

Exit signs and smoke... A cloudy issue under study

A study concerning the visibility of exit signs in smoke, by the National Research Council of Canada, may result in changes to building codes in Canada.

By Mark S. Rea, Ph.D., P.Eng.

Exit signs are an important aspect of fire protection strategies in buildings. Since they are intended to direct building occupants to points of egress in case of fire, one would expect them to be visible to occupants in smoke. But are they? Maybe not.

Many exit signs used in Canadian buildings could be invisible in very low densities of smoke. Many more could be unreadable. Since we rely so heavily on exit signs to direct us to locations for safe egress, they must be visible when they are most needed, namely in smoke.

One naturally looks to the various fire-protection codes for guidance on such matters. However, current recommendations from the Canadian General Standards Board and the National Building Code of Canada, the primary sanctioning bodies in Canada, may not adequately address exit-sign visibility in smoke. These bodies are concerned, however, and have approached the Division of Building Research at the National Research Council Canada to study this matter in detail. The results of the DBR/NRCC study will be published

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Figure 1. An electric, transilluminated exit sign photographed in smoke.



Figure 2. The same sign as shown in Fig. 1 made brighter by adding more internal lights.

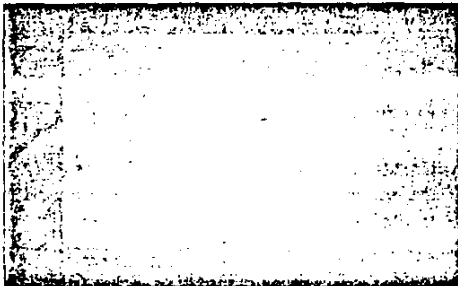


Figure 3. Identical to Fig. 2, except a small amount of ambient illumination has been added to the smokey environment, producing scatter.

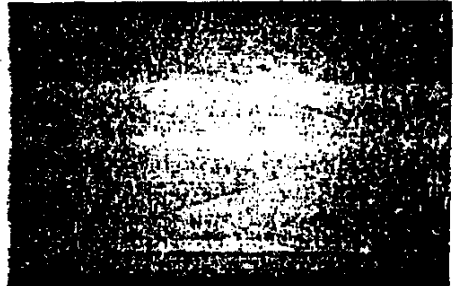


Figure 4. An exit sign with a 'down-light' and a bright luminous surround in smoke. No ambient illumination has been added to the smokey environment; scattered light, created by the sign itself, has obscured the lettering on the sign.

soon. In the meantime, a summary with some recommendations are made here.

Bright signs are more visible in smoke. Dim signs, including chemiluminescent (self-luminous) signs, may be completely obliterated in very low smoke densities. Electric, transilluminated exit signs equipped with incandescent lamps can be made markedly brighter by retrofitting them with new compact fluorescent lamps. This simple strategy makes them more

energy-efficient and more visible in smoke. They can be made even brighter, and thus more visible in smoke, with optical designs incorporating focusing lenses or reflectors. See Figures 1 and 2.

Scattered light from other light sources, such as fluorescent luminaires or emergency lights, can reduce the visibility of exit signs. Scattered light in smoke creates a visually debilitating luminous cloud much like high-beam headlights on a

car driven in fog. Extinguishing or dimming these other light sources in smoke makes a dramatic improvement in exit-sign visibility.

See Figure 3.

Ironically, some features of the exit signs themselves limit a person's ability to read them in smoke. Downlights on the underside of many exit signs (used to illuminate doorway thresholds) contribute to the scattered light in smoke. Some exit-sign designs have bright, luminous areas surrounding the lettering; this also adds to the scatter. These features limit exit sign readability in smoke and they should be eliminated, at least under conditions of smoke.

See Figure 4.

The technology is available to make exit signs more visible in smoke. Centralized lighting-control systems have been used successfully to co-ordinate the energy performance of ambient lighting fixtures in large buildings. These systems could also

be used to co-ordinate the ambient lighting fixtures with the performance of exit signs and emergency-lighting fixtures. For example, only when smoke is detected would the exit signs be bright; at other times they would be dim (yet visible).

Ambient and emergency illumination would be strategically dimmed or extinguished in smoke; at other times these fixtures would operate in a conventional manner. Even downlights underneath the exit sign, potentially useful in a clear atmosphere, could be extinguished by the computer system when smoke is detected in the building.

It is uncertain, however, whether buildings in Canada will be changed to incorporate such technically feasible strategies. These research findings will probably have little impact on building design and retrofit unless they are reflected in revisions to the building codes.

Very likely, codes will be revised.

There has been a growing interest expressed by sanctioning bodies in Canada and elsewhere to improve fire safety recommendations. For example, the research outlined in this article was prompted by standards writing bodies.

Changes to building codes, however, are sometimes made without prior input from practising designers and engineers. Although the author is in no position to rewrite the fire safety codes, it would be most informative to receive readers' reactions regarding these recommendations and their thoughts on other potentially useful improvements in fire safety. □

Your reaction...

Let us know what you think. Write or call Canadian Consulting Engineer, 1450 Don Mills Road, Don Mills ON M3B 2X7; tel. 416 445-6641.