The concept of a fire wall, which is a method of effective fire separation of a structure into two buildings, was fairly consistent between the three legacy model codes that predated the International Building Code (IBC). Much like the IBC, the 1999 edition of the Building Officials and Code Administrators International, Inc., National Building Code prescribed fire resistive capacity based upon occupancy classification and use. The 1997 Uniform Building Code (UBC), published by the International Conference of Building Officials, included similar but nonspecific structural stability criteria—prescribing a “complete separation” between buildings through the use of an “area separation wall” and fire resistive criteria based upon the type of construction classification. Finally, the Standard Building Code, published by the Southern Building Code Congress International, Inc., did not include any structural stability criteria but required a stricter fire-resistance rating of 4 hours for any fire wall.

Although the specific provisions of the previous codes varied, there was sufficient consistency to achieve today’s unity. However, there remains a level of confusion in the building design community regarding the distinction between the differing ideas of structural stability versus structural independency. This is evidenced by the common assertion that “A fire wall is required to be structurally independent,” which reveals a misunderstanding of the intent of the structural stability requirements given in the IBC for fire wall construction.

The stability performance prescription given in IBC Section 705.2 reads:

Fire walls shall have sufficient structural stability under fire conditions to allow collapse of construction on either side without collapse of the wall for the duration of time required by the fire-resistance rating.

Note that while this provision can include structural independence, it does not demand it. What it does is establish, in general, a degree of separation as well as a level of redundancy (assuming that construction on either side of the fire wall may fail and collapse, but not both sides simultaneously). With an inherent assumption of a worst-case fire scenario in which active fire protection features such as automatic sprinklers are not operational, the structural stability requirement is one of the higher levels of redundancy for fire wall building separations, making them distinct from fire barrier walls.

Thus, the assertion that “A fire wall is required to be structurally independent” is not necessarily incorrect, but dependent upon what is considered the object of independency. For example, only in rare conditions would a fire wall be required to be completely structurally independent from any other support system, such as a roof or floor diaphragm. Nonetheless, the phrase has been repeated so many times that many do not realize that the requirement is not in the IBC except for in a very specific and unusual case.

Types of Fire Walls
There are at least three identifiable types of fire wall approaches used to separate buildings: a single wall and party (common) wall, also known as a tied fire wall; a double wall; and a cantilevered independent wall.

**Single Fire Wall**
The most common fire wall design is a single wall that relies upon the roof or floor diaphragm for structural stability. This approach might more correctly be characterized as a structurally dependent wall system—the fire wall is tied to both diaphragms, relying on each for structural stability but not at the same time; if one side of the diaphragm is damaged by the effects of fire, the other diaphragm is
required to support the assumed load induced during col-
lapse. The intent is not to preclude damage to the fire wall
but to prevent a dangerous collapse while limiting the pos-
sibility of fire spread for the duration specified.

In order to accomplish these goals, it is recommended by
intent, although not prescribed by the IBC, to limit continu-
ous structural members from passing perpendicularly
through the fire wall. Member supports and the structural
system with respect to the fire wall are recommended to be
conceptualized as pin-connected, allowing rotation to occur
upon failure. The integrity of a fire wall during a fire should
not be jeopardized by the installation method of members
such as continuous bar joists or wood or steel beams passing
through the fire wall unless a structural engineer can
account for the effects of collapse on either side during a
fire. Many designers are familiar with a “fire cut” at sup-
ports of wood member. In the days when unreinforced
masonry buildings were popular, wood beams and joists
were typically built into the bearing walls. The idea of
having an angled cut was intended to ensure that the wood
member, rotating due to the effects of a fire, would not
damage the fire wall when the roof or floor collapsed.

Another consideration is the effect of height when a
building collapses. Without implying a limitation on the use
of fire walls in multistory buildings, the stability prescrip-
tion during collapse may present a significant challenge as
building height and number of stories increases. Therefore,
the benefit of an independent, vertical (gravity) double wall
support system has greater merit as the fire wall height in-
creases or when diaphragms supporting a single wall are not
the same height.

**Double Fire Wall**

A double fire wall approach uses two independent walls
having the same required fire resistance connected to their
own supporting roof and floor diaphragms. This fire wall
system is redundant and dependent upon its own diaphragm
but independent of the other diaphragm and structural
system. If one side of the fire wall and diaphragm system is
jeopardized by the effects of fire, the second is expected to
remain. This approach is often used for building additions,
and may offer a solution for the use of fire walls in multi-
story buildings or those having dissimilar roof heights.

A challenge posed by use of a double wall arrangement is
that exiting may be restricted. If the egress path is through
such walls, a vestibule and side-swinging doors may need to
be provided. Some building and fire safety officials have
accepted a fire resistive vestibule rated the same, including
the ceiling, as the fire wall to allow this configuration, and
the International Building Code Commentary provides lan-
guage to support this concept.

**Cantilevered Fire Wall**

A cantilevered fire wall does not rely upon either the floor
or roof diaphragm systems, and adjacent roof diaphragms
are expected to be completely structurally independent.
More common in the past—when insurance perspectives
drove fire protection criteria—but rarely used today, this
type of wall is self-supporting and is the only kind of fire
wall that can be truly described as independent.

Through a reference in the International Fire Code (IFC)
to National Fire Protection Association (NFPA) 30B, Code
for the Manufacture and Storage of Aerosol Products, the
IBC includes one provision by which a cantilevered fire
wall becomes mandatory. The general scoping section of
IFC Chapter 28, which addresses the use and construction
of aerosol warehouses, requires compliance with both the
IBC and NFPA 30B. Section 6-3.6.3 of the NFPA standard,
in turn, requires that aerosol warehouse buildings be
freestanding and independent of other uses unless a can-
tilevered fire wall having 4-hour fire resistance is provided
between uses.\(^1\)

It is of interest to note that Section 307.8, Number 15, of
the BOCA code required adherence to NFPA 30B. The code
also addressed the unique challenges posed by aerosol
warehouses in Section 707.1.2, requiring that they be

(continued on page 26)
detached from other buildings but allowing other uses in the same structure if separated by a 4-hour fire wall. Much has been learned regarding the special fire protection needs of aerosol warehouses, and there is still work to be done to ensure that fire walls in aerosol warehouses are designed to withstand the energy of an aerosol container projectile. However, because single and double fire wall systems provide equivalent levels of redundancy, a freestanding and structurally independent cantilevered fire wall is not a necessary prescription.

**Conclusions**
Except in unusual circumstances, most fire wall designs should be considered structurally dependent with respect to their supporting diaphragms. A fire wall design must offer not only an appropriate fire resistive capacity but sufficient detail addressing stability under fire and collapse conditions. Fire wall designs should also consider collapse conditions affected by dissimilar heights and multiple stories.

Finally, the language of the IBC and the IFC provisions for aerosol warehouses, which directly references NFPA 30B for a freestanding or cantilevered fire wall, should be reconsidered. The IBC and IFC are the appropriate locations to prescribe the fire resistive construction requirements for such building areas.

**Notes**
1. NFPA 221, *Standard for High Challenge Fire Walls, Fire Walls and Fire Barrier Walls*, Appendix A.6.3 clarifies that a “freestanding wall” is equivalent to a cantilevered wall.

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