-1.

The ceiling frame forms a right isosceles triangle with two 20 ft (6.10 m) long sides adjacent to the wall frames. See Figure D-1.

For tests intended to evaluate wall assemblies only, 0.0179 in. (0.045 mm) thick corrugated form deck shall be secured to the underside of the ceiling frame furring strips and 1 in. (25 mm) perlite roof insulation installed between the furring strips over the form deck.

![Figure D-1. 50 ft (15.2 m) Corner Test Structure](image-url)
D-2. Sample Mounting

D-2.1 To provide an uninterrupted test surface, samples are installed on the inside of the corner test structure. For many test constructions, this will result in the unconventional location of structural members.

D-2.2 Corrugated steel form deck, 0.0179 in. (0.45 mm) thick, shall be installed over the entire inside surfaces of both wall frames and the entire bottom surface of the ceiling frame with the long dimension vertical on both walls and parallel one wall on the ceiling. Where interlocking insulated panels with minimum 0.0179 in. (0.045 mm) thick steel or aluminum facers are to be installed, the steel form deck may be omitted.

D-2.3 Samples shall be mounted to cover the wall frames full height out to 20 ft (6.10 m) from the corner created by the intersection of the sample walls. Samples or a standard ceiling (see Section D.1 above) shall be mounted to cover the ceiling frame in the triangular area adjacent to the walls.

D-2.3.1 Interlocking insulated panels with minimum 0.0179 in. (0.45 mm) thick steel or aluminum facers shall be through fastened directly to the steel wall and ceiling (if applicable) framing at intervals typical of actual practice. The long dimension of wall panels shall be vertical unless the panels are normally installed in actual practice with their long dimension horizontal. The long dimension of roof/ceiling panels shall be parallel to one wall.

D-2.3.2 Interlocking insulated panels with plastic facings shall be through fastened through the steel form deck to the steel wall and ceiling (if applicable) framing at intervals typical of actual practice. The long dimension of wall panels shall be vertical unless the panels are normally installed in actual practice with their long dimension horizontal. The long dimension of roof/ceiling assemblies shall be parallel to one wall.

D-2.3.3 Insulations with less than 0.0179 in. (0.45 mm) thick steel or aluminum facers, plastic interior finish panels, plastic exterior panels and substrates for interior or exterior finish systems or wall/ceiling coating systems shall be installed over 2 by 2 in. (51 by 51 mm) wood furring strips fastened through the steel form deck to the steel wall and ceiling (if applicable) framing. The spacing and orientation of furring strips and securement to the furring strips shall be typical of actual practice. Interior or exterior finish systems or wall/ceiling coating systems shall be installed over the installed substrate in a manner typical of actual practice.

D-2.4 Panel end joints and panel joints at both ceiling/wall intersections shall be covered with 0.0239 in. (0.61 mm) thick sheet steel closures.

D-3. Procedure

D-3.1 Test samples shall be installed on the test structure as required above and allowed to condition for up to 28 days.

D-3.2 20 ga. (0.81 mm) Chromel-Alumel Thermocouples shall be installed at the following locations: 1 in. (25 mm) from the ceiling surface and 1 in. (25 mm) from the wall surface 15 ft (4.57 m) from the corner in both directions and 1 in. (25 mm) from the ceiling 6 in. (150 mm) and 12 in. (305 mm) from the corner in the plane bisecting the corner.

D-3.3 Within 1 hour of the start of the test, 750±10 lb (340±4.5 kg) of 42 by 42 in. (1065 by 1065 mm) conditioned oak pallets shall be checked for moisture and weight. Moisture content shall be 6 ± 1% as measured by a resistance type moisture meter. The pallets shall be stacked
maximum 5 ft (1.5 m) high at the intersection of the assembly walls, 1 ft (305 mm) from each wall. Pallets necessary to meet the mass requirement that would result in violation of the maximum height shall be placed vertically adjacent to the north side of the pallet stack in contact with the stack or the next pallet.

D-3.4 The stack of pallets shall be ignited using two cellucotton rolls soaked in 8 oz. (0.24 L) of gasoline in a plastic bag placed inside the bottom pallet in the stack. The test shall continue for 15 minutes after ignition of the gasoline soaked cellucotton or until flames reach any of the limits of the corner test structure, whichever occurs first.

D-3.4.1 Thermocouple readings shall be recorded during the test at intervals not exceeding 10 seconds.

D-3.4.2 A video recording of the test structure shall be made prior to, during and after the test.

D-3.4.3 Photographs of the test structure shall be taken prior to the test, at maximum one minute intervals during the test, and after the smoke has cleared and the test assembly has cooled.

D-3.4.4 Detailed observations of the test structure shall be written and/or recorded before the test, during the test, and after the smoke has cleared and the test assembly has cooled.

D-3.5 Venting through the walls or roof/ceiling shall not occur during the test. The graphs of the thermocouple readings shall be inspected for locations with sudden temperature drops if venting is suspected. An examination of the test structure for evidence of venting shall be made after termination of the test and cooling of the test structure if venting is suspected.