YOUR— Smoke detectors

Introduction:

"National statistics have shown that close to two-thirds of all reported fires occur in the home and most of them begin when the occupants are in bed and asleep".

This statement, as well as other and similar statements, has appeared in recent months in connection with the various campaigns aimed at encouraging the use of fire detection devices in the home. To be more specific, the Dominion Fire Commissioner reports that in 1973, 61 per cent of all fires occurred in residential property and these fires accounted for about 85 per cent of the fire deaths in Canada. A number of Municipal By-Laws have been drafted, and in some cases put into effect, which require the installation of fire detection devices in single family dwellings and there has been considerable publicity as to the pros and cons of the various devices which have been developed for this purpose.

As one would expect at this juncture, there is a growing need for a publication along the lines of "Everyone's Guide to Fire Detection in The Home". This article will not pretend to be so all-encompassing, but we will try to place such matters as the selection, installation and maintenance of fire detection systems and devices for use in the home in their proper perspective as well as comment as to how the investigation and testing of such devices by Underwriters' Laboratories of Canada (ULC) attempts to accommodate all of the appropriate considerations and provide a common standard of performance against which to judge their acceptability.

Detector Specification:

"If we could predict with some measure of certainty the type of fire to be detected, then the appropriate detector could be selected". This is a comment extracted from a recent article on the subject of fire detection, which summarizes the basic problem of fire detection almost as succinctly as one can put it. If we expand the comment to include reference to predictions as to where the fire will occur and what will be burning, we shall have virtually (but not quite) defined the complete problem.

Most people will agree that a significant requirement in the specifying of a fire detector for use in the home is that it provides as early a warning of a fire as possible. Warming to the subject, our specifier will quickly add that the device will preferably be: capable of detecting a fire involving all types of burning materials, able to discriminate between "friendly" and "unfriendly" phenomena (i.e. free from a tendency to give false alarms), able to provide coverage for a large area; easy to maintain or require little or no maintenance, reliable, "reasonably" priced, and so on.

Is there a detector with all these desirable qualities? How much of a compromise to our requirements may we have to accept? Are we expecting too much? In order to tackle some of these questions it will be necessary to go back to "square one" in our story and examine some of the fundamentals of fire protection, particularly as they apply to fire detection in the home.

To begin with, although it is possible to conjecture on a number of possible causes of fire in the home as well as possible sources, they are not likely to be concentrated in any one area, nor are they likely to involve only one material or group of materials. The Report of the Dominion Fire Commissioner for Fire Losses in Canada during 1973 notes that the leading cause of all fires is careless smoking (28 per cent), which in residential fires usually involves bedding or upholstery, with 13 per cent attributable to faulty electrical equipment and 11 per cent to faulty heating equipment. Other causes of fires in residential property include lightning, flammable liquids, incendiary activities and cooking equipment.

Ideally a home fire detection system or device should be able to respond to all possible fire situations and provide sufficient warning to the occupants of a home to enable them to evacuate under all conceivable circumstances.

Detector Types:

All fire detection systems and devices have at least one thing in common and that is they depend upon the detection of one or more of the phenomena resulting from a material either burning or smoldering by the device or system employed. The current and popular word for this detectable phenomenon is the "fire signature".

In every day terms the phenomena most readily associated with a fire condition are heat and smoke. Fire also produces quantities of gases among the products of combustion.

In "fire signature" terms heat is associated with the "energy release" signature and encompasses convected and radiated heat energy. Smoke is associated with the "aerosol" signature which embraces a range of visible and invisible particles released during the combustion process. The "gas signature" includes gaseous products of combustion such as Carbon Monoxide, Carbon Dioxide and Hydrogen Chloride.

Let us now briefly examine the principles of operation of some of the common types of fire detectors that have been developed for use in the home and comment upon the manner in which they make use of the fire signature in the detection process.

Bearing in mind the level of sophistication presently reached in the design of fire detection devices, it would be fair to say that some of the simple forms of fire detection devices are those designed to respond to the "energy release" signature. These fire detectors are commonly known as "heat detectors" and depend upon such actions as the fusing of a low melting point alloy or the disproportionate expansion of dissimilar metals to precipitate a fire warning condition by such means as the closing of contacts completing an electrical circuit releasing of a mechanical bell mechanism or the release of gas under pressure through a horn. These detectors are referred to as "fixed temperature" type heat detectors.

Another common type of detector employing the "energy release" signature makes use of the expansion characteristics of heated air to announce the presence of a fire condition. This "rate-of-rise" type of heat detector is often combined with a "fixed temperature" type to obtain as much warning advantage as possible from the conditions of heat release in a fire.

Heat detectors are normally set to respond to temperatures in the order of 135 F and at a temperature rate-of-rise of 15 F per minute and because of their response characteristics probably give the least number of "false", or rather "unwanted" alarms.

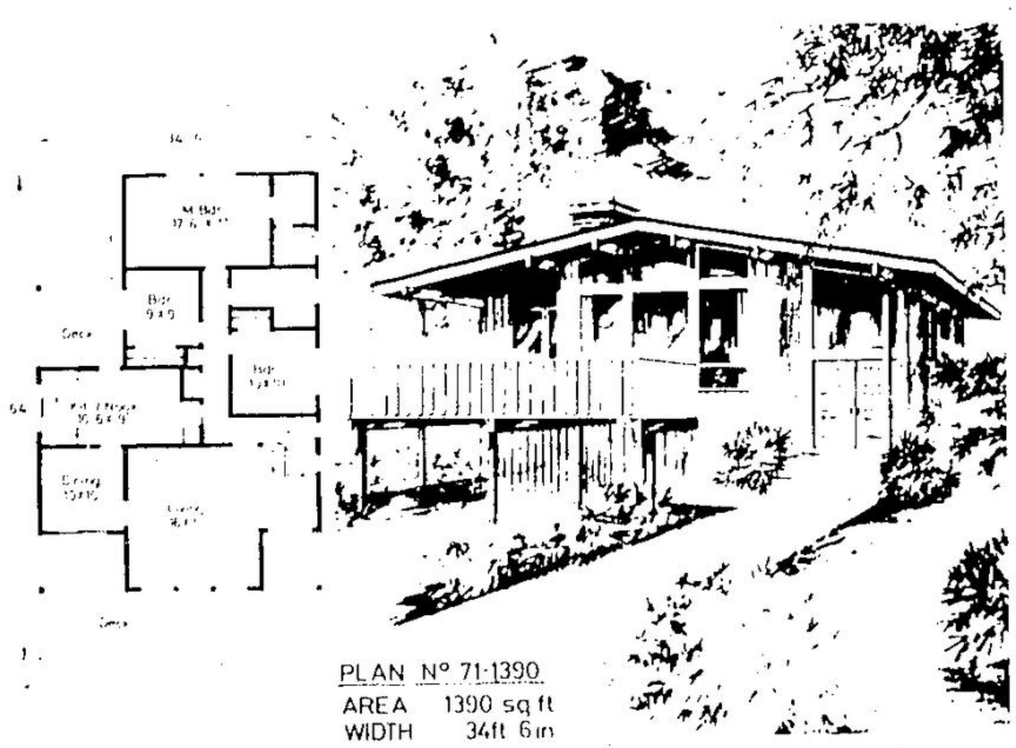
The two most common types of fire detectors which employ the "aerosol" signature in the detection process are the "ion chamber" type (known in ULC parlance as the "combustion products" type) and the "photoelectric" type.

The ion chamber type employs a radio-active source to establish a conductive path in a sampling chamber between two oppositely charged electrodes by ionizing oxygen and nitrogen molecules in the air between them. (The radio-active source is a very low order and we are given to understand that the radiation dose rate outside the unit is less than the commonly accepted dose rate which may come from a colour television set or a luminous timepiece. Each distributor of such devices in Canada is required to be licensed by the Atomic Energy of Canada Limited following examination of this feature of the device by the Radiation Protection Bureau of the Department of Health). When a voltage is applied, a current flows, and when particles of combustion (which are not necessarily visible particles) enter the chamber, the conductivity of the path between the two electrodes is reduced, causing a decrease in the current flow. When the current falls below the alarm threshold level, which occurs at a particle "presence" level consistent with a fire situation, the device is triggered to a warning condition.

The photoelectric type of smoke detector usually depends for its operation upon the amount of light reflected or "scattered" by particles of primarily visible smoke which have entered its sampling chamber, impinging upon a photocell or phototransistor. The presence of smoke thus results in a change in the conductivity of the photocell or phototransistor which is interpreted and announced by an appropriate electrical circuit. A similar effect is produced in some designs of photoelectric type smoke detectors where a light path aimed at a photocell is interrupted or partially obscured by the presence of smoke.

Smoke from a typical house fire contains particles in a wide range of sizes and in varying densities. These and other characteristics associated with a fire condition may favour the response of either type of smoke detector. However it is considered that both types respond to most of the fire conditions which may be encountered in the home. As will be

NEW HOME OF THE WEEK



PLAN N° 71-1390
AREA 1390 sq ft
WIDTH 34ft 6in

CONTEMPORARY SPLIT ENTRY

This three bedroom split design is ideally suited to the deep and narrow footage lot and affords the growing family abundant room for future development. The rugged post and beam construction, front and side decks and rough cedar siding of the exterior emphasize the outdoors, and make this design appropriate to any setting, either highly urban or rural residential.

The weather sheltered, double doored cathedral entry faces a semi circular stair case leading up to the main living area, or down five risers to the unfinished ground level.

The living room features a vaulted beamed ceiling, large corner fireplace and front wall of window for excellent natural lighting.

The dining room for formal entertaining separates from both the living room and the kitchen nook via pocket doors and gives access to the wide front deck via sliding glass doors.

The U shaped kitchen and adjacent breakfast nook is well planned to facilitate casual family meals and to minimize household chores. The kitchen nook has access to a rear deck, encouraging patio style dining in fair weather.

The main bath is centrally positioned to all three bedrooms and features a double vanity sink counter configuration.

All three bedrooms have ample closet storage and each has a window for natural lighting. The large master bedroom has a full walk in closet and a two piece ensuite bath.

The unfinished ground level has abundant space for the future development of a fourth bedroom, a large recreation room and or family room. A large utility and interior storage room contains the laundry facilities. The downstairs has roughed-in plumbing and a fireplace for the recreation or family room.

A double carport with adjacent exterior storage area completes the facilities of this appealing and highly practical design.

Plans for design No. 71-1390 may be purchased either by single set, at a cost of $70. for the first set and $10. for each additional set, or by the package. A five set plan package, including the first set, is economically priced at $100. and an eight set package, also including the first set, is only $125.

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