Research & Development Highlights

Technical Series
90-237

Costs and Benefits of Smoke Alarms

Introduction

The widespread use of affordable, reliable smoke alarms has greatly reduced the rate of property loss, injury and death from fire in Canada. Wired-in smoke detectors have been mandatory in new housing since 1980. By 1988, about 83 percent of owner-occupied homes and 74 percent of tenant-occupied homes had alarms.

The low cost and high effectiveness of smoke alarms suggest that even greater reductions in damage, injury and death could be achieved if alarms were installed in those houses which do not have them.

This study examines three factors:

- the effectiveness of smoke alarms in preventing death, injury and property damage due to fire;
- the costs and benefits of installing smoke alarms in houses that do not have them; and
- methods of improving the dependability of smoke alarms.

Use and Reliability

An estimated 18 percent of Canadian one- and two-family houses do not have smoke alarms. The main reasons for not installing alarms are that occupants are unaware of the importance of smoke detectors, or cannot afford them.

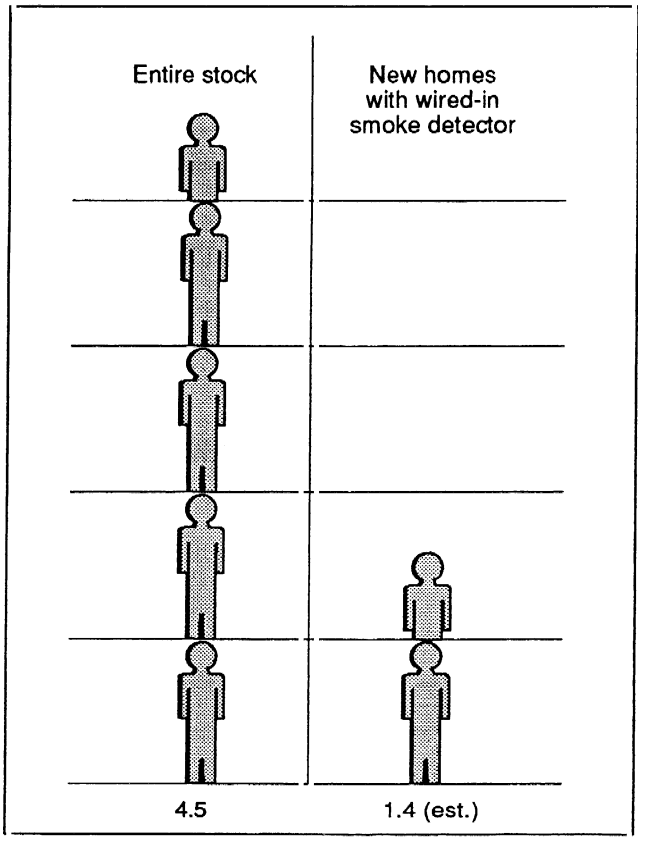
Based on U.S. studies, battery-operated smoke alarms are reliable 75 percent of the time, while wired-in alarms are reliable 95 percent of the time. Failure of battery-operated alarms is caused mainly by dead batteries or improper installation.

Effectiveness

Smoke alarms do not prevent fires, but because they provide warnings of small fires that can be easily extinguished, they reduce the number of fires that become serious enough to require reporting. Houses with alarms have fewer reported fifes, and those that do have fires experience fewer injuries and deaths and substantially less property loss. The number of reported fires in houses without alarms is about 10 times greater than in houses with alarms.

The annual fire-death rate in houses without alarms is 130 deaths per million households. By installing several battery-operated smoke detectors in each house, that rate would be reduced by approximately two-thirds.

The exact effect of smoke alarms on property loss is difficult to assess, because many of the fires detected by alarms are not reported. According to one rough estimate, houses without alarms suffer an average loss of $79.30 per house, while those with alarms incur a loss of only $40.20 per house. Factoring in other variables, the annual property saving gained as a result of smoke alarms is about $45.00 per house. Indirect costs, such as the need for temporary housing because of fire, would also be reduced.



Fatality rate per 100,000 homes in Canada-1987

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Smoke Alarms in New Houses

Smoke alarms probably save 26 lives per million newer houses per year. Newer houses also have about 10 percent fewer fire-related injuries than the general housing stock. Since these houses have wired-in smoke alarms, it was assumed the more reliable alarms are likely the primary reason for the reduction.

Although property loss for new houses is greater—because new houses are more expensive to repair—the savings per new house due to wired-in alarms is $22.27.

Making Smoke Alarms More Effective

There is significant room for improving the effectiveness of smoke alarms. Many do not function as well as they could because of battery failure, incorrect installation and improper placement.

The study recommends several improvements:

- replace annoying weak-battery beeps with a flashing light, and include a second signal to show the alarm has no batteries (for example, a cover that does not close unless the battery is installed);
- install at least three alarms in each house, one in the living room (41 percent of fatal fires start in the living room), one near the bedrooms, and one in the basement; and
- subsidize the installation of detectors in the homes of families that cannot afford them.

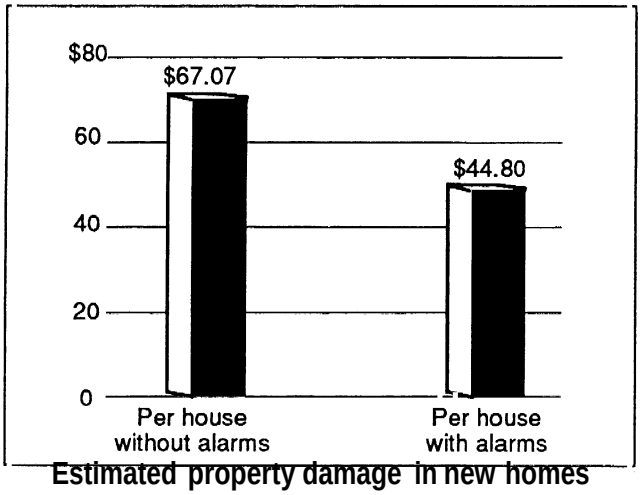
Cost of Installing and Maintaining Smoke Alarms

At the time of the study, the average cost of a wired-in alarm system with eight detectors for a 140 m^2 split-level house was about $490.00. A system with four detectors would cost about *$315.00.* A battery-operated alarm which works just as well as wired-in units—if the batteries are working-costs about $20.00.

Conclusions

Smoke alarms clearly reduce deaths, injuries and property losses. These figures could be further reduced if the remaining 18 percent of Canadian houses without alanns had them.

Householders, salespeople and others still need to be educated about the benefits of smoke alarms and their contribution to fire safety. Governments should consider subsidized installation programs for families who cannot afford to install an alarm.



Estimated property damage in new homes

	Fatalities per 100,000 homes	Injuries per 100,000 homes
Existing homes before alarms	9.2	23.5
Existing homes with smoke alarms(mostly battery-operated)	3.4	20.6
New homes with wired-in smoke alarms	1.4	20.0

Fatalities and injuries

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Research Report: The Costs and Benefits of Smoke Alarms in Canadian Houses

Research Consultant: A.T. Hansen, Scanada Consultants Limited.

A full report on this research project is available from the Canadian Housing Information Centre at the address below.

This Research and Development Highlights factsheet is one of a wide variety of housing-related publications produced by CMHC.

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Under Part IX of the National Housing Act, the Government of Canada provides funds to CMHC to conduct. research into the social, economic and technical aspects of housing and related fields, and to undertake the publishing and distribution of the results of this research,

This factsheet is one of a series intended to inform you of the nature and scope of CMHC's technical research program.