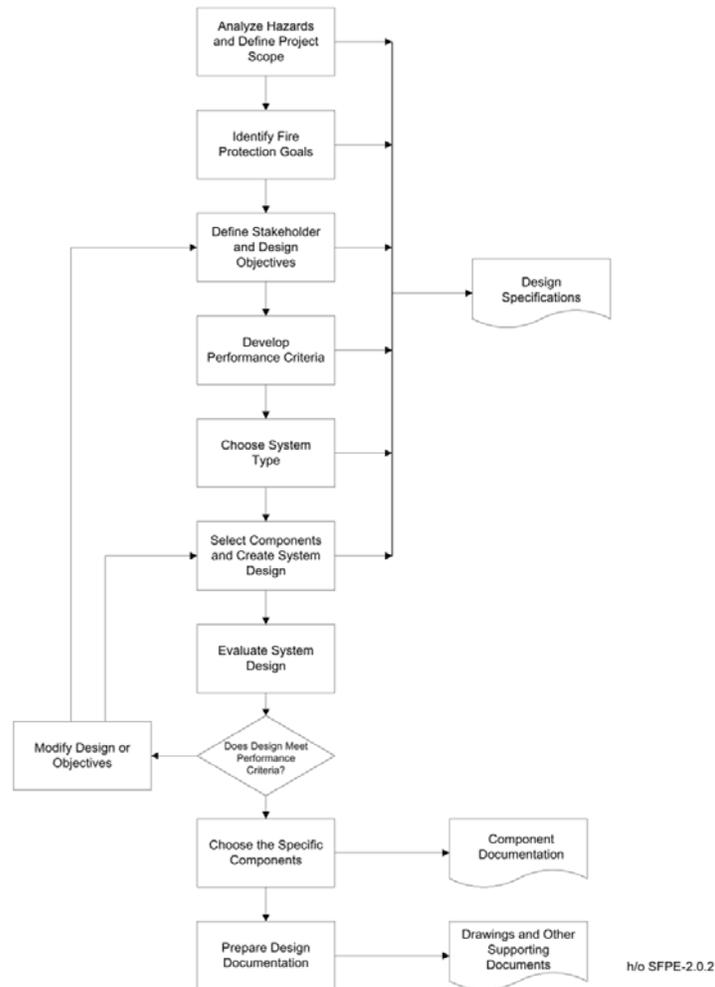


Applying Performance-based Fire Alarm System Design – Part 6

by Dean K. Wilson, P.E.

Performance-based building design continues to reign as one of the hotter topics in fire protection. In the last six issues of *IMSA Journal*, I have followed the graphical representation of a process designed to assure the overall quality and reliability of a fire alarm system design.

Performance-based design succeeds most effectively when a careful process guides the designer.



A fire alarm system designer who intends to work in the performance-based building design arena will do well to understand that “a process makes it work.” The methodical procedure makes certain that a designer will include every detail necessary to create *and* thoroughly document a design. The procedure makes certain that the performance objectives of a particular design derive from the objectives gleaned from the stakeholders in the project.

The methodical procedure also makes certain that each performance objective has one or more performance criterion to quantify the particular objective. The performance criteria will serve to validate the effectiveness of a design.

The steps I have outlined in the past issues include active efforts on the part of the designer to:

- Define the project scope
- Identify the project-specific fire protection goals
- Define the stakeholder and design objectives
- Develop the performance criteria to quantify the design objectives
- Choose the System Type
- Select components and create a system design

Thorough documentation provides an important aspect of these first six steps in the process. The designer carefully records every decision with full background information for each step in the process in the Design Specifications. This document allows anyone to relive the process by which the designer arrived at every key decision in developing the design.

The next step in this methodical performance-based design process requires that the designer evaluate the system design. To some, this step represents the most difficult to comprehend. It truly blends the science of fire protection engineering with the practical analysis of what will happen in various fire scenarios.

Quite interestingly, in applying the performance-based building design process, for example, NFPA 101-2000, *Life Safety Code*, devotes a significant amount of narrative to describing this portion of the design process.

The designer must draw on his or her knowledge of a vast amount of information on how building materials and people respond to and behave during a fire. The designer must carefully consider the effects of heat and products of combustion on a variety of intervening variables that will affect life safety, property protection, mission continuity, and environmental protection. At this point in the process, the care with which the designer has selected the performance criteria to support the design objectives will come into play.

In short, the designer must test the adequacy of the design. When exposed to the rigors of the particular performance criteria, does the design perform adequately to assure that the achievement of the design objectives?

If the designer discovers that the design does not meet the performance criteria, then either the designer must modify the design or the designer must modify the design objectives and the supporting performance criteria.

The attention to detail that the designer applies during this step will largely determine whether or not the performance-based fire alarm system design will stand the test of time. Some might fall to the temptation to gloss over this step. Others might try to weave a narrative filled with

“slippery” language that would allow them to give the appearance of meeting strict performance criteria, while actually more or less bypassing the rigor intended by this part of the process.

Authorities Having Jurisdiction who must review performance-based building designs will do very well to place as much emphasis as possible on a very detailed and careful review of all the documentation that records this part of the process. Does the proposed design truly withstand the scrutiny of the performance criteria? Do the performance criteria accurately and adequately reflect the true intent of the performance objective they support?

AHJs should not fear asking for assistance in conducting a review of this step in the process. Where a jurisdiction cannot afford to have a fire protection engineer on staff, many will require the developer proposing the performance-based building design to hire an independent fire protection engineering firm to conduct a peer review of the proposed design. Other jurisdictions will pool their resources to hire a firm to represent them in conducting a thorough review.

Whatever method an AHJ chooses to employ, this step remains the most critical in achieving a design that will offer a level of safety equal to or even greater than that provided by a prescriptive code-complying design. An investment of time and resources at this point in the performance-based design process will give the AHJ confidence in the nature and character of the specific design. Particularly until this process becomes far more routine than it has become at present, the confidence-building aspect of this step will remain critically important.

Once the fire alarm system design has met the performance criteria, the designer can then move on to choose the specific components for the system and prepare the final design documentation. We will focus on these last two steps, and their associated supporting documents, in the next issue.

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