CONSTRUCTING SMOKE BARRIERS

by using

GYPSUM PRODUCTS

By Jerry A. Walker

The building and fire codes throughout the United States and Canada are primarily concerned with the life safety of building occupants. Most modern residential and commercial buildings are designed and built to exacting code provisions that are observed by architects and builders and enforced by building officials. An important focus of the codes is on fire-resistive materials and construction techniques to protect people from the effects of unwanted fires, but smoke and its related toxic components also can be deadly stalkers.

Smoke is the airborne solid and liquid particulates and gasses created by burning material. Smoke and its related constituent parts displace oxygen in the space it occupies and can cause asphyxiation. When the smoke contains toxic gasses and materials, an even greater hazard is created for the hapless person trapped in the relentless path of smoke.

Owners, designers, builders and inspectors should work together and carefully attend to the recommenda-

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tions below to improve the effectiveness of smoke barriers and to increase the life-safety features of new and renovated buildings.

Walls, partitions and other systems serving as smoke barriers must form an effective membrane from outside wall to outside wall, from a smoke barrier to a smoke barrier, from floor to floor or roof deck above or a combination.

The membrane must also be continuous through all concealed spaces such as above non-rated suspended ceilings, and in interstitial, structural and mechanical spaces. Gypsum board should be installed using the longest practical lengths to reduce the number and length of joints in the membrane.

Each fire-rated gypsum board system must be installed as it was tested; for example, joints must be offset between opposite sides and between plies in multi-layered systems. Proper spacing of fasteners must be heeded.

Perimeters, intersections of dissimilar materials and areas extending above non-rated ceilings must be tightly sealed with joint compound or other sealant.

Recessed cabinets, outlet boxes and other penetrations should be located in separate framing cavities between partition faces; these penetrations should be placed in walls or partitions other than smoke barriers wherever possible.

The openings for penetrations should be sized so that the gap surrounding the penetrating object does not exceed one quarter inch.
Plumbing, electrical, mechanical, service lines and other through penetrations in fire-rated systems must be firestopped with tested materials.

Transfer grilles, louvers and similar openings should not be placed in membranes that serve as smoke barriers unless the devices close automatically upon detection of smoke.

All exposed joints, angles and abutments in the system, including those above a non-rated ceiling and at the floor, must be taped and finished in accordance with a minimum of level one as described in the Gypsum Association’s publication GA-214, Levels of Finish. The interface between the partitions and door jambs or sidelight frames needs special attention to ensure a correct seal that will prevent smoke movement; shims may be needed to assure proper fit.

The interface between the door leaf and frame should be tight or a gasket installed. Double doors may be equipped with an astragal or rabbeted edges where they meet to improve resistance to passage of smoke.

About the Author
Jerry A. Walker is executive director of the Gypsum Association, Washington, D.C. Assistance in the writing of this article was provided by the Gypsum Association’s staff, Technical Committee and James L. Houser, industry expert.

Proper application of materials is essential to ensure fire-test compliance.