Occupant Notification in Large Spaces

An Engineering Study Sponsored by the Fire Protection Research Foundation

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Abstract

The requirements for the installation and performance of visible signaling in NFPA 72, the *National Fire Alarm Code*, are based on occupants being alerted by indirect signaling effectsⁱ. That is, they are alerted by the illumination of their surroundings, not necessarily by direct viewing of the signaling appliance.

The testing that led to the requirements in NFPA 72 was limited to classroom and office type spacesⁱⁱ. The methodology was never tested in large, well lit spaces such as warehouses, large "super stores", etc. Nevertheless, because strobes are required by other codes in these spaces, the installation and performance requirements of NFPA 72 are being enforced despite the lack of any technical foundation. In some cases, authorities are imposing their own requirements such as not allowing ceiling mounted appliances. The Annex of NFPA 72 states that there may be more efficient methods of visible signaling in large spaces such as warehouses and distribution centers.

NFPA 72 permits a performance based design approach that actually exceeds the prescriptive requirements for visible signalingⁱⁱⁱ. Ad hoc testing in a large home supply store showed that such an approach may be effective, but not necessarily for the same reasons that it works in smaller spaces. The tests showed that high ambient light levels resulted in little or no *indirect* signaling effect in some parts of the space. The signal-to-noise ratio produced by the operating strobes was low in many locations. However, with strobes located over the aisles or unobstructed by stock, *direct* signaling and some indirect signaling was achieved.

As a result of that test, a proposal was submitted to the NFPA 72 Technical Committee on Notification Appliances for Fire Alarm Systems to add text to the Annex explaining possible direct signaling effects in large spaces. The committee accepted the proposal but requested that additional data be gathered and added in the form of a Comment on the Report on Proposals^{iv}. A proposal for limited research and testing was submitted to the Fire Protection Research Foundation. The proposal was accepted and the project was funded.

Tests were conducted in three different warehouse type stores. The results show that it is possible to have effective occupant notification by strobes installed per the requirements of the performance-based section of NFPA 72. Occupant alerting is achieved by a combination of direct and indirect signaling. The tests highlighted additional factors that designers, installers and owners should consider in order to increase the effectiveness of systems in large spaces. As a direct result of this project, the NFPA 72 Technical Committee on Notification Appliances drafted a Committee Comment revising the Annex text regarding visible signaling in large spaces to incorporate ideas and concepts found in the testing.

ⁱ NFPA 72, *National Fire Alarm Code*, National Fire Protection Association, Quincy, MA 1993 through 2002 editions.

ⁱⁱ F. DeVoss, "Report of Research on Emergency Signaling Devices For Use By the Hearing Impaired", Underwriters Laboratories, Inc., Northbrook, IL, 1991.

ⁱⁱⁱ Section 7.5.4.3, NFPA 72, *National Fire Alarm Code*, National Fire Protection Association, Quincy, MA 2002. ^{iv} *Report on Proposals*, NFPA 72, 2007 edition, National Fire Protection Association, Quincy, MA.