Air Sealing Strategies

Making sure the retrofit cure isn't worse than the disease.

In most cases, the most cost-effective retrofit—after installing a low-flow showerhead and insulating the hot water heater—is to air seal the building shell. If you are planning to add insulation to uninsulated wall and ceiling cavities, then air sealing is essential to reduce the risks of moisture damage.

To ensure success with energy retrofits you have to look at the whole house as a system and coordinate the different aspects of your work. Otherwise you may not get the energy savings and other benefits you expect. In the worst cases, you can worsen existing problems or create new ones. For example, if you add insulation to a house with a wet basement and fail to seal off airflow paths from the basement to attic, you are likely to find a frosted attic ceiling, or worse.

At the outset, then, you should assess the problem, and plan a strategy. This will vary depending on the building type, site conditions, and the idiosyncracies of the particular building. You will need to determine the major paths of air leakage and the major paths of moisture transport. At the same time, you need to identify any problems that air sealing might cause or excacerbate. Based on this analysis, you can plan a reasonable course of action.

Find the leaks

There are two main types of leaks—direct leaks through the exterior walls or ceiling to the outdoors, and indirect leaks through interior partitions, ceilings, or stairwells. In many cases, the indirect paths account for more leakage than is evident, particularly in older balloon-framed homes. The location of leaks will vary a lot from house to house, but the distribution in Figure 1 is typical. A trained eye can pick out many of the obvious leaks—around baseboards, door casings, doors and windows, attic hatch, and electrical outlets. Less obvious are leaks around bathtubs, built-in cabinets, medicine cabinets, and stairwells. Depending on their location, these may leak either directly or indirectly to the outdoors.

Where possible, indirect leaks are best dealt with at the source, which may be accessible in the basement or attic. Plumbing and chimney chases, open-topped partitions, and stairwells are often the main culprits. These should be sealed off in the basement and attic, where possible. Other ones are not so obvious, and require a thorough understanding of the structure of the building. Many of these leaks are unaffected by the presence of a poly air/vapor barrier, unless it was properly sealed at corners, intersecting walls, and wire and plumbing penetrations. Otherwise, the breaks in the poly line up nicely with breaks in the other building components.

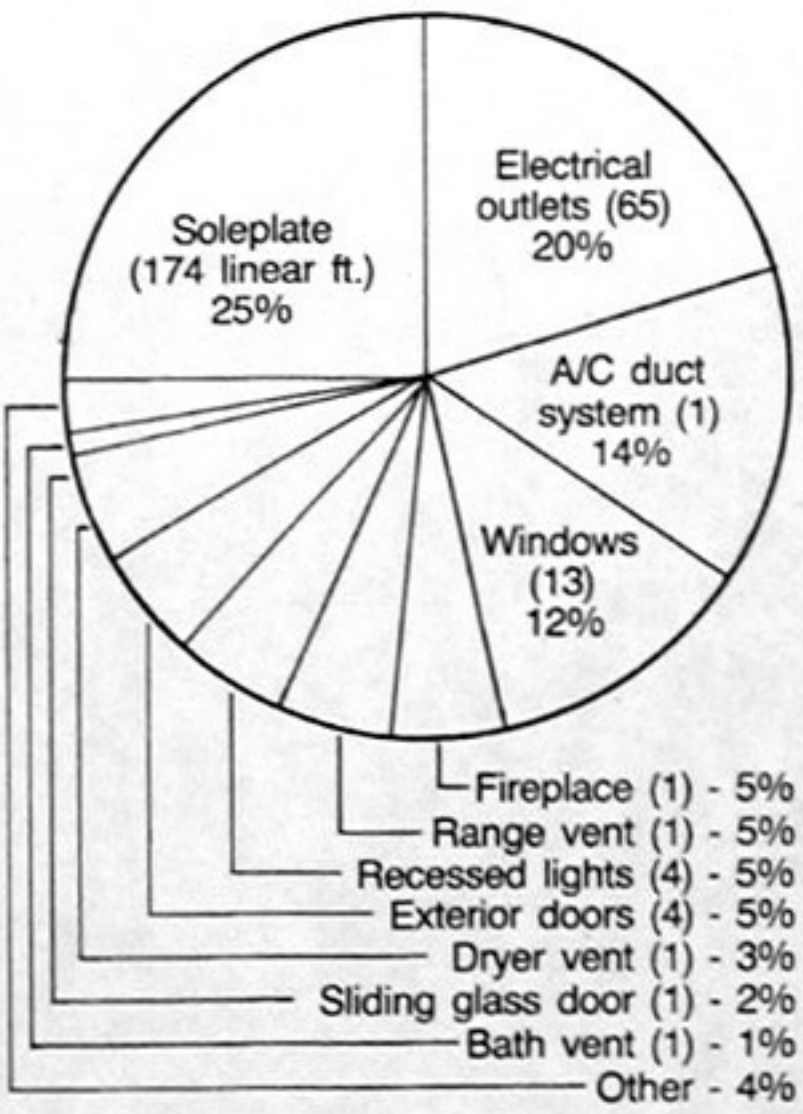

Figure 1. The pie chart shows the average distribution of air leakage in 30 homes tested by Texas Power and Light Company in 1976. The single-family houses tested had insulated 2x4 walls with brick veneers and ranged from one to 10 years old. The average number of each component per house is indicated.

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