Over the years, requirements for passive fire-resistance rated walls have been eroded in favor of active fire suppression (sprinkler) systems. Much of this erosion can be attributed to changes in the model building codes, and to the creeping misperception that if there’s a sprinkler system in the plans, there’s less need for other fire protection features. The result of this trend is fierce competition between the producers of fire-resistant materials where passive fire-rated construction is still required. Fire-resistance rated walls can be constructed from a variety of materials, typically either gypsum board or masonry. Each has its advantages and disadvantages. Gypsum board is lighter and is installed much more efficiently than masonry. Masonry provides a wall that is generally considered to be more durable. The masonry industry has seized upon this characteristic to run a series of advertisements in several construction industry magazines that depict what could be described as a grossly exaggerated fire performance claim based on durability. Here, USG sets the record straight.

—Lee G. Jones

Comment on the
MASONRY INDUSTRY’S
MARKETING CAMPAIGN
Based on Hose Steam Testing

The masonry industry, through the National Concrete Masonry Association, began a marketing campaign about a year ago claiming superiority of concrete block fire rated walls compared to gypsum board steel and wood framed fire rated walls. The campaign utilizes magazine advertising, press releases and direct mailings to individual architects,

By Philip H. Shaeffer
code officials, owners and others involved in the design, regulation, construction and occupancy of buildings.

The primary basis of their claim of masonry’s superiority is that fire rated concrete block walls typically, if not always, are able to pass the ASTM E119 (E119-00a, “Standard Test Methods for Fire Tests of Building Construction and Materials,” approved July 10, 2000. Published October 2000) hose stream testing at the end of the fire exposure portion of the test. They typically describe gypsum board walls as being tested by the “alternate” or “optional” hose stream procedure. This is incorrect, as shown in the excerpt from E119 below.

Section 11 of E119, with key points in bold, reads as follows:

11. Hose Stream Test

11.1 Where required by the conditions of acceptance, the hose stream test shall be conducted to subject the specimen described in 11.2 or 11.3 to the impact, erosion and cooling effects of a hose stream.

11.1.1 Exemption—The hose stream test shall not be required in the case of constructions having a resistance period, indicated in the fire endurance test, of less than 1 h.

11.2 The hose stream test shall be conducted on a duplicate test specimen.

11.2.1 The duplicate specimen shall be exposed to the effects of the hose stream immediately after being subjected to a fire endurance test for a time period of one-half the fire endurance classification period determined from the fire endurance test on the initial specimen.

11.2.2 The length of time that the duplicate specimen is subjected to the fire endurance test shall not exceed 1 h.
11.3 **Optional Program**—As an alternative procedure, conduct the hose stream test on the initially tested specimen immediately following its fire endurance test.

11.4 In conducting the hose stream test, direct the hose stream first at the middle and then at all parts of the exposed face of the specimen. Any changes in direction shall be made slowly.

11.5 **Stream Equipment and Details**—The stream shall be delivered through a 2 1/2-in. (64-mm) hose discharging through a National Standard Playpipe of corresponding size equipped with a 1 1/8-in. (28.5-mm) discharge tip of the standard-taper smooth-bore pattern without shoulder at the orifice. The water pressure and duration of application shall be as prescribed in Table 1.

11.6 **Nozzle Distance**—The distance between the tip of the nozzle and the center of the exposed surface shall be determined by the deviation from normal between the center of the nozzle axis and the center of the exposed surface of the specimen. The distance shall be 20 ft (6 m) when the axis through the center of the nozzle is normal to the center of the exposed surface. This distance shall be decreased by an
amount equal to 1 ft (305 mm) for each 10° of deviation from
the normal.

We at USG are not aware of any substantiating data from
NCMA or others as to why running the hose stream test after
the fire exposure establishes or indicates superior perfor-
mance of a fire-rated wall. Section “11.3 Optional Program”
certainly does allow running the hose stream testing at the
end of the fire exposure period as an “alternate procedure,”
not the standard 11.2 procedure. Not a better procedure, sim-
ply an alternate. Presumably this “alternate procedure” was
included in E119 to spare the entity running a fire test the
expense of running the hose stream portion by the standard
procedure of using a duplicate specimen if their wall would
pass the hose stream portion after full fire exposure. No prob-
lem with that.

A duplicate specimen for a one-hour wall would be exposed
to fire for 30 minutes (see 11.2.1) and then submitted to the
hose stream testing. A duplicate specimen for a two-, three-
or four-hour wall would be exposed to fire for 60 minutes (see
11.2.2) and then submitted to the hose stream testing. Note
from the following Table 1 below, from E119, that the water
pressure and duration of application varies with the fire rat-
ing of the wall.

The debate over the purpose and significance of the hose
stream portion of E119 testing is decades old-documented
back into the 1920s and even earlier. We do not attempt to
reflect the various arguments and counterarguments here.

ASTM E119 itself offers the following
regarding the prescribed fire testing
overall and the hose stream portion of
the testing in particular:

■ From Section X5.2 “Historical Aspects,” Section X5.2.1.
  “Test Methods E119 was first published by ASTM as C19 in
1918. A number of refinements have been made in the stan-
dard since that time, such as the classification of beams and
of floor and roof assemblies based on conditions of support.
Several provisions, including the temperature-time curve and
the major apparatus, remain essentially unchanged.”

■ From Section X5.9 “Integrity,” Section X5.91. “In this hose
stream test, the ability of the construction to resist disinte-
gration under adverse conditions is examined.”

In short, any wall or partition that satisfies the acceptance
conditions of ASTM E119, with the hose stream test run in
accordance with the standard procedure or with the alternate
procedure, obtains a fire rating-with no distinctions made
as to which procedure was used. Interestingly, we are not
aware of any listings (model building code tables, directo-
ries published by testing laboratories, etc.) of fire-resistive
walls or partitions that identify which procedure was used.

ASTM standards are not static documents; they are contin-
uously reviewed and updated. They have been and are open
to ongoing review and revision by committees which, by a
balanced and consensus process, evaluate proposed revi-
sions that may be submitted by anyone. The committees
actions reflect the votes of a broad spectrum of members—
government agencies, universities, architects, engineers,
trade organizations, consultants, manufacturers, etc. Given

<table>
<thead>
<tr>
<th>Resistance Period</th>
<th>Water Pressure at Base of Nozzle, psi (kPa)</th>
<th>Duration of Application, min/100 ft² (9 m²) exposed area</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 h and over</td>
<td>45 (310)</td>
<td>6</td>
</tr>
<tr>
<td>4 h and over if less than 8 h</td>
<td>45 (310)</td>
<td>5</td>
</tr>
<tr>
<td>2 h and over if less than 4 h</td>
<td>30 (207)</td>
<td>2.5</td>
</tr>
<tr>
<td>1.5 h and over if less than 2 h</td>
<td>30 (207)</td>
<td>1.5</td>
</tr>
<tr>
<td>1 h and over if less than 1.5 h</td>
<td>30 (207)</td>
<td>1</td>
</tr>
<tr>
<td>Less than 1 h, if desired</td>
<td>30 (207)</td>
<td>1</td>
</tr>
</tbody>
</table>
adequate substantiating data and consensus agreement of the applicable committee, revisions are made or rejected. Had adequate substantiating data ever been submitted for a revision of ASTM E119 to require the hose stream portion of the fire test to be performed after full fire exposure, presumably that would be the current required procedure.

Requirements that particular walls or partitions be fire rated and, if so, the fire rating required are stated in the model building codes or fire safety codes. None, to our knowledge, require that the fire rating be determined utilizing the alternate procedure for the hose stream test. These model codes could well carry such a requirement if the parties involved in developing them considered such a requirement of significance and desirable. If a substantial history of failure of walls for which the fire rating had been determined using the standard hose stream procedure existed, presumably it would have driven such a requirement.

Local (state, city, town, etc.) jurisdictions adopt these codes and may make revisions to them. They can, if they choose, revise their local code to require that certain fire-rated walls be masonry and/or that other types of fire-rated walls be subjected to the alternate hose stream procedure. A few have done this for certain types of walls—typically referred to as “firewalls.” Obviously, the masonry industry promotes and encourages such revisions, though their success has been limited and spotty. The states of New York and North Carolina have had such requirements for certain types of walls in place for years. Occasionally a similar requirement is put into place by a local city or town for the fire-rated walls separating townhouses. We are not aware of any jurisdictions that have such a requirement for all types of fire-rated walls or partitions.

For clarification, there are several different types of fire-rated walls and partitions defined by the building codes as illustrated by the following definitions excerpted from the 2000 International Building Code (2000 IBC). Any of these can
be gypsum or masonry with the hose stream test conducted in accordance with either procedure.

**Fire Barrier.** A fire-resistance-rated vertical or horizontal assembly of materials designed to restrict the spread of fire in which openings are protected.

**Fire Partition.** A vertical assembly of materials designed to restrict the spread of fire in which openings are protected.

**Fire Wall.** A fire-resistance-rated wall having protected openings, which restricts the spread of fire and extends continuously from the foundation to or through the roof, with sufficient structural stability under fire conditions to allow collapse of construction on either side without collapse of the wall.

In the model building codes, fire resistance testing of wall assemblies in accordance with ASTM E119 is the primary method of establishing the fire resistance of a wall, but not the only way. The following, with key items in bold, are excerpted from the 2000 IBC.

**Fire-Resistance Rating.** The period of time a building element, component or assembly maintains the ability to confine a fire, continues to perform a given structural function, or both as determined by the tests, or the methods based on tests, prescribed in Section 703.

**703.2 Fire-resistance ratings.** The fire-resistance rating of building elements shall be determined in accordance with the test procedures set forth in ASTM E119 or in accordance with Section 703.3.

**703.3 Alternative methods for determining fire resistance.** The application of any of the alternative methods listed in this section shall be based on the fire exposure and acceptance criteria specified in ASTM E119. The required fire resistance of a building element shall be permitted to be established by any of the following methods or procedures:

1. Fire-resistance designs documented in approved sources.

2. Prescriptive designs of fire-resistance-rated building elements as prescribed in Section 719.

3. Calculations in accordance with Section 720.

4. **Engineering analysis** based on a comparison of building element designs having fire-resistance ratings as determined by the test procedures set forth in ASTM E119.

5. Alternative protection methods as allowed by Section 104.11.

Of relevance to the preceding, the following definition is from Chapter 2 of the 2000 IBC.

**APPROVED.** Acceptable to the building official.

The Section 719 referenced above is a series of tables, as per the following excerpt from the 2000 IBC:

**719.1 General.** The provisions of this section contain prescriptive details of fire-resistance-rated building elements. The materials of construction listed in Tables 719.1(1), 719.1(2), and 719.1(3) shall be assumed to have the fire-resistance ratings prescribed therein.

Fire-rated masonry walls utilizing proper materials and properly constructed have apparently provided adequate performance for decades, as have properly constructed gypsum board walls utilizing proper materials. NCMA’s allusions to broader use of ordinary concrete block fire-rated walls providing enhanced protection from ordinary fire events or particularly, from terrorist attacks, compared to gypsum board assemblies are simply beyond substantiation.

Should building code requirements become more stringent in regard to fire resistance, impact resistance, blast resistance, non-combustibility, etc., or should owners choose such enhancements—undoubtedly both industries will respond with assemblies meeting the requirements and demands. With the requirements and demands met-then the decision making process reverts to the same list of other characteristics both industries have dealt with for decades—cost, weight, speed of completion, labor availability, thickness, weather considerations, sound control, design flexibility and aesthetics.

**About the Author**

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