What is a “balanced design” approach to fire protection? Aren’t sprinklers sufficient to protect a building from the spread of fire?

John R. Hall Jr. and Arthur E. Cote describe the “balanced design” approach to fire protection in Section I/Chapter I of the eighteenth (1997) edition of the National Fire Protection Association’s Fire Protection Handbook:

“It is important to remember that fire protection requires the development of an integrated system of balanced protection that uses many different design features and systems to reinforce one another and to cover for one another in case of the failure of any one. Defense in depth and engineered redundancy are concepts that also are relevant here. The process of achieving that integration, balance and redundancy to attain fire safety objectives is the essence of fire protection engineering, including codes and standards.

“This means that success is not measured by the extent of use of any one technology or system or code. Success is measured by the extent of usage of effectively designed, integrated fire protection systems. No one system should be considered disposable, and no one system should be considered a panacea.

“. . . Automatic detection systems will tend to activate first, followed by automatic sprinklers or other automatic suppression systems, although this will vary depending on the design of the detection and suppression systems.

“Passive fire protection provides the final opportunity to stop the fire and smoke but also plays an essential role in providing automatic systems with a manageable fire to act on. Passive protection is designed to confine fire and smoke in zones, a concept called compartmentation. Special attention is given to protection of the building’s structural integrity and the spaces through which occupants will move to safety.

“Occupant evacuation depends on effective detection and a system to alert occupants, along with a total fire safety design that will defend the occupants where they are or provide routes to safe refuges, inside or outside of the building.”

I’m doing a renovation that involves removing the old wood lath and plaster ceiling. I plan to replace that ceiling with a gypsum lath and plaster ceiling. But the owner is concerned that the new ceiling will not have the same sound transmission properties as the old one, especially since there were places in the old plaster that were as much as 2 inches thick. Is there any data on the sound transmission properties of these two systems?

Having scoured the John H. Hampshire Memorial Research & Reference Library I was unable to find a figure indicating the sound transmission class of plaster over wood lath. But several volumes on acoustical design described plaster as having a fairly low sound absorption coefficient, lower than that of gypsum board, and even lower when applied directly over dense substrates such as brick or concrete, suggesting that thicker is not always better.

I also was unable to determine the STC of gypsum lath and plaster attached directly to wood floor joists, but I was able to compare the performance of gypsum lath with plaster over resilient channels to that of gypsum board over resilient channels, with or without fiberglass insulation. These two systems were essentially the same, both ranging in the 50 to 54 STC area, although the plaster system was applied over 16 inch centers and the gypsum board system over 24 inch centers. I also found a figure for two layers of gypsum board attached directly to wood joists on 24 inch centers, which offered a lower STC of 35 to 39, suggesting that a system incorporating resilient channels with fiberglass insulation outperforms a similar system directly attached to the joists, including wood lath and plaster.

About the Author
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