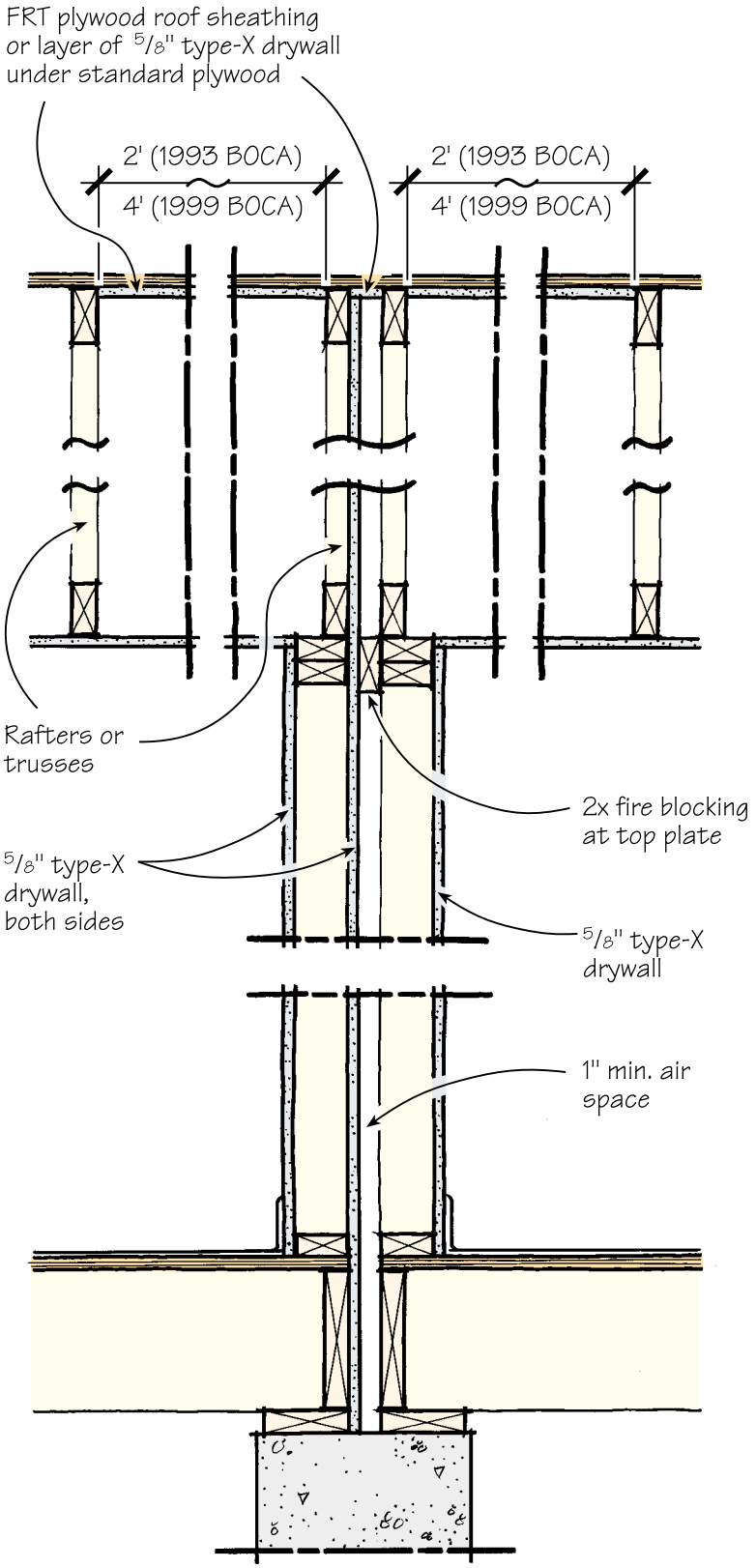
Firewall Details

Q. *In a wood-framed townhouse with a crawlspace, does the separating firewall start from the footing and go all the way to the underside of the roof, or can it start at the main floor and go to the roof, leaving a continuous open crawlspace under adjoining units?*

A. *Bruce Austin, inspector for the town of Greenfield, Mass., responds:* In townhouse construction, the code-required firewall protects tenants in one unit from a fire in an abutting unit. Although the crawlspace runs horizontally, it could still provide a path for a fire to move from one unit to another, as the fire seeks oxygen. Thus the firewall must run continuously from the footing all the way to the underside of the roof sheathing (see illustration, right). At the roof, the fire protection, in the form of type-X drywall, must run 4 feet horizontally in each direction on the underside of the sheathing. (This is according to the 1999 BOCA code; the '93 BOCA code requires 2 feet of horizontal protection at the roof.)

Besides fire transmission, the code regulations for townhouses also address sound and smoke transmission. The one-hour-rated wall assembly shown in the illustration will meet the requirements for all three items.



Straightening a Warped Door

Q. *How can I straighten a wood door that has warped? In this case, the bottom rail bows out from the frame.*

A. *Paul Fisette, director of the Building Materials and Wood Technology program at the University of Massachusetts in Amherst, responds:* This is a difficult thing to do and there's no guarantee that it will work, but sometimes you succeed or at least improve the situation. When a piece of wood bows, the

convex surface of the "arc" is longer than the concave surface. To correct this, you must equalize the surface lengths. First, wet the concave side with water from a spray bottle. Then, clamp the door flat. Put the door on a flat surface — a wide workbench is best — so that the door cups upward. Cut lengths of 2x4 and place them across the door along the bowed edges to pin the door between the strips and the flat work surface. Don't fully tighten the clamps right away — this should be a gradual process. The next day, spray the same surface again and tighten the clamps a little more. Play this out until you think the door is as flat as it will get. Let the door dry thoroughly, then seal all surfaces and edges.

Carpet Filtration Mystery

Q. *We are builders in the Philadelphia area. Over the past few years, we've experienced several cases of what we've been told is "carpet filtration" — dark ghost lines that appear on the carpet under doors and around the perimeter of rooms. We tested the hvac system and found a sizeable imbalance between the supply and return sides, so we added an additional central return system to equalize the pressures. Is the imbalance the major cause of the filtration? If not, what are the causes? We have had to replace some carpet, and hope that we don't continue to be liable for a recurring problem.*

A. *Frank Vigil, of Advanced Energy in Raleigh, N.C., responds:* You are correct in assuming that a pressure imbalance is causing the carpet to filter particulates out of the air. However, simply adding additional return air is not likely to correct the situation.

In dealing with carpet filtration, the most effective strategy is to remove the source of the soiling. A number of things can cause carpet stains, from simple dirt and dust to more complex sources such as soot from candles or improperly functioning combustion appliances. Get rid of the source and you'll get rid of the problem.

Second, try to determine the driving force acting upon the pollutant that is causing the filtration. Three basic rules apply. First, in order to have air flow, you must have a hole and a driving force. Eliminate either of these, and there will be no air flow. Second, for every cubic foot of air that leaks into a house, one cubic foot must also leak out. Thus, any air entering a home requires that air is also exiting. Third, high pressure always moves to low pressure.

With this in mind, you can understand the three driving forces that create pressure imbalances: heat (stack effect), wind, and fans. These can work independently or together to cause negative or positive pressures inside the building.

Stack effect depends on two things: the difference in temperature between the inside and outside of the building, and the height of the building. The greater either of these are, the greater the stack effect.

Wind can enter a building through cracks, crevices, and holes around the framing, windows, and doors. Again, as the wind leaks in, air must leak out. Keep in mind that whatever is in the wind leaking in (moisture, dirt, dust, pollen, and so forth) will now also be in the house.

Last, and possibly most important, are the effects of fans in the house. Three types of "fan effects" are caused by leaky ducts, exhaust fans, and the closing of interior doors. Where any portion of a duct system is located outside the heated space, leaks can cause pressure imbalances. An airtight duct system would draw one unit of air through the return from inside the house and send that one unit — now conditioned — back to the house. But if there are leaks on either the return or the supply side, more air will either be taken from the building or supplied back to it, causing either negative or positive pressures.

Exhaust fans also create pressure imbalances, because they exhaust air from inside the house to the outside. Unless there is sufficient makeup air available, the house can be under negative pressure with respect to the outside.

The last fan effect is caused by closing interior doors. In houses with only one or two returns, closing the door to an interior room restricts the free flow of air from that room on its way back to the return air grille. This "starves" the house for that air, causing the portion of the house with the return grille to be under negative pressure with reference to the outside, and the bedroom to have positive pressure. When the bedroom door is closed, the return grille draws air through the gap at the threshold, causing the carpet to filter out dirt or soot and leaving the characteristic stain along the bottom of the door.

Hire a qualified energy contractor to determine the driving forces causing the filtration. Once you know the problem, you can use proper building techniques, many of which have been discussed in previous issues of *JLC*, to eliminate it. These include:

- proper air sealing of the building shell to minimize wind intrusion
- sealing the upper half of the building (all holes, bypasses, chases, and so forth, between the house and attic) to minimize stack effect
- sealing ducts and adding multiple return-air grilles to minimize pressure imbalances caused by closing interior doors
- providing adequate makeup air for exhaust appliances to help counteract the negative pressures these devices create

GOT A QUESTION? Send it to On the House, *JLC*, 932 West Main St., Richmond, VT 05477; or e-mail to *jlc@bginet.com*.